Proposed Expansion of Rodrigues Airport

Draft Environmental and Social Impact Assessment Report

Report prepared for Airport of Rodrigues Ltd.

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AFD Agence Française de Développement
AGL Airfield Ground Lighting
AOI Area of Influence
AQNR Anse Quitor Natural Reserve
ARL Airport of Rodrigues Ltd
AML Airports of Mauritius Co Ltd
ASDA Accelerate-Stop Distance Available
ATC Air Traffic Control
CIA Cumulative Impact Assessment
CCR Constant Current Regulators
CCTV Close Circuit TeleVision
DVOR Doppler VHF Omnidirectional Radio Range
DME Distance Measuring Equipment
EC European Commission
EHS Environment Health Safety
EHSG Environmental, Health and Safety Guidelines
EIA Environmental Impact Assessment
EPA Environment Protection Act
E&S Environmental & Social
ESIA Environmental and Social Impact Assessment
ESCP Environmental and Social Commitment Plan
ESF Environmental and Social Framewor
ESMP Environmental and Social Management Plan
ESS Environmental and Social Standard
ESS1 Assessment and Management of Environmental and Social Risks and Impacts
EU European Union
E&S Environmental and Social
GoM Government of Mauritius
GSE Ground Service Equipment
HVAC Heating, Ventilation, and Air Conditioning
ICAO International Civil Aviation Organisation
IFC International Finance Corporation
MDGs Millennium Development Goals
LDA Landing Distance Available
LED Light Emitting Diode
LON Length of need
NDB Non-Directional Beacon
OLS Obstacle Limitation Surface
PAPI Precision Approach Path Indicator
PCA Plaine Corail Airport
PDR Preliminary Design Report
PQC Pavement Quality Concrete
RAL Runway Approach Lights
RCSS Rodrigues council of Social Services

RESA Runway End Safety Area
RESA-O Overshoot Runway End Safety Area
RESA-U Undershoot Runway End Safety Area
RFF Rescue and Fire Fighting
RFFS Rescue and Fire Fighting Services
RGL Runway Guard Lights
RRA Rodrigues Regional Assembly
RTIL Runway Threshold Identification Lights
TODA Take Off Distance Available
ToR Terms of Reference
TORA Take Off Runway Available
SCP Stakeholder Commitment Plan
SEP Stakeholder Engagement Plan
SIDPR Sustainable Integrated Development Plan for Rodrigues
VDGS Visual Docking Guidance System
VEC Valued environmental and Social component
VHF / UHF Radio frequencies
VIP Very Important Person
VSAT Very Small Aperture Terminal
WB World Bank
World Bank ESF World Bank Environmental and Social Framework
WTP Wastewater Treatment Plant

1 Non-Technical Executive Summary

1.1 Introduction

Plaine Corail Airport in Rodrigues Island is managed by Airport of Rodrigues Ltd. (ARL), a subsidiary of the Airports of Mauritius Co. Ltd. (AML).

An Environmental and Social Impact Assessment for the New runway at Plaine Corail Airport in Rodrigues Island was prepared in 2019 to meet the requirements of the Government of Mauritius and those of the Agence Française de Développement (AFD) and the European Union (EU).

Airport of Rodrigues Ltd is now proposing to seek financing support from the World Bank for the proposed expansion of the Rodrigues Airport, and is therefore required to update the ESIA to meet the requirements of the World Bank Environmental and Social Framework (ESF).

This draft ESIA document has therefore been updated to meet the requirements of the World Bank ESF and will be finalized once the detailed design has been completed

A final version of the ESIA will be prepared and disclosed before project appraisal (preliminarily planned for April 23) based on the additional studies identified in the draft ESIA (this document) and the finalization of the airport design.

1.2 Project description

The updated scope of the proposed expansion of the Rodrigues Airport is as follows:

Infrastructure works

- New runway 2100x45m
- Taxiway and aprons
- Airfield ground lighting
- Approach lights
- Flood lights masts
- PAPIs
- CNS equipment and landing procedures
- Landside car park
- Stormwater network
- Potable water network
- Sewerage network
- Sewerage treatment plant
- Maritime rock revetment works
- Desalination plant

Building works

- Air traffic control tower
- Rescue and fire fighting station
- Meteo building
- Quarantine building
- Incinerator and associated building
- Boat house for the national coast guard
- Power centre
- Cold storage building

Note that the Air Traffic Control tower and the Rescue and Fire Fighting Station, initially located within the perimeter of Anse Quitor Nature Reserve, has been relocated outside the reserve. Hence the draft ESIA is updated accordingly.

1.3 Environmental and social baseline conditions

1.3.1 Physical environment

For the purposes of the physical environment baseline description, the Area of Influence shown in Figure 1 as defined in the initial ESIA 2019 had been subdivided into:

- The “large area” includes the airport and its remote surroundings, which are known to be influenced by the direct and indirect impacts of the airport;
- The “restricted area” is the project footprint’s direct surroundings, which are considered potentially directly impacted by the project.

The area of Influence will be reviewed further, in a manner consistent with the requirements of the ESSs, in the light of the detailed design and technical information gathered on the project on the one hand, and the collection and analysis of environmental and social baseline information and data on the other hand.

As such the biophysical area of influence will include ground and underground areas as appropriate, being on the landward side the adjoining Anse Quitor Nature Reserve, the river and its estuary and on the seaward side a portion of lagoon and islets. The aerial area of influence will include the area potentially affected by emission of pollutants in the atmosphere.

It is recalled that an area of influence encompasses, as appropriate[1]:

(i) the primary project site(s) and related facilities that the client (including its contractors) develops or controls, such as power transmission corridors, pipelines, canals, tunnels, relocation and access roads, borrow and disposal areas, construction camps;

(ii) associated facilities that are not funded as part of the project (funding may be provided separately by the client or by third parties including the government), and whose viability and existence depend exclusively on the project and whose goods or services are essential for the successful operation of the project;

(iii) areas potentially impacted by cumulative impacts from further planned development of the project, any existing project or condition, and other project-related developments that are realistically defined at the time the Social and Environmental Assessment is undertaken; and

(iv) areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.

The area of influence does not include potential impacts that would occur without the project or independently of the project.

[1] International Finance Corporation, Performance Standard 1 Social and Environmental Assessment and Management Systems

Figure 1: Area of influence (to be updated at final ESIA stage)

1.3.1.1 Geographical overview

Rodrigues is an island of volcanic origin belonging to the Mascarene Islands, located in the South Western Indian Ocean. It is 18 km long, 6.5 km wide and covers a surface area of 108 km².

The capital city is Port Mathurin, located on the opposite side of the island from Plaine Corail, in the northeast.

The island has a general mountainous topography with alluvial plains in the north and south. It is organized around a central ridge, from which steep ravines radiate. The valley bottoms usually remain dry and are only affected by torrential flows during heavy cyclonic rains.

However, the southwestern part of the island is dominated by a karst plain of coral sandstone over an area of about 10 km².

The island is surrounded by a large coral reef with several islets that emerge from it.

1.3.1.2 Climate and meteorological conditions

Rodrigues lies near the edge of the southern tropical belt. The climatological regime is mild tropical maritime, determined by the alternation of the two seasons:

Summer from November to April, the rainier and warmer season, during which tropical cyclones occur,
Winter from May to October which is cooler and relatively drier.
The average annual rainfall over Rodrigues is 1348 mm. The rainfall increases from 800 mm on the coast to over 1,600 mm on the summits.

The wind pattern on the coast of Rodrigues is influenced year-round by two types of persistent winds: south-easterly trade winds and Austral westerly ones. Most of the wind comes from the East and South-Southeast directional sector with a mean velocity of 7.68 m/s. During extreme events, such as cyclones, wind gusts can reach a speed of up to 44.03m/s.

The most frequent natural disasters faced by Rodrigues are cyclones and high intensity rainfall: Rodrigues can be affected by hurricanes arriving from the east from November to April. Since the early 60's, 74 tropical disturbances have occurred in the vicinity of Rodrigues.

On the other hand, there is no record of any significant tsunami that has affected Rodrigues, but there is a possibility that a tsunami generated from either the Sumatra or the Makran source could affect the coasts of Rodrigues.

According to the 'update of the nationally determined contribution of the Republic of Mauritius' published on 1 October 2021, Rodrigues Island tends to be more affected by the strongest winds and deepest storm surge. On the island, a 100-year event would generate winds exceeding 200 km/h. As compared to the island of Mauritius, Rodrigues is more exposed to longer periods of water scarcity.

1.3.1.3 Marine conditions

The mean magnitude of current in deep water near Rodrigues is 0.17 m/s and most of the magnitude is inferior to 0.3 m/s, 89%. Directions vary with a predominance of South West – North East currents.

The reef lagoon's hydrodynamics are complex, although three lagoonal passes can be identified in the fringing reef around Rodrigues, none of them are in front of Plaine Corail.

Alongside the runway, currents are flowing from South-East to North-West throughout the duration of the year and fluctuate from almost no magnitude to 0.5 m/s with ebb and flow tide currents. They are tide-generated, the wave height inside the lagoon being very small. The current coefficient can briefly be reversed during light winds and strong tides.

Rodrigues' tides can be classified as meso-tidal due a tidal range inferior to 2 m. Sea level has risen by 6.7 cm between 1950 and 2001.

The coral reef fringing Rodrigues serves as a natural barrier that protects adjacent shorelines from offshore coastal hazards such as storms surges and waves. Plaine Corail is well protected from extreme waves due to the reef which is up to 8.3 km wide. In the canal between Crab Island and the runway, significant height reaches 45 cm when eastern wind blows with 10.5 m/s velocity (highest 10%) and 20 cm without wind.

Sea levels in the southwest Indian Ocean based on reconstructed tide gauge data and Topex/Poseiden altimeter for the period 1950-2001 shows a rise of around 1.5 mm/yr at Port Louis and 1.3 mm/yr at Rodrigues, (Church, et al., 2006). Analysis of Port Louis data for the period 1987-2007 gives a mean rise of 2.1 mm/yr for the last 10 years. This slightly higher rise is consistent with IPCC WGII AR4 conclusions, although longer period of measurements are necessary for reliable conclusions.

1.3.1.4 Climate Change

1.3.1.4.1 Sea level rise

Sea level have started to rise under the impact of climate change. This increase is estimated by the IPCC for different parts of the world. For the South Indian Ocean, the estimates are as follows compared to the period 1995-2014 according to 2 scenarios:

Period	Sea level rises	
	Scenario SSP2-4.5 *(middle-of-the-road development)*	Scenario SSP5-8.5 *(Fossil-fuelled development)*
Near term (2021-2040)	+0,1m	+0,1m
Medium Term (2041-2060)	+0,2m	+0,3m
Long Term (2081-2100)	+0,6m	+0,7m

1.3.1.4.2 Tropical cyclones

IPCC projections show medium confidence in evolution of tropical cyclones according to document: Climate Change 2021: The Physical Science Basis.

Projections for Madagascar (no projections for Indian Ocean) show medium confidence of decrease in frequency and increase in intensity. Cyclones will potentially be less numerous with more intense winds and rainfall. Lower minimum pressure and stronger winds may generate more significant surges. According to IPCC, "*The increase in global TC* [Tropical Storm] *maximum surface wind speeds is about 5% for a 2°C global warming across a number of high-resolution multi-decadal studies (Knutson et al., 2020)*" and "*A projected increase in*

global average TC [Tropical Storm] *rain rates of about 12% for a 2°C global warming* […] *(Knutson et al., 2020)".*

1.3.1.5 Terrestrial geology and geotechnics

Rodrigues Island is located on the eastern part of a roughly E-W trending fracture zone, east of the Mascarene Plateau.

The geological history of Rodrigues Island is marked by three separate volcanic activity periods:

- The first period led to the production of a basalt basement;
- The second period began with the formation of a central cone made up of aerial and subaerial lava, slags and cinders;
- The third period was a hydrothermal activity that took place on the centre of the cone, followed by an explosive episode. A volcanic plug of hawaiites and basalts filled the depression.

Located in the Southern part of Rodrigues Island, the general geological profile of the project's new runway, based on the results of in-situ ground investigations, is:

- Calcarenites composed of alternating fine to coarse sands and grained corals deposits rated by clayey beds (average thickness of 5 m) and with some areas affected by depressions in the calcarenites or by karstic evolution, including the formation of voids and caverns,
- Basalts – composed, from top to bottom of Basalt series, of highly to slightly weathered basalts, with high plasticity silty clays with intervals of gravels and cobbles (average thickness of 9.5m),
- Breccias – composed of highly weathered breccia, often located beneath Calcarenite deposits up to a 10 m depth, with high plasticity silty clays and medium to fine weathered basalts gravel (average thickness of 3 m).

Numerous voids have been located in the proposed runway area. It shows that the Eolian Calcarenite Formation is a geological unit affected by karstic dissolution. But uncertainties remain with regard to relationships between geophysical/drilling anomalies attributed to karstic features and the known caverns located along the western flank of Anse Quitor.

Plaine Corail's local topography ranges from 5 m to 39 m above mean sea level. The highest point near Plaine Corail is the Mount Sainte Marie.

Rodrigues Island is generally affected by important erosion resulting from:

- bad agricultural and grazing practices;
- past deforestation;
- poor building practices (especially the dispersed nature of settlements);
- steep topography;
- high intensity rainfall.

1.3.1.6 Marine and shores geology and marine turbidity

The coastal zone is mostly surrounded by fringing coral reef enclosing a shallow lagoon area – 0.5 to 3m – with local deeper channels. A shallow channel also separates the location of the future airport runway from Crab Island. The width of lagoons varies from 4-8km from the shore (4,6km from the airport runway).

The coastline is about 67 km long and is composed of different shore types: rocky stretches alternating with sandy beaches and smaller stretches of rock boulders and pebble shores. Plaine Corail shore is mostly rocky.

The western coastal area of Rodrigues lagoon is characterized by a significant amount of medium sand and mud. The Northern part of the bay is composed of mud due to the very weak current and the important water runoff during heavy rains. Bed load and resuspension occurs within the lagoon during each tidal cycle. Sediment transport under the influence of the flow is mainly from South-East to North-West.

The sea water around Rodrigues is usually very clear. However, rivers carry large amounts of debris and soil into the lagoons during heavy rain, increasing the sea water turbidity. In some places, mangroves have been planted that stabilize the sediments and prevent the turbidity spreading into the lagoon. In Baie Topaze, the northern area of Plaine Corail Airport, natural turbid plume was identified in the past.

1.3.1.7 Hydrology

Rodrigues Island is divided into 38 major river basins. The low permeability of soils generated by alteration of basalt suggests a generally low infiltration capacity, which is sometimes increased locally by the presence of fracture zones. Also, a significant proportion of surface run off water returns to the sea.

A geographical gradient is observed for the annual rainfall between coastal areas (less than 1000 mm) and the central plateau (more than 1,600 mm).

The airport is located near the Anse Quitor River which is quite deep near the actual airport runway, although as a result there is no potential flooding expected.

Runoff from the current runway flows to the shoulders and into the natural drains, thus directly discharged into the natural environment.

1.3.1.8 Hydrogeology

The hydrogeological units of the Rodrigues Islands are formed on the coast by mainly volcanic rocks and a minority of limestone rocks (called calcarenite hereby).

Plaine Corail is characterized by two types of potentially aquiferous formation:

- Basalts which are weak and altered and are defined as a fractured aquifer with double porosity: matrix and fracture porosity.
- Karst calacarenites which represent highly complex aquifers since they combine three types of porosities that contribute to groundwater flow: the matrix, fracture and karst network porosities.

The epikarst in the project area is partially represented by sinkholes when visible but also by numerous non-observable dissolution structures below the soil deposit. The process of recharging can occur from different mechanisms:

- Direct infiltration through the soil;
- Streambed infiltration (sinking stream);
- Lateral recharge from basaltic material.

In terms of volume, usually, sinking streams represent the one mode of recharge for the underlying karst aquifers. Flood events may temporarily create an inflow to the cave network through riverbeds like the Anse Quitor River or through the large number of cave collapse

sinkholes. In some areas, such as the Grande Caverne cave system's Canyon Tiyel section, the presence of an elongated collapsed depression could also act as preferential inflow during a rain event to the underground network. A considerable amount of water can circulate in the karstic network during rainstorms.

Basalt outcrops present in the new runway indicative of the potential presence of a basaltic fractured aquifer. This aquifer is probably in relation to the overall phreatic water in the Pointe Corail peninsula.

The three identified receiving environments are:

- Carbonate Karstic aquifer which has a consistent karst developed area with numerous open caves and gallery connections. The calcarenites in Plaine Corail are probably affected as well by karstic development and numerous entries of caves as identified. The cavities are mainly located below 10 m depth. This material seems to be relatively permeable.
- Basaltic aquifer which represents a small part of the geological material in the project area. No information on the groundwater level is available but probably lower than the deepest borehole that is to say 25m depth. Weathered basalt usually has high permeability compared to weathered basalt.
- Large caves and well-developed galleries. Three caves are located near Plaine Corail village, around the end of the projected runway's footprint (Caverne Bouteille, Caverne Petit Lac, Grotte Fougère).

There is no information regarding groundwater quality in the airport area. Water in the caves close to sea level is probably salty, at least in the tidal influence area. Stagnant freshwater ponds inside the caves are usually quickly invaded by biological elements and quickly become inappropriate for human consumption

Topsoil has been encountered in most exploratory holes with an average thickness of 0.25m and it was generally described as gravelled, low plasticity sandy silt with roots. This description of topsoil corresponds to a thin layer of permeable material which is a "first barrier" to a potential contamination on the surface.

1.3.1.9 Water resource and wastewater management

Drinking and fresh water needs and resource

Construction

The water requirement during construction is both for potable and non-potable use. The water demand is not known at this stage and shall be calculated by the contractor.

Given the water scarcity, it is proposed that a built in temporary containerised-type desalination plant be set up by the contractor, with all precautions taken to minimize the impact on the environment. Since only 20 feet containers can be unloaded at Port Mathurin Harbour, no 40 feet containers will be considered.

Operation

The daily water demand for Rodrigues is estimated to be 11,000 to 12,000 m³/day, satisfied by rainwater harvested by private individuals and by water provided by the public services. The daily freshwater production is provided by surface water harvesting, boreholes, and desalination of sea marine water.

The airport's water needs are used for the passenger terminal building and firefighting.

During November and December (highest passenger traffic period due to school holidays) the average daily water consumption reaches an average of 12.5 m^3 per day. For the rest of year when traffic is at its lowest, the airport's average minimum daily water consumption is 3.6 m^3 per day (rising over 12.5 in November-December).

Wastewater management

The existing airport has its own on-site wastewater treatment system consisting of a sceptic tank and a leaching field; which corresponds roughly to a primary treatment. The overflow from the septic tank is released to a leaching field. However, currently regular pumping of the overflow from the septic tank is done because the system does not work properly and the leaching field is not permeable enough. This pre-treated wastewater is carted away to the municipal wastewater treatment plant of Grenade.

The existing wastewater treatment plant will be dismantled once the new wastewater treatment plant is operational.

Stormwater management

Only natural drains enable the stormwater drainage on the Project's site, in addition to the natural slope of the existing runway which helps to drain the stormwater towards the sea, without any specific pre-treatment.

The fuel depot is equipped with a retention capacity (equipped with a disconnection valve) to collect stormwater generated therein. The loading / unloading platform is equipped with a disconnecting valve in order to direct the stormwater from the platform towards an open-air oil separator during "off duty" periods and to isolate the platform during fuel loading / unloading operations.

1.3.1.10 Physical environment sensitivity

The Physical Environment Sensitivity is summarised in Tale 1 hereafter.

Table 1: Physical Environment Sensitivity

Sub-theme	Receptor	Sensitivity
Marine and shores geology and marine turbidity	Marine sediment quality: contamination of marine sediments	Medium
	Marine sediment dynamics: physical disturbance of marine sediments	Medium
	Seawater quality: temperature, salinity, concentration of contaminant	High
	Physical coastal processes: shoreline, morphology, wave, currents	Medium
Hydrology	Stormwater management	Major
	Flooding of issues downstream of facilities	Low
	Transfer of pollution to the natural environment	Major
	Transfer of sediments to the lagoon	Major
Terrestrial geology and geotechnics and Hydrogeology Karstic environment	Carbonate Karstic aquifer	High
	Basaltic aquifer	Medium
	Caves (Plaine Corail)	Major

Water resource and wastewater management	Domestic wastewater management	High
	Water supply management	High

1.3.2 Biological environment

1.3.2.1 Terrestrial biological environment

Figure 2 shows the Area of Influence used to describe the terrestrial biological baseline conditions.

Anse Quitor is a 10.34 ha declared Nature Reserve as per the Second Schedule of the Forests and Reserves Act 1984 as amended; it was gazetted in 1982. Anse Quitor is one of the 4 nature reserves in Rodrigues and is a coastal dry ecosystem, with a limestone substrate. A Biodiversity Restoration Project was funded by the World Bank i.e. weeding of all weed-infested areas and replanting areas weeded with native species (1995-2001).

Anse Quitor is an interesting area with caves in which many bones of the extinct Solitaire and tortoise have been found, and plants grown in crater-like holes where little soil has gathered. Furthermore, Anse Quitor Nature Reserve holds the unique endemic tree of Zanthoxylum paniculatum and the rare Foetidia rodriguesiana, Terminalia benzoe, Antirhea bifurcata, and Gastonia rodriguesiana grow along the river banks in this nature reserve (source GEF SGP, 2011).

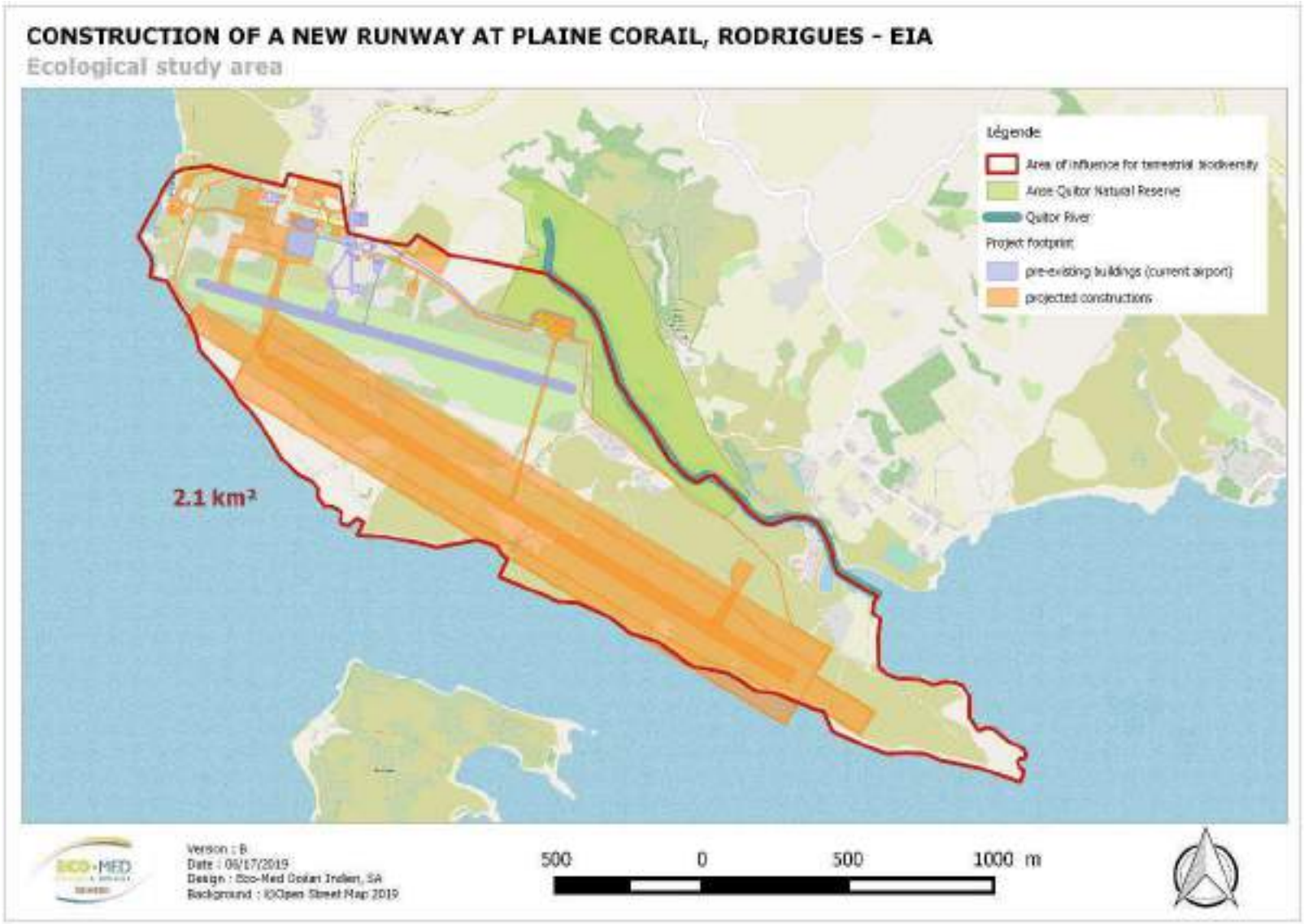


Figure 2: Area of influence – Terrestrial Biodiversity

1.3.2.1.1 Vegetation and flora

Ten terrestrial vegetation and habitat types are recorded in the area of influence (refer Table 2 and Figure 3).

Table 2: Habitat types recorded in the area of influence (ESIA 2018)

Sensitivity	Name	Area (ha)	% of the total surface
Medium	Grazing lands on basaltic resurgences	4.55	**2.03%**
Medium	Grazing lands on calcarenic substratum	66.61	**29.73%**
Medium	Coastal vegetation dominated by Ipomoea pes caprae (shore-line community)	11.52	**5.14%**
Negligible	Anthropized areas	62.77	**28.02%**
Major	Dry forest	17.57	**7.84%**
Medium	Riparian vegetation	1.20	**0.54%**
Medium	Estuarine habitat	8.25	**3.68%**
Medium	Calcarenic dry lawns of anthropogenic origin	2.19	**0.98%**
Low	Coastal grasslands dominated by secondarized thickets (*Lantana camara*)	25.55	**11.40%**
Negligible	Secondarized thickets (*Leucaena leucocephala*)	23.84	**10.64%**

As per the World Bank ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, “Habitat” is defined as a terrestrial, freshwater, or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment.

ESS 6 requires a differentiated risk management approach to habitats based on their sensitivity and values. This ESS addresses all habitats, categorized as ‘modified habitat’, ‘natural habitat’, and ‘critical habitat’, along with ‘legally protected and internationally and regionally recognized areas of biodiversity value’ which may encompass habitat in any or all of these categories.

AQNR is defined as a ‘critical habitat’ as per ESS6 in as much as it meets the definition below: Critical habitat is defined as areas with high biodiversity importance or value, including: (a) Habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent national approaches; (b) Habitat of significant importance to endemic or restricted-range species; (c) Habitat supporting globally or nationally significant concentrations of migratory or congregatory species; (d) Highly threatened or unique ecosystems; and € Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d).

Table 2 will be updated during the finalisation of the ESIA as part of the overall review of the terrestrial biodiversity study.

Note that the shores of Crab’s Island will need to be characterized following the additional baseline, if these shores are used for turtles nesting, it will be considered a critical habitat; Figure 3 will be updated accordingly.

Native flora recorded in the area of influence and sensitivity assessment are listed in Table 3. The most threatened species recorded in the area of influence for terrestrial biodiversity, as per IUCN red list of threatened species: (updated 2022):

- Critically endangered (CR) species are recorded at the study site, both are located inside the project area, such as *Hyophorbe verschaffeltii, Polyscias rodriguesiana, Latania verschaffeltii, Zanthoxylum paniculatum, Antirhea bifurcata Foetidia rodriguesiana;*
- Endangered (EN) species are recorded at the study site, which are all partially located inside the project footprint such as *Diospyros diversifolia , Fernelia buxifolia; Clerodendrum laciniatum*

Sarcostemma viminale (now referenced as *Cynanchum viminale (L.) L*.), *Terminalia bentzoe subsp. Rodriguesensis*.are not listed on the IUCN red list of threatened species; they are listed in the red list of Reunion Island.

Note that Figure 4 will be updated at final ESIA stage to reflect the above

Table 3: Native flora recorded in the area of influence and sensitivity assessment

Type	Status	Sub items	Area/number of specimens inside the area of influence	Sensitivity
Flora	Plant species of major sensitivity (IUCN - CR)	*Hyophorbe verschaffeltii*	43	**Major**
		Polyscias rodriguesiana	7	
		Latania verschaffeltii	10	
		Zanthoxylum paniculatum	1	
		Antirhea bifurcata	1	
		Foetidia rodriguesiana	3	
Flora	Plant species of high sensitivity (IUCN - EN)	*Diospyros diversifolia*	2	**High**
		Fernelia buxifolia	2	
		Clerodendrum laciniatum	3	
Flora	Plant species of high sensitivity (not found in IUCN)	*Terminalia bentzoe subsp. Rodriguesensis*	28	
Flora	Plant species of medium sensitivity: 13 species	*Adiantum rhizophorum, Camptocarpus sphenophyllus, Cyperus iria, Mathurina penduliflora, Nephrolepis biserrata, Pandanus heterocarpus, Paspalidium geminatum, Phymatosorus scolopendria, Pleurostylia putamen, Rhizophora mucronata, Sarcanthemum coronopus, Secamone rodriguesiana, Tournefortia argentea.*	118	**Medium**
Flora	Plant species of low sensitivity: 9 species	*Dodonaea viscosa, Dracaena reflexa, Elaeodendron orientale, Ficus reflexa, Ficus rubra, Phyllanthus dumentosus, Premna serratifolia, Sarcostemma viminale, Thespesia populnea*	287	**Low**

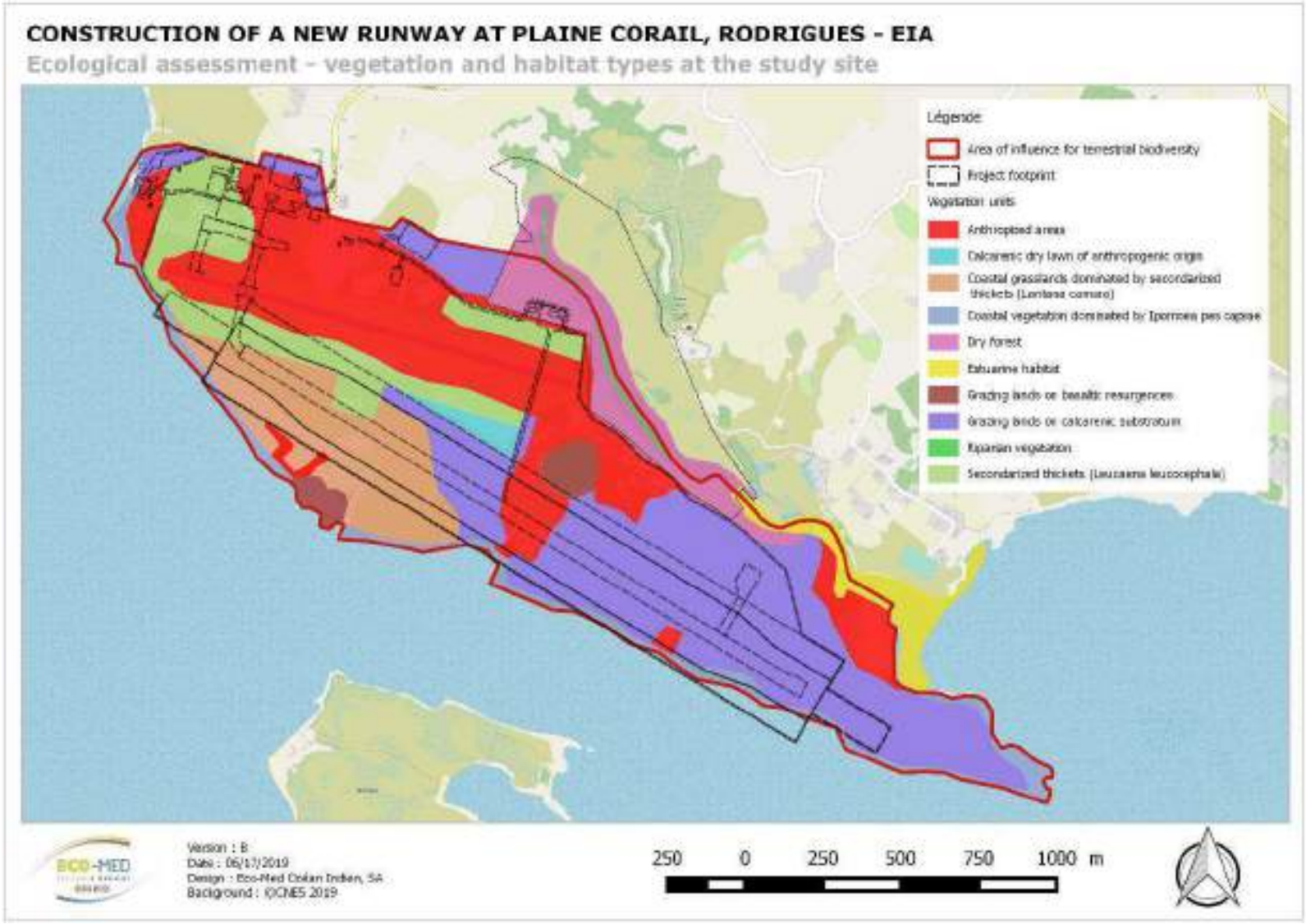


Figure 3: Vegetation and habitat types mapping

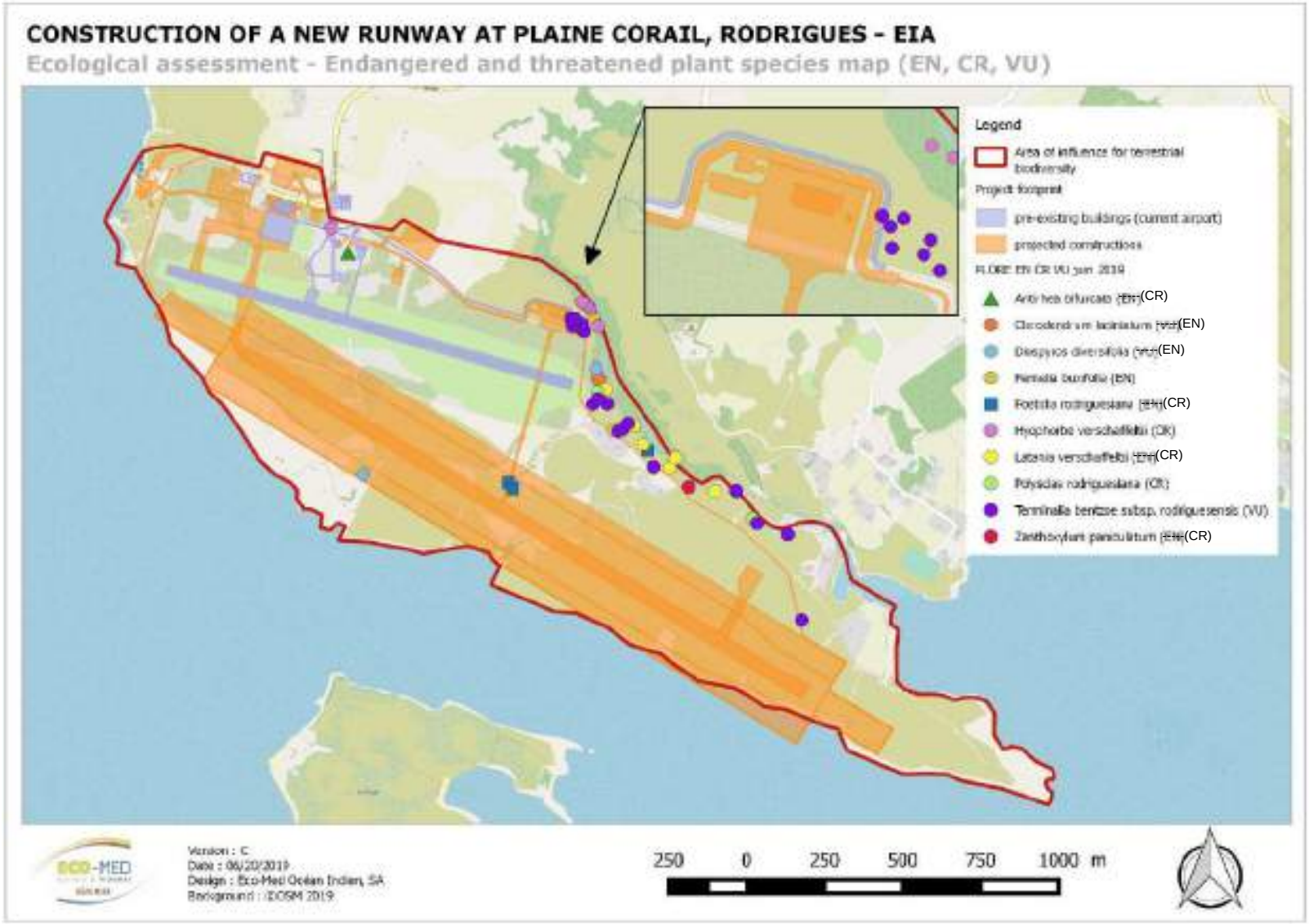


Figure 4: Endangered and threatened plant species map

1.3.2.1.2 Fauna

The baseline of terrestrial fauna is:

- Mammals: mainly bovid (cows, goats, sheep) and other domestic (cat, dog) or introduced animals (rats). There is only one native species, classified as endangered (IUCN): *Pteropus rodricensis*, an endemic bat. Only some individuals were observed flying over the area.
- Reptiles: mainly of exotic origin. Only one species is presumed to be native, *Lepidodactylus lugubris*.
- Birds: mainly exotic population. No species with a particular conservation status observed in the area.
- Molluscs: well represented by native and endemic species. *Tropidophora articulata* has an "endangered" status (IUCN red list). However only empty shells were found on the site.
- Crustaceans: no threatened species.
- Insects: no threatened species (note that the inventory period, one week after the passage of a cyclone, was not favourable to a representative vision).
- Arachnids: no threatened species.
- Myriapods: no threatened species.

1.3.2.1.3 Ecological continuities

The ecological network is presented in the table 4 below:

Table 4: List of ecological continuities included within the area of influence

Ecological continuites	Function	Species concerned
Anse Quitor river	**Terrestrial corridor**	Native breeding birds (*Acrocephalus rodericanus, Foudia flavicans*), bats (*Pteropus rodricensis*), waterbirds (*Butorides striata*), reptiles (L*ygodactylus lugubris*)
Anse Quitor river	**Aerial corridor**	Bats (*Pteropus rodricensis*), marine birds (*Phaeton lepturus*)
Anse Quitor Nature Reserve	**Biodiversity reservoir**	Native plant species, i.e.: *Camptocarpus sphenophyllus, Clerodendrum laciniatum, Diospyros diversifolia, Fernelia buxifolia, Foetidia rodriguesiana, Hyophorbe verschaffeltii, Latania verschaffeltii, Mathurina penduliflora, Pleurostylia putamen, Polyscias rodriguesiana, Sarcanthemum coronopus, Secamone rodriguesiana, Terminalia bentzoe subsp. rodriguesensis, Zanthoxylum paniculatum…* Native breeding birds (*Acrocephalus rodericanus, Foudia flavicans*), bats (*Pteropus rodricensis*), waterbirds (*Butorides striata*), reptiles (*Lygodactylus lugubris*)
Coast	**Terrestrial corridor**	Waterbirds (*Butorides striata*), waders (N*umenius phaeopus, Arenaria interpres…*)
Grazing lands		
Coast	**Aerial corridor**	Waterbirds (*Butorides striata*), waders (*Numenius phaeopus, Arenaria interpres…*), marine birds (*Phaeton lepturus, Anous*

Grazing lands		*ssp., Onychoprion ssp., Sterna dougallii, Ardenna pacifica, Gygis alba, etc*)

1.3.2.1.4 Critical habitats

As per the World Bank ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, "Habitat" is defined as a terrestrial, freshwater, or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment.

ESS 6 requires a differentiated risk management approach to habitats based on their sensitivity and values. This ESS addresses all habitats, categorized as 'modified habitat', 'natural habitat', and 'critical habitat', along with 'legally protected and internationally and regionally recognized areas of biodiversity value' which may encompass habitat in any or all of these categories.

AQNR is defined as a 'critical habitat' as per ESS6 in as such as it meets the definition below: Critical habitat is defined as areas with high biodiversity importance or value, including: (a) Habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent national approaches; (b) Habitat of significant importance to endemic or restricted-range species; (c) Habitat supporting globally or nationally significant concentrations of migratory or congregatory species; (d) Highly threatened or unique ecosystems; and € Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d).

1.3.2.2 Marine biological environment

Figure 5 shows the Area of Influence used to describe the marine biological baseline conditions.

Figure 5: Area of influence for Marine biodiversity

1.3.2.2.1 Marine habitats

The habitats recorded at the area of influence are:

- Lagoon sedimentary plain: the most common profile of the study area. It includes Sandy facies, Sandy muddy facies, Muddy facies, Macro-algae facies dominated by *Caulerpa brachypus*, and Seagrass facies with *Halophila ovalis* (phanerogam)
- Infralittoral rocks dominated by photophilic algae
- Coral reef dominated by *Acropora formosa,* a species listed as Near Threatened in the latest update of the IUCN Red List of Threatened Species last Assessed (2008)

1.3.2.2.2 Marine species

Marine species are:

- Ichtyofauna: coral formations support the richest and most diverse populations, while meadows or soft areas, such as in the area of influence, are poorer. A dominance of Scaridae, Siganidae and Labridae is observed. At the edge of the sand, we find Nemipteridae, Mullidae and Dasyatidae. On the coral reef, damselfish dominate the fish community. Emperors, snappers, trevally and groupers are rare or absent and no triggerfish (ballistids) are observed.
- Marine turtles: six species of marine turtles are present in the Indian Ocean, but none were observed in the area of influence during the dives in July 2019. However, marine turtles (hawksbill turtle) occasionally visit Rodrigues. Additional marine baseline will confirm which turtle species are present if there are nesting sites in the project area of influence

Marine mammals: No marine mammal was observed in the area of influence during the dives in July 2019 but five main species are observed in the coastal waters of Rodrigues (spinner dolphin, pantropical spotted dolphin, common bottlenose dolphin, Indo-Pacific bottlenose dolphin, humpback whale).

1.3.2.2.3 Summary: Biological environment sensitivity

Table 5: Summary of Biological Environmental Sensitivity

Theme	Sub-theme	Receptor	Sensi-tivity
Biological environment	Terrestrial habitats	Grazing lands on basaltic resurgences	Medium
		Grazing lands on calcarenic substratum	Medium
		Coastal vegetation dominated by Ipomoea pes caprae (shore-line community)	Medium
		Dry forest	Major
		Riparian vegetation	Medium
		Estuarine habitat	Medium
		Calcarenic dry lawns of anthropogenic origin	Medium
		Coastal grasslands dominated by secondarized thickets (Lantana camara)	Low
	Terrestrial flora	*Hyophorbe verschaffeltii, Polyscias rodriguesiana, Latania verschaffeltii, Zanthoxylum paniculatum, Antirhea bifurcate, Foetidia rodriguesiana*	Major
		Diospyros diversifolia, Fernelia buxifoli,a Clerodendrum laciniatum,	High
		Adiantum rhizophorum, Camptocarpus sphenophyllus, Cyperus iria, Mathurina penduliflora, Nephrolepis biserrata, Pandanus heterocarpus, Paspalidium geminatum, Phymatosorus scolopendria, Pleurostylia putamen, Rhizophora mucronata,	Medium

Theme	Sub-theme	Receptor	Sensi-tivity
		Sarcanthemum coronopus, Secamone rodriguesiana, Tournefortia argentea. Terminalia bentzoe subsp. Rodriguesensis,	
		Dodonaea viscosa, Dracaena reflexa, Elaeodendron orientale, Ficus reflexa, Ficus rubra, Phyllanthus dumentosus, Premna serratifolia, Sarcostemma viminale, Thespesia populnea	Low
	Terrestrial fauna	*Tropidophora articulata*	Medium/ High
		Tropidophora eugeniae, Lepidodactylus lugubris, Pteropus rodricensis	Low
	Marine habitats	Subalittoral rocks dominated by photophilic algae	Low
		Lagoon sedimentary plain, muddy facies	Low
		Lagoon sedimentary plain, sandy facies	Low
		Lagoon sedimentary plain, sandy-muddy facies	Low
		Lagoon sedimentary plain, macroalgae facies dominated by Caulerpa brachypus	Medium
		Lagoon sedimentary plain, seagrass facies with Halophila ovalis	Medium
	Marine fauna	Coral reef dominated by Acropora formosa	High
		Ichtyofauna	Low
		Marine turtles	High
		Marine mammals	Low

1.3.3 Transport network, electricity supply and waste management

1.3.3.1 Transport network

The road network is the main mode of transportation around the island. The main road crosses the island along a northeast-southwest axis with a secondary network that connects different municipalities.

There is one airport (Plaine Corail Airport), one port (located at Port Mathurin) and no rail network.

1.3.3.2 Electricity supply

Mauritius depends on imported petroleum products to meet most of its energy requirements. The distribution network emanates from the Port Mathurin power station where electricity is distributed. There is potential to increase the use of local and renewable energy sources such as biomass, hydro, solar and wind energy.

1.3.3.3 Solid waste management

Actually an amount of 86 tons of solid wastes are produced per week in Rodrigues. Since the year 1990 an open dump has been set up at Roche Bon Dieu but same is nearing saturation and other options had to be considered thereto.

The construction of a proper landfill is still under consideration as the site has already been vested thereto. A cell of size 50 m x 50 m has already been constructed to start receiving wastes.

The construction of the proper landfill rest on availability of funds.

Since the beginning of 2022 waste segregation at household levels has started and actually the following wastes are temporarily collected at a material recovery centre at Grenade which is under construction. It will be equipped with appropriate equipment and infrastructures such as conveyors, weighbridge, bailer machines, wheelie bins. During the actual phase, a levelled and fenced platform of area 80 m x 100 m has been constructed to receive the following segregated wastes:

- PET bottles and cans (food and drinks) -

- Glass bottles

Electronic wastes are collected through regular campaigns and temporarily stored for making available to local exporters.

Scrap metals are also collected by local exporters for shipment to Mauritius.

Actually green wastes are shredded and made available to planters for agricultural purposes. The population is sensitised on the adoption of composting at household levels; composting bins have also been granted to some families as part of a National project.

Glass bottles are shredded in view of minimising spaces and preventing eyesores; RRA is now considering the application of the shredded glasses in construction work, decoration and art work.

Construction wastes are disposed at Mt Plate which is a rock quarry site. Same upon approval of the Commission for Environment view the inert nature of such wastes.

1.3.3.4 Wastewater management

A wastewater treatment plant of capacity 50 m3 has just been constructed at Grenade. It is in the handing over phase and will be in operation shortly. In the meantime waste water is being disposed in a leaching field at Grenade itself

1.3.4 Social environment

Figure 6 shows the Area of Influence used to describe the socio-economic baseline conditions.

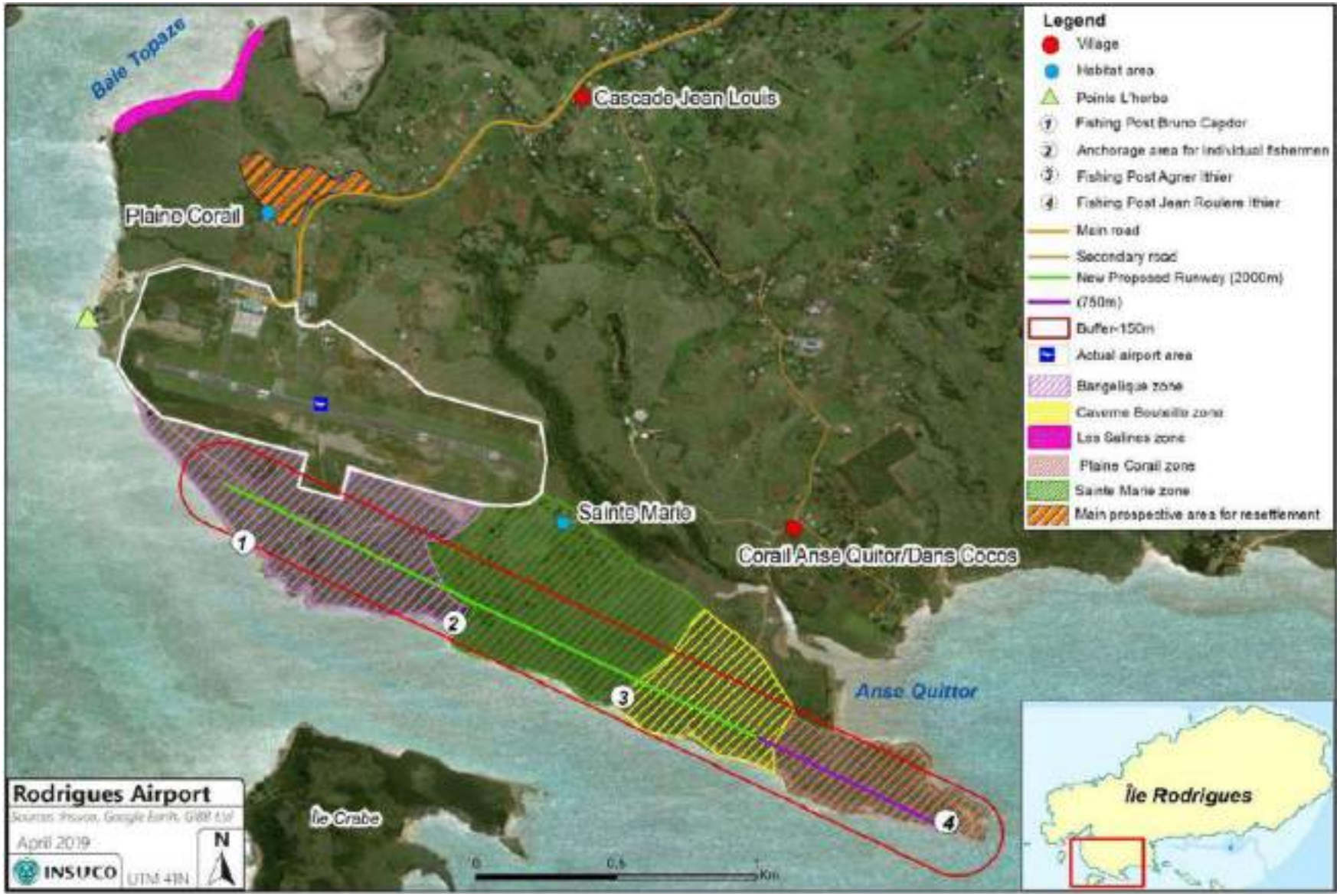


Figure 6: Area of influence of the Rodrigues Airport Extension Project

1.3.4.1 Administration and Governance

Rodrigues Island obtained its status as an autonomous territory of the Republic of Mauritius in October 2002. Its administration consists of a Parliamentary Assembly known as the Rodrigues Regional Assembly (RRA) and an Executive Council which frames and implements socio-economic policies. The Rodriguan autonomy is based on the Rodrigues Regional Assembly Act of 2001, voted in the National Assembly of the Republic of Mauritius.

The Rodrigues Regional Assembly consists of 17 members (10 elected representatives of the Government and 7 elected representatives of the opposition).

The Chief Commissioner represents the main authority of the island. The Executive Board consists of 7 Commissioners who take over the management of various commissions as shown in Figure 7.

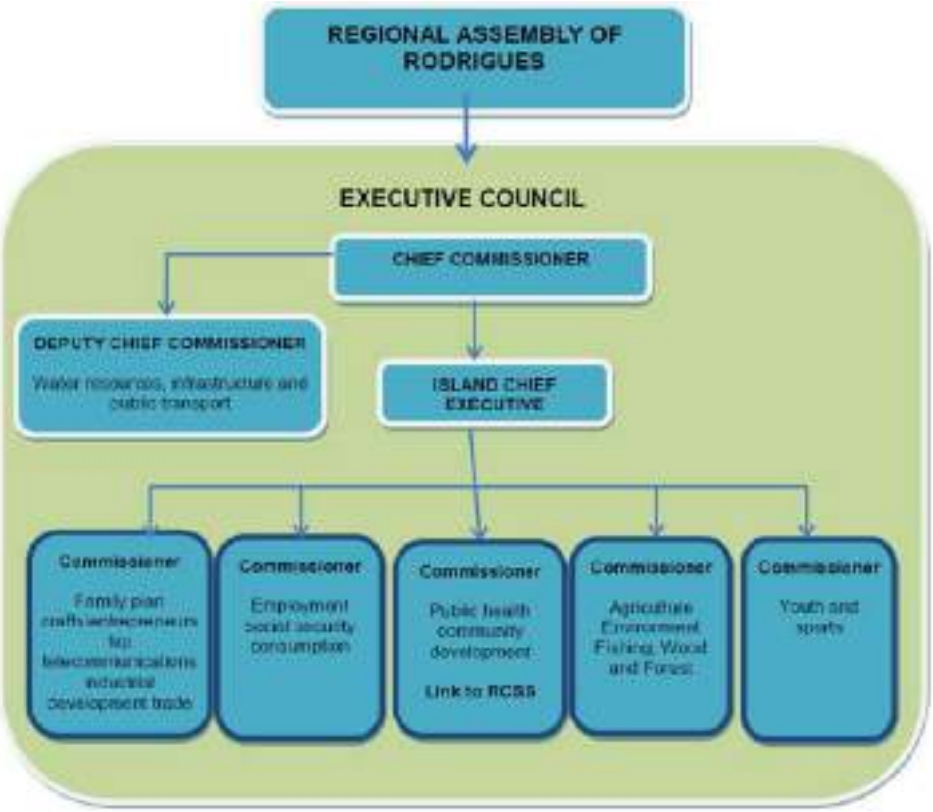


Figure 7: Rodrigues Regional Assembly (RRA) organizational chart

The Rodrigues Council of Social Services (RCSS) is an entity not dependent on the Regional Assembly of Rodrigues but which comprises all the villages of Rodrigues and which acts as a facilitator between the different stakeholders in community projects, namely the communities of the Regional Assembly, donors, private companies, etc. the RCSS organisational chart is shown in Figure 8.

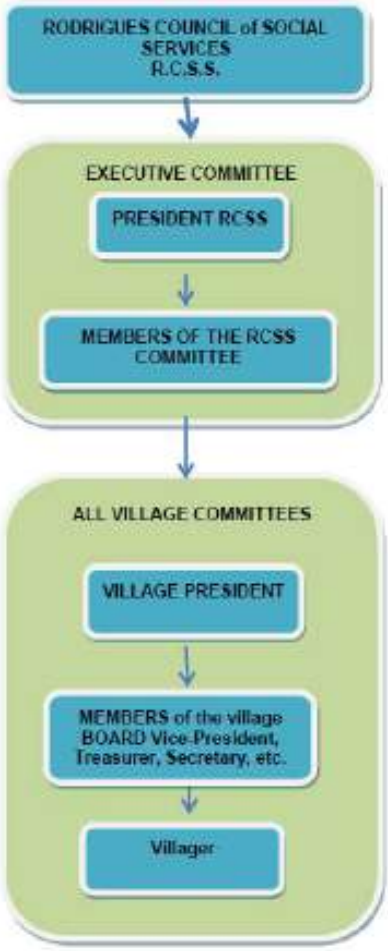


Figure 8: Rodrigues Council of Social Services (RCSS) organizational chart

1.3.4.2 Demographic and local governance

Sainte Marie is a small family community. Village-related issues are settled mainly through internal family mechanisms.

From an administrative point of view, Sainte Marie is not a village: it is an area of the Anse Quitor Village to which it is attached. However, the inhabitants of Sainte Marie do not participate in the public life of the connected village. De facto, they consider Sainte Marie as an autonomous socio-territorial entity.

1.3.4.3 Access to basic public services

Public infrastructure for civil status and administrative records management are mainly located in Port Mathurin. The other services are more spread out on the island as shown on Figure 9.

Figure 9: Access to basic public services (health, education) in the project area

1.3.4.4 Local economy

The main sectors of production in the area of social influence of the project are:

- Fishing
- Livestock
- Agriculture

1.3.4.5 Summary: social and economic sensitivity

Table 6: Summary of Social and Economic Sensitivity

Sub-theme	Receptor	Sensitivity
Social environment	Demographic and social dynamics	High
	Power, governance and civil society	High
	Land	Major
	Agriculture	Major
	Sainte Marie and Plaine Corail inhabitants	Major
	Bangelique breeders	Major
	Fishermen of the impacted zone	Major

1.3.5 Air quality and noise

Figure 10 shows the Area of Influence used to describe the air and noise baseline conditions.

Figure 10: Building location map and area of influence

1.3.5.1 Air quality

The air quality issue is due to the presence of sensitive populations living nearby and of the pre-primary school Le Caneton. The presence of agricultural parcels is also to be taken into account.

The aircraft traffic growth will lead to a significant increase in pollutant emissions.

1.3.5.2 Noise

The noise issue is due to the presence of sensitive populations living nearby and of the pre-primary school Le Caneton.

The aircraft traffic growth will lead to a significant increase in noise.

1.3.5.3 Summary: air and noise sensitivity

Table 7: Summary of Air and Noise Sensitivity

Sub-theme	Receptor	Sensitivity
Air quality	Population exposed	High
Noise	Population exposed	High

1.3.6 Heritage resources and visual environment

1.3.6.1 Cultural heritage resources

There are six National Heritage Sites in Rodrigues:

- Cannon (Pointe Canon),
- Ex-Administration Block (Port Mathurin),
- Garde Post (Mont Venus),
- Ben Gontron House (Barclay Street, Port Mathurin),
- Lieu de Mémoire, L'Union, Rodrigues,
- Residency Buildings (Port Mathurin)

None of them are located within the project area of influence.

1.3.6.2 Archaeology and palaeontology

In the restricted area, several sites have been identified as having a palaeontological interest. The underground hydrographic network has formed karst structures like cracks and caves throughout Plaine Corail.

These Karst formations in Plaine Corail are particularly interesting under the point of view of sedimentology and fossil conservation. Some caves such as Grotte Fougere are reported as containing sediment filled with a lot of fossils in an excellent state of conservation.

A conservation plan of sites of Archaeological and/or palaeontological interests that may be threatened by the expansion of Rodrigues airport will need to be set up.

1.3.6.3 Landscape and visual environment

The landscape components are:

- Large plain
- Field crop areas
- Urbanized spaces
- Artificial or semi-artificialized spaces

- Rivers

1.3.6.4 Summary: cultural and visual environment sensitivity

Table 8: Summary: cultural and visual environment sensitivity

Theme	Sub-theme	Receptor	Sensitivity
Heritage resources and visual environment	Cultural heritage resources	Presence of cultural site	Low
	Archaeology and palaeontology	Presence of cultural site of archaeological or palaeontological interest	High
	Landscape end visual environment	Living environment and site visibility	High

1.4 Summary of the Stakeholder Engagement Plan

The following is a summary of the stakeholder engagement activities conducted and detailed in the stakeholder engagement plan available in the appendix.

1.4.1 Engagement activities conducted prior to the ESIA

The community engagement activities began formally with regular relations and meetings between the Executive Council of the Rodrigues Regional Assembly and the directly impacted populations. These community engagement activities took place on the following timeline.

Date	Purpose of the consultation
25 June 2018	An internal meeting chaired by Davis Hee Hong Wye, Island Chief Executive (ICE), was held at the Central Administration conference room (Island Chief Executive's Office) in Port Mathurin for the community relocation plan. The main objective was to establish a steering committee composed of representatives of the various government entities and other stakeholders involved in the resettlement.
28 June, 2018 and 2 July, 2018	Preliminary census by the officers of the Land Registry Office and the officers of the Agriculture Commission for the identification of families eligible for resettlement and inventory.
5 July, 2018	An internal meeting chaired by Davis Hee Hong Wye (ICE) was held at La Résidence (Chief Commissioner's Office) in Port Mathurin to review the initial information already collected in the field and to assess the need to refine the data available, particularly with regard to the Agriculture Commission and the Fishing Commission.
13 July, 2018	Consultative assembly in the conference room of the Plaine Corail police station bringing together the entire Executive Council, the villagers of Sainte Marie and all those having an activity in the area concerned. The objective was to officially provide information about the project to expand the airport runway and therefore the need for relocation of homes in the impacted area and supporting those individuals who carry out an activity there.
9 August, 2018	Meeting of the Steering Committee established in June with the villagers concerned in order to collect their grievances and their choices or preference for the type of support procedures (compensation or relocation).

20 August, 2018	Development of a census timetable and sending of letters to the people concerned in order to communicate the dates of beginning and closing of the census.
22 - 24 August, 2018	Detailed census of dwellings and families taking into consideration their properties, main activities and attached buildings as well as the services and facilities available in the area.
31 August, 2018	Submission of the detailed census report.
4 September, 2018	Internal meeting of the Executive Committee for a presentation to the various Commissioners of the situation and progress concerning the relocation of the villagers of Sainte Marie.
12 September, 2018	Visit to the residential relocation sites proposed by the Commissioners, the Steering Committee of the resettlement project and the inhabitants to be relocated from the village of Sainte Marie.
27 September, 2018	Meeting of the Executive Committee chaired by Davis Hee Hong Wye (ICE) with the villagers of Sainte Marie, who have not approved the relocation site originally proposed.
26 October, 2018	Submission by the Land Registry Office of potential sites for the relocation of Sainte Marie's households to the Executive Committee.
22 November, 2018	Meeting of the Executive Committee chaired by Davis Hee Hong Wye (ICE) with villagers who had not approved the proposed relocation site initially for a presentation and visit of new proposed sites. Then presentation to all the villagers of Sainte Marie of a draft of the agreement documents for resettlement.
27 November, 2018	Submission by the land registry office of the report of the land parcels approved by the villagers of Sainte Marie.
10 January, 2019	Internal meeting of the Executive Committee with the Steering Committee of the resettlement project to take stock of all the advances made and measures taken during the last few months.
28 February, 2019	Submission of a report by the Agriculture Commission concerning the offers of compensation to the villagers of Sainte Marie in relation to food crops.
6 March, 2019	Submission of a report by the Fishing Commission on the compensation mechanism for the abandonment of net fishing activities (in accordance with the national budget of 2014).
8 March, 2019	Submission of the valuation report of the market value of the houses of the villagers of Sainte Marie by the evaluation department of the Ministry of Finance and Economic Development of Mauritius.
15 March, 2019	Submission of the report of the Fishing Commission concerning the census of fishing posts in the impacted area.
19 March, 2019	Submission of a report by the Agriculture Commission on the compensation mechanism for villagers engaged in animal husbandry.
2 April, 2019	Sending of letters by the Executive Committee to all the villagers of Sainte Marie to inform them of the amounts assessed by the evaluation department of the Ministry of Finance and Economic Development of Mauritius and to establish a date of meeting in order to discuss these announced amounts.
11 April, 2019	Meeting of the Executive Committee with the owners of the fishing posts of the impacted area of Plaine Corail.

1.4.2 Presentation of the consultations performed during the ESIA

During the preparation of the SEP, the following meetings and consultations were carried out and are still ongoing. Details of the consultations and the consultation reports are available in the Annexure 14, in the stakeholder engagement plan.

Phase	Date	Place of consultation	Entities represented/persons consulted	Medium
Exploratory	04/03/19	Plaine Corail	Airport Operational & Maintenance Manager ESIA project manager and SETEC consultants Environmental impact consultants	Meeting
Exploratory	04/03/19	Port Mathurin	Island Chief Executive and Assistant Airport Manager Airport Operational & Maintenance Manager ESIA project manager and SETEC consultants	Meeting
Exploratory	04/06/19	La Ferme	Island Chief Executive and assistants Airport Manager Airport Operational & Maintenance Manager External socio-economic study consultants	Lunch meeting
SEP	04/10/19	Caverne Bouteille	Fishing station manager (individuals)	Individual consultation
SEP	04/11/19	Sainte Marie	Village spokesperson	Individual consultation
SEP	04/11/19	Sainte Marie	Inhabitants of Sainte Marie	Public consultation
SEP	04/11/19	Sainte Marie	Fisherman of Sainte Marie	Individual consultation
SEP	04/12/19	Maréchal	Fishing station manager (Bangélique)	Individual consultation
SEP	04/13/19	Plaine Corail	Resident of Plaine Corail	Individual consultation
SEP	04/14/19	Sainte Marie	All the inhabitants of Sainte Marie	Public consultation
SEP	04/15/19	Plaine Corail	All the inhabitants of Plaine Corail	Public consultation
SEP	04/15/19	Bangélique	Bangélique livestock breeder (non-resident)	Individual consultation
SEP	05/03/19	Anse Quitor	Anse Quitor village committee	Public consultation
SEP	05/03/19	Cascade Jean Louis	President of the village of Cascade Jean Louis	Individual consultation
Exploratory	05/08/19	Port Mathurin	Resettlement Committee (RRA)	Meeting

Exploratory	05/09/19	Citronelle	Director of agricultural services	Meeting

1.4.3 Stakeholder engagement activities to be conducted

The stakeholder engagement plan is considered a living document and will be updated during the lifecycle of the project.

The list of stakeholders will be updated as the next phase of the ESIA and as the project evolves. Above all, the stakeholder analysis will particularly focus on the identification and consideration of disadvantaged or vulnerable people or groups. Further attention will also be paid to NGOs, which have a strong mobilization power.

Stakeholder engagements are ongoing and additional public consultations will be undertaken as part of the updating of the ESIA and the SEP. . Issues of communication, channels for submitting project related grievances, project information, and potential environmental and social impacts, risk and opportunities of the project will be revisited in public consultations in each affected locality

1.5 Potential impacts and measures

Potential environmental and social impacts and associated management measures are summarized in the next tables. Construction phase impacts which are temporary in nature are distinguished from the permanent impacts.

Impacts related to Operations are addressed in a third section.

1.5.1 Temporary impacts during works phase

Table 9: Summary of Temporary impacts during works phase

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
Physical	Marine	Phy-Mar-W-Temp-1	Increase in turbidity	Adverse	Major	Phy-Mar-Mit-1	Control of backfilling processes	High
						Phy-Mar-Mit-2	Optimisation of the location of discharges	
						Phy-Mar-Av-3	Optimisation of the discharges timetable to avoid times when currents reverse and/or already turbid condition	
						Phy-Mar-Mit-4	Silt curtain around discharges	
		Phy-Mar-W-Temp-2	Modification of the seabed	Adverse	Low	Phy-Mar-Mit-1	Control of backfilling processes	Low
						Phy-Mar-Mit-2	Optimisation of the location of discharges	
						Phy-Mar-Av-3	Optimisation of the discharges timetable to avoid times when currents reverse and/or already turbid condition	
						Phy-Mar-Mit-4	Mitigation - Silt curtain around discharges	
		Phy-Mar-W-Temp-3	Dredging in front of the boathouse	Adverse	Major	Phy-Mar-Av-3	Optimisation of the discharges timetable to avoid times when currents reverse and/or already turbid condition	High
						Phy-Mar-Mit-5	Mitigation - Silt curtain around dredging area	
	Hydrology	None	-	-	-	-	-	-
	Hydrogeology and geotechnics	Phy-Kar-W-Temp-1	Vibrations	Adverse	High	Phy-Kar-Mit-1	Reduce speed of trucks' movement to an acceptable level	Negligible
						Phy-Kar-Mit-2	Reduce rotations between embankment site and material storage site Carry out and document baseline observations at potentially exposed buildings to check on the presence of cracks ahead of works.	
		Phy-Kar-W-Temp-2	Mass haul - Hauling equipment movement inducing vibration and noise pollutions	Adverse	Major	Phy-Kar-Mit-3	Reuse of materials from cutting to embankment areas	Low
						Phy-Kar-Mit-4	Reuse of topsoil materials after works phase	
		Phy-Kar-W-Temp-3	Erosion/Groundwater ingress	Adverse	High	Phy-Kar-Mit-5	Infilling of local erosion features and use of a drainage system to manage the rainwater responsible for local erosion	Low
						Phy-Kar-Mit-6	Open blasting and site excavation works to be done during dry season	
		Phy-Kar-W-Temp-4	Noise Blasting	Adverse	High	Phy-Kar-Mit-7	Reduce unit explosive charge decreasing noise impact	Medium
						Phy-Kar-Mit-8	Concentrate open blasting operations in a short time	
						Phy-Kar-Mit-9	Work only during the day and inform local authorities and communities bout the health and safety plan applicable on work site	
						Phy-Kar-Mit-10	Avoid running excavator's engines in case of no use	
		Phy-Kar-W-Temp-5	Cut and fill balance impacts: transport	Adverse	Medium to Major	Phy-Kar-Mit-11	Chose the closest extraction site for fill material / Forbid the export of cuttings	Negligible to high
	Water resource and wastewater	Phy-Wat-W-Temp-1	Impact of water resource resulting from works' water supply	Adverse	Major	Phy-Wat-Mit-1	Install a desalination plant to supply drinking water to the workers' camp by sea water pumping	Negligible
		Phy-Wat-W-Temp-2	Impact of works on water resource resulting from impact on karstic groundwater	Adverse	Major	Phy-Wat-Comp-2	Temporarily replace the Caverne Bouteille intake by a sea water pumping Upgrade Caverne Bouteille plant to enable it to provide drinking water from sea water Thus, temporarily provide drinking water from sea water to people currently connected to Caverne Bouteille plant	Negligible
		Phy-Wat-W-Temp-3	Works wastewater	Adverse	Major	Phy-Wat-Av-3	Works wastewater treatment plant	Negligible
		Phy-Wat-W-Temp-4	Risk of accidental pollution	Adverse	High	Phy-Wat-Av/Mit-4	Preventive measures to reduce risks during the construction phase - Risk management plan	Negligible
		Phy-Wat-W-Temp-5	Desalination plant	Adverse	High	Phy-Wat-Av/Mit-5	Good engineering design and best site practices to reduce the impacts Importance of ESMP & ESCP in the contractor's contract	Negligible to low

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
Biological	Terrestrial habitat	None	-	-	-	-	-	-
	Terrestrial flora	None	-	-	-	-	-	-
	Terrestrial fauna	BioT-Fau-W-Temp-1	Impact on Pteropus rodricensis (Chiroptera)	Adverse	Low	None	None	Low
	Marine habitat	BioM-Hab-W-Temp-1	Degradation of coral reef dominated by Acropora formosa	Adverse	Low	BioM-Mit/-1	Installation of a floating boom to confine sediments and prevent their resuspension in the marine environment	Low
		BioM-Hab-W-Temp-2	Degradation of habitats dominated by macroalgae and seagrass	Adverse	Negligible			Negligible
		BioM-Hab-W-Temp-3	Modification of ecological functionality	Adverse	Negligible	None	-	-
	Marine species	BioM-Spe-W-Temp-1	Ichtyofauna	Adverse	Low	None	-	-
		BioM-Spe-W-Temp-2	Marine turtles	Adverse	Medium	BioM-Mit/-2	Monitoring for the possible presence of turtles in the project area and egg laying site on Crab Island	Low
		BioM-Spe-W-Temp-3	Marine mammals	Adverse	Low	None	-	Low
Transport network, electricity supply and waste management	Transport network	Trspt-W-Temp-1	Impact on the transport network	Adverse	Low	Inf-Mit-1	Transfer materials out of high traffic periods	Low
						Inf-Mit-2	Anticipate and supervise exceptional convoys	
						Inf-Mit-3	Rehabilitate roads that were used during construction and at the end of works	
	Electricity supply	Elec-W-Temp-1	Impact on electricity supply	Adverse	Low	Inf-Mit-4	Adapt the period of work	Low
						Inf-Mit-5	Use generators	
	Waste management	Sol-Wst-W-Temp-1	Impact on the solid waste management	Adverse	Low	Inf-Mit-6	Recycling and reuse materials	Low
Socio-economics	Demographics and social dynamics	SE-Demo-W-Temp-1	Increase of the population of Plaine Corail and its surroundings	Adverse	Low	SE-Mit-5	Communication plan for the integration of external workers	Negligible
						SE-Mit-6	Influx management plan	
		SE-Demo-W-Temp-2	Evolution of internal relations and in relation to foreign influx	Adverse	Medium	SE-Mit-5	Recruitment policy	Negligible
						SE-Mit-6	Influx management plan	
		SE-Demo-W-Temp-3	Social tensions arising from hiring conditions	Adverse	Low	SE-Mit-7	Communication and hiring management plan	Negligible
						SE-Mit-8	Communication and complaint management plan connected with employment	
		SE-Demo-W-Temp-4	Temporary employment opportunities for neighbouring residents	Positive	Low	SE-Mit-5	Communication plan for the integration of external workers	Medium
						SE-Mit-7	Communication and hiring management plan	
	Power, governance and civil society	SE-Gov-W-Temp-1	Risk of tension between the displaced community and the host community (of workers) (cumulative impact)	Adverse	Low	SE-Mit-3	Communication plan, complaint management and internal support for relocation.	Negligible
	Land	SE-Land-W-Temp-1	Increase in social tensions in relation to the land resource (cumulative impact)	Adverse	Major	SE-Mit-3	Communication plan, complaint management and internal support for relocation.	Medium
		SE-Land-W-Temp-2	Evolution of land management procedures (cumulative impact)	Adverse	Major	SE-Mit-3	Communication plan, complaint management and internal support for relocation.	Medium
						SE-Mit-9	Agricultural technical support plan.	

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
	Agriculture and livestock	SE-Agri-W-Temp-1	Decrease in income from agriculture during the adjustment period (cumulative impact)	Adverse	High	SE-Mit-10	RAP follow-up plan	Medium
		SE-Agri-W-Temp-2	Decrease in livestock breeding activity (cumulative impact)	Adverse	Major	SE-Mit-11	Community consultation plan for monitoring the evolution of the agro-pastoral system.	Medium
						SE-Mit-12	Support plan concerning livestock breeding techniques.	
		SE-Agri-W-Temp-3	Change of livestock breeding practices due to the reduction in available pasture land (cumulative impact)	Adverse	High	SE-Mit-11	Community consultation plan for monitoring the evolution of the agro-pastoral system.	Medium
						SE-Mit-12	Support plan concerning livestock breeding techniques.	
		SE-Agri-W-Temp-4	Increase in the rehabilitation time of agricultural surfaces (cumulative impact)	Adverse	High	SE-Mit-11	Community consultation plan for monitoring the evolution of the agro-pastoral system.	Medium
						SE-Mit-12	Support plan concerning livestock breeding techniques.	
	Local economic context	SE-Eco-W-Temp-1	Decrease in household incomes due to the potential decrease in the livestock (or even agricultural) activity of the people affected (indirect impact)	Adverse	Major	SE-Mit-10	RAP follow-up plan	Medium
						SE-Mit-14	Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	
		SE-Eco-W-Temp-2	Increase in local production prices (indirect impact)	Positive	Low	SE-Mit-14	Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	High
						SE-Mit-15	Economic support plan for households.	
		SE-Eco-W-Temp-3	Increase in local production prices – adverse for the local consumers (cumulative impact)	Adverse	High	SE-Mit-14	Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	Medium
						SE-Mit-15	Economic support plan for households.	
		SE-Eco-W-Temp-4	Increase in local development initiatives – positive for the farmers (cumulative impact)	Positive	Medium	SE-Mit-14	Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	High
						SE-Mit-15	Economic support plan for households.	
		SE-Eco-W-Temp-5	Increase in household incomes (cumulative impact)	Positive	Medium	SE-Mit-7	Communication and hiring management plan	High
		SE-Eco-W-Temp-6	Necessary adaptation to a new local economic landscape (cumulative impact)	Adverse	Low	SE-Mit-14	Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	Negligible
						SE-Mit-15	Economic support plan for households.	
		SE-Eco-W-Temp-7	Collaborative partnership or operational opportunities between local communities (indirect impact)	Positive	Medium	SE-Mit-15	Economic support plan for households.	High
		SE-Eco-W-Temp-8	Reinforcement of professional skills (cumulative impact)	Positive	Medium	SE-Mit-7	Communication and hiring management plan	High
						SE-Mit-15	Economic support plan for households.	
	Health and safety of the communities	SE-Safe-W-Temp-1	Increased risk of accidents due to traffic	Adverse	High	SE-Mit-16	Mitigation - Communication plan for the communities and livestock breeders of the area concerning road safety.	Low
						SE-Mit-17	Facilitation of access to protected pedestrian lanes and safety signage management plan.	
		SE-Safe-W-Temp-2	Respiratory discomfort of the inhabitants of the towns closest to the building area	Adverse	Low	None	-	Low
	Health and safety of workers	SE-Wor-W-Temp-1	Increased risk of accidents and illnesses	Adverse	High	SE-Mit-18	Coordination with the contractors involved in the work sites for the implementation of specific Health-Safety training.	Medium
						SE-Mit-19	Communication plan for the communities concerning the importance of complying with safety instructions on construction sites	
Air quality and noise	Air quality	Phy-Air-W-Temp-1	Alteration of air quality due to construction activities	Adverse	Medium	Air-Mit-1	Institute a speed limit on all unpaved roads around the site (max 30 km/h)	Low

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
						Air-Mit-2	Regularly water the main roads and areas producing dust	Low
						Air-Mit-3	Limit the storage and handling of materials that may create dust	Low
						Air-Mit-4	Reduce road traffic to a minimum by optimizing the truck loading for the site supply	Low
						Air-Mit-5	Minimize on-site travel distances and avoid as far as possible traffic close to inhabited areas	Low
	Noise	Noi-W-Temp-1	Nuisance caused by noise due to construction activities	Adverse	Low	Noi-Mit-1	Avoid night work and limit work during evening period	Low
						Noi-Mit-2	Choose the least noisy techniques and equipements	Low
Heritage resources and visual environment	Landscape	Vis-W-Temp-1	Alteration of the living environment	Adverse	Medium	Land-Mit-1	Limit the vegetation clearing area during construction	Low
						Land-Mit-2	Prevent encroachment of areas outside designated boundaries	
						Land-Mit-3	Minimize the lighting of construction sites	
						Land-Mit-4	Minimize visual intrusion	
						Land-Mit-5	Ensure that platforms and construction work areas are maintained in a clean and orderly manner	
						Land-Mit-6	Perform temporary seeding	
						Land-Mit-7	Temporary fences and earthworks will be arranged to reduce visual intrusion	
						Land-Mit-8	Ensure that earth and material storage areas are not located directly on the coast	
						Land-Mit-9	Plantings are designed and arranged to form visual screens to mitigate visual impacts	
						Land-Mit-10	Rehabilitate areas that were temporarily used during construction.	
		Vis-W-Temp-2	Increasing pressure on island landscape	Adverse	Negligible	Land-Mit-11	Favour dispersed relocation building in existing communities	Negligible
						Land-Mit-12	Relocate families outside of the Zone of Visual Influence	
						Land-Mit-13	Community support in construction process	
	Palaeontology	Kar-W-Temp	Impacts on hydrogeology and geotechnics	-	-	Impacts on hydrogeology and geotechnics	Impacts on hydrogeology and geotechnics	-

1.5.2 Permanent and irreversible impacts during works phase

Table 10: Summary of Permanent and Irreversible Impacts during Works phase

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
Physical	Marine	Phy-Mar-W-Def-1	Alteration of the local bathymetry and shoreline	Adverse	Low	None	None	Low
		Phy-Mar-W-Def-2	Modification of the local hydrodynamic processes	Adverse	Negligible	None	None	Negligible
		Phy-Mar-W-Def-3	Modification of the sediment transit	Adverse	Low	None	None	Low
		Phy-Mar-W-Def-4	Modification of the bathymetry due to the dredging to access jetty facilities	Adverse	Low	None	None	Low
		Phy-Mar-W-Def-5	Remains of suspended particulate matter and sediment	Adverse	Low	None	None	Low
	Hydrology	Phy-Hyd-W-Def-1	Transfer of sediments to the lagoon	Adverse	Major	Phy-Hyd-Mit-1	Temporary sedimentation ponds	Low
	Hydrogeology and geotechnics	Phy-Kar-W-Def-1	Cavern collapse	Adverse	Medium	Phy-Kar-Mit/Av-12	Define a restricted area around the caverns with no heavy vehicles allowed to access	Low
						Phy-Kar-Mit-13	Reduce trucks' movement's speed to an acceptable level to minimize the induced vibrations	
						Phy-Kar-Av-14	Adapt and reduce trucks' movements and rotations between embankment filling site and material storage site	
		Phy-Kar-W-Def-2	Damage to caves	Adverse	Medium	Phy-Kar-Av-15	Restrict traffic in close vicinity of the caves	Low
						Phy-Kar-Av-16	Restrict access to airport to necessary construction and operations staff	
						Phy-Kar-Comp-17	Remove the remaining fossiliferous sediments from all threatened caves	
		Phy-Kar-W-Def-3	Groundwater flow disturbance	Adverse	High	Phy-Wat-Comp-5	Carry out measurements on Caverne Bouteille intake Go on supplying inhabitants from water supply during analysis and measurements According to measurements results, keep using seawater in a definitive manner or get back to the initial situation, pumping underground water in Caverne Bouteille intake	Low
		Phy-Kar-W-Def-4	Pollution of groundwater	Adverse	Medium	Phy-Kar-Av/Mit-18	Daily maintenance and inspection of excavators	Low
						Phy-Kar-Av/Mit-19	No maintenance and refuelling on the construction site (or with specific waterproof delimited zone)	
						Phy-Kar-Mit-20	Establishment of a storage site for earthworks wastes, close to the project site, in order to reduce pollution induced by traffic from storage activity	
						Phy-Wat-Comp-5	Carry out measurements on Caverne Bouteille intake Go on supplying inhabitants from water supply during analysis and measurements According to measurements results, keep using seawater in a definitive manner or get back to the initial situation, pumping underground water in Caverrne Bouteille intake	
		Phy-Kar-W-Def-5	Cut and fill balance: impacts of material importation of exportation on extraction and storage sites	Adverse	Unknown	Phy-Kar-Mit-21	Proceed to and impact assessment of the extraction site and have the site validated by the client	Low
						Phy-Kar-Mit-11	Chose the closest extraction site for fill material / Forbid the export of cuttings	

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
	Water resource and waste water	Phy-Wat-W-Def-1	Demolition of an unused reservoir	Adverse	Low	-	-	Low
		Phy-Wat-W-Def-2	Impact on water resource	Adverse	High	Phy-Wat-Av/Mit-4	Preventive measures to reduce risks during the construction phase - Risk management plan	Negligible
						Phy-Wat-Comp-5	Carry out measurements on Caverne Bouteille intake Go on supplying inhabitants from water supply during analysis and measurements According to measurements results, keep using seawater in a definitive manner or get back to the initial situation, pumping underground water in Caverne Bouteille intake	
Biological	Terrestrial habitat	BioT-Hab-W-Def-1	Impact on grazing lands on basaltic resurgences	Adverse	Low	none	None	Low
		BioT-Hab-W-Def-2	Impact on grazing lands on calcarenic substratum	Adverse	Low	none	None	Low
		BioT-Hab-W-Def-3	Impact on coastal vegetation dominated by Ipomoea pes caprae	Adverse	Low	none	None	Low
		BioT-Hab-W-Def-4	Impact on anthropized areas	Adverse	Negligible	none	None	Low
		BioT-Hab-W-Def-5	Impact on dry forest	Adverse	High	BioT-Av-1	Avoid remarkable trees located at the edge of the project Targeted species*: Antirhea bifurcata , Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	Negligible
						BioT-Av-2	Moving the control tower out of the nature reserve	
						BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	
						BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	
						BioT-Mit-5	Genetic conservation of populations of impacted rare species : production and reintroduction of clones and genetic ancestors of these species	
						BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	
						BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
		BioT-Hab-W-Def-6	Impact on riparian vegetation	Adverse	Negligible	none	None	Negligible
		BioT-Hab-W-Def-7	Impact on estuarine habitat	Adverse	Negligible	none	None	Negligible
		BioT-Hab-W-Def-8	Impact on calcarenic dry lawns of anthropogenic origin	Adverse	Negligible	none	None	Negligible
		BioT-Hab-W-Def-9	Impact on coastal grasslands dominated by secondary thickets (Lantana camara)	Adverse	Low	none	None	Low
		BioT-Hab-W-Def-10	Impact on secondary thickets (Leucaena leucocephala)	Adverse	Negligible	none	None	Negligible
	Terrestrial flora	BioT-Flo-W-Def-1	Impact on Hyophorbe verschaffeltii	Adverse	Major	BioT-Av-1	Avoid trees worth conservation value located at the edge of the project Targeted species*: Antirhea bifurcata, Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	Low
						BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
						BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	
						BioT-Mit-5	Genetic conservation of populations of impacted rare species : production and reintroduction of clones and genetic ancestors of these species	
						BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	
						BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
		BioT-Flo-W-Def-2	Impact on Polyscias rodriguesiana	Adverse	Negligible	None	None	Negligible
		BioT-Flo-W-Def-3	Impact on Antirhea bifurcata	Adverse	Major	BioT-Av-1	Avoid remarkable trees located at the edge of the project Targeted species*: Antirhea bifurcata , Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	Low
						BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	
						BioT-Mit-5	Genetic conservation of populations of impacted rare species : production and reintroduction of clones and genetic ancestors of these species	
						BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	
						BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
		BioT-Flo-W-Def-4	Impact on Clerodendrum laciniatum	Adverse	Negligible	None	None	Negligible
		BioT-Flo-W-Def-5	Impact on Diospyros diversifolia	Adverse	Major	BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	Low
						BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	
						BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	
						BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
		BioT-Flo-W-Def-6	Impact on Fernelia buxifolia	Adverse	High	BioT-Av-1	Avoid remarkable trees located at the edge of the project Targeted species*: Antirhea bifurcata , Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	Low
						BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	
						BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	
						BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
		BioT-Flo-W-Def-7	Impact on Foetidia rodriguesiana	Adverse	High	BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	Low
						BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	
						BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	
						BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
		BioT-Flo-W-Def-8	Impact on Latania verschaffeltii	Adverse	Negligible	none	None	Negligible
		BioT-Flo-W-Def-9	Impact on Terminalia bentzoe subsp. Rodriguesensis	Adverse	High	BioT-Av-1	Avoid remarkable trees located at the edge of the project Targeted species*: Antirhea bifurcata , Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	Low
						BioT-Av-2	Moving the control tower out of the nature reserve	
						BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	
						BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	
						BioT-Mit-5	Genetic conservation of populations of impacted rare species : production and reintroduction of clones and genetic ancestors of these species	
						BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	
						BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
		BioT-Flo-W-Def-10	Impact on Zanthoxylum paniculatum	Adverse	Negligeable	none	None	Negligible
		BioT-Flo-W-Def-11	Impact on plant species with medium sensitivity: Adiantum rhizophorum, Camptocarpus sphenophyllus, Cyperus iria, Mathurina penduliflora, Nephrolepis biserrata, Pandanus heterocarpus, Paspalidium geminatum, Phymatosorus scolopendria, Pleurostylia putamen, Rhizophora mucronata, Sarcanthemum coronopus, Secamone rodriguesiana, Tournefortia argentea.	Adverse	Medium	BioT-Av-2	Moving the control tower out of the nature reserve	Low
						BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	
						BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	
						BioT-Mit-5	Genetic conservation of populations of impacted rare species	
						BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	
						BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
		BioT-Flo-W-Def-12	Impact on plant species with low sensitivity: Dodonaea viscosa, Dracaena reflexa, Elaeodendron orientale, Ficus reflexa, Ficus rubra, Phyllanthus dumentosus, Premna serratifolia, Sarcostemma viminale, Thespesia populnea	Adverse	Low	BioT-Av-1	Avoid remarkable trees located at the edge of the project Targeted species*: Antirhea bifurcata , Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	Low
						BioT-Av-2	Moving the control tower out of the nature reserve	
						BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	
						BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	
						BioT-Mit-5	Genetic conservation of populations of impacted rare species : production and reintroduction of clones and genetic ancestors of these species	
	Terrestrial fauna	BioT-Fau-W-Def-1	Impact on Pteropus rodricensis (Chiroptera)	Adverse	Low	None	None	Low
		BioT-Fau-W-Def-2	Impact on Tropidophora articulata (Gastropoda)	Adverse	Medium/High	BioT-Mit-8	Collect arthropods from the Tropiphodora genus before and during earthwork	Low
		BioT-Fau-W-Def-3	Impact on Tropidophora eugeniae (Gastropoda)	Adverse	Low	None	None	Low
		BioT-Fau-W-Def-4	Impact on Lygodactylus lugubris (Reptilia)	Adverse	Low	None	None	Low

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
	Marine habitat	BioM-Hab-W-Def-1	Destruction of natural habitats including a protected species Acropora formosa	Adverse	Major	BioM-Av-3	Avoid coral heads located at the edge of the project	Low
		BioM-Hab-W-Def-2	Modification of the physical functioning of habitats	Adverse	Negligible	none	-	Negligible
	Marine species	BioM-Spe-W-Def-1	Impact on soft bottom species	Adverse	Low	none	-	Low
		BioM-Spe-W-Def-2	Impact on mobile species	Adverse	Low	none	-	Low
Socio-economics	Demographics and social dynamics	SE-Demo-W-Def-1	Physical displacement of the population affected by the project	Adverse	Major	SE-Comp-1	Resettlement Action Plan (RAP).	Medium
						SE-Comp-2	Availability of farmland	
						SE-Mit-3	Communication plan, complaint management and internal support for relocation	
		SE-Demo-W-Def-2	Involuntary economic and physical displacement of the active and non-resident population affected by the project	Adverse	Major	SE-Comp-1	Resettlement Action Plan (RAP)	Medium
						SE-Comp-4	Provision of pasture areas and new fishing infrastructures	
						SE-Mit-3	Communication plan, complaint management and internal support for relocation	
	Land	SE-Land-Def-1	Loss of houses or infrastructure due to involuntary displacement of the population affected by the project	Adverse	Major	SE-Comp-1	Resettlement Action Plan (RAP)	Medium
						SE-Comp-2	Availability of farmland	
						SE-Mit-3	Communication plan, complaint management and internal support for relocation	
	Agriculture and livestock	SE-Agri-W-Def-1	Loss of farmland and pasture in the construction area	Adverse	Major	SE-Comp-1	Resettlement Action Plan (RAP)	Medium
						SE-Comp-2	Availability of farmland	
						SE-Mit-9	Agricultural technical support plan	
		SE-Agri-W-Def-2	Loss of perennial crops	Adverse	High	SE-Comp-1	Resettlement Action Plan (RAP)	Medium
		SE-Agri-W-Def-3	Loss of farmland (cumulative impact)	Adverse	High	SE-Comp-1	Resettlement Action Plan (RAP)	Medium
						SE-Comp-2	Availability of farmland	
						SE-Mit-9	Agricultural technical support plan	
		SE-Agri-W-Def-4	Change in animal husbandry and agricultural practices (cumulative impact)	Adverse	High	SE-Mit-9	Agricultural technical support plan	Low
						SE-Mit-11	Community consultation plan for monitoring the evolution of the agro-pastoral system	
	Fishing	SE-Fish-W-Def-1	Loss of direct access to the fishermen landing sites	Adverse	Major	SE-Comp-1	Resettlement Action Plan (RAP)	Medium
						SE-Mit-13	Support and fishermen's complaint management plan	
		SE-Fish-W-Def-2	Loss of fishing infrastructures	Adverse	Major	SE-Comp-1	Resettlement Action Plan (RAP)	Low
						SE-Mit-13	Support and fishermen's complaint management plan	
		SE-Fish-W-Def-3	Increased distances and travel times to fishermen landing sites	Adverse	Medium	SE-Comp-1	Resettlement Action Plan (RAP)	Low
						SE-Mit-13	Support and fishermen's complaint management plan	
		SE-Fish-W-Def-4	Increased time and distance to preferred fishing areas (cumulative impact)	Adverse	High	SE-Mit-10	RAP follow-up plan	Medium
						SE-Mit-13	Support and fishermen's complaint management plan	
	Community mobility	SE-Mob-W-Def-1	Resettlement of displaced people from the main road line	Positive	Medium	None	-	Medium
		SE-Mob-W-Def-2	Reduction of the time to travel to health and education infrastructures (cumulative impact)	Positive	High	None	-	High
Heritage resources and	Landscape	Vis-W-Def-1	Alteration of the living environment	Adverse	Major	Land-Mit-7	Permanent fences and earthworks will be arranged to reduce visual intrusion	High

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
visual environment						Land-Mit-9	Plantings are designed and arranged to form visual screen	
		Vis-W-Def-2	Increased pressure on island landscape	Adverse	High	Land-Mit-14	Establishment of an Airport Urban Development Master Plan to monitor and frame urban development related to airport activity and ensure sustainable good living conditions	Medium
						Land-Mit-13	Community support in construction process	
	Paleonthology	Kar-W-Def	Impacts on hydrogeology and geotechnics	-	-	Impacts on hydrogeology and geotechnics	Impacts on hydrogeology and geotechnics	-

Note: when no impacts are foreseen, ‘Impact ID’ column is marked ‘none’ and the following columns are hence not populated and marked ‘-‘

1.5.3 Permanent impacts during operation phase

Table 11: Summary of Permanent Impacts during Operation Phase

Context	Sub-context	Impact	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
Physical	Marine	Phy-Mar-Op-1	Accidental spillage	Adverse	Major	Phy-Mar-Mit-6	Prevent spills and accidents : train staff to avoidance of spills.	Low
						Phy-Mar-Mit-7	Implementing methodologies for quick confining and treatment of pollutants and protocol for depollution in case of spill	
		Phy-Mar-Op-2	Uncontrolled waste water discharges	Adverse	Low	None	None	Low
	Hydrology	Phy-Hyd-Op-1	Stormwater management	Adverse	Major	Phy-Hyd-Mit-2	Stormwater network	Low
		Phy-Hyd-Op-2	Flooding issues downstream of airport facilities	Adverse	Low	Phy-Hyd-Mit-3	Stormwater ditch located to restore the watershed boundary	Negligible
						Phy-Hyd-Mit-4	Climate change adaptation: buffering storage and works facilitating infiltration	
		Phy-Hyd-Op-3	Transfer of pollution to the natural environment	Adverse	Major	Phy-Hyd-Mit-5	Treat chronic or accidental sources of pollution	Low
		Phy-Hyd-Op-4	Increase in supply of materials to the lagoon	Adverse	Major	Phy-Hyd-Mit-6	Vegetation of slopes and ditches and collection of infrastructures runoff	Low
	Hydrogeology and geotechnics	Phy-Kar-Op-1	Collapse/Erosion	Adverse	High	Phy-Kar-Av-22	Supplementary geotechnical and geophysical investigations to characterize karstic network (caves and voids)	Low
						Phy-Kar-Mit/Comp-23	In situ investigation diagnostic of infilled cavities (televisual cavity inspections)	Low
						Phy-Kar-Mit/Comp-24	Addition laboratory testings (Aggregate testings) to characterize erosive potential of in situ geological formations	Low
		Phy-Kar-Op-2	Access to caves	Adverse	High	Phy-Kar-Av-16	Restrict access to airport to necessary construction and operations staff	Low
		Phy-Kar-Op-3	Pollution of groundwater	Adverse	Medium	Phy-Kar-Av-25	All operations involving hydrocarbons must comply with current standards to prevent spills and, if necessary, implement emergency measures	Low
						Phy-Kar-Mit-26	Do not allow groundwater use downstream of airport infrastructure	
	Water resource and waste water	Phy-Wat-Op-1	Pollution of soil and surface water	Adverse	Major	Phy-Wat-Av-6	Integrated water management plan	Negligible
		Phy-Wat-Op-2	Peak flows resulting in increasing soil erosion	Adverse	Major	Phy-Wat-Av-6	Integrated water management plan	Negligible
		Phy-Wat-Op-3	Pollution of marine water	Adverse	Low	Phy-Wat-Mit-7	Water treatment plant	Negligible
		Phy-Wat-Op-4	Extra burden on the water supply public network	Adverse	High	Phy-Wat-Mit-8	Reuse water plan	Low
Biological	Terrestrial habitat	None	-	-	-	-	-	-

Context	Sub-context	Impact	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
	Terrestrial flora	None	-	-	-	-	-	-
	Terrestrial fauna	None	-	-	-	-	-	-
	Marine habitat	BioM-Hab-Op-1	Modification of ecological functionality	Adverse	Negligible	none	-	-
		BioM-Hab-Op-2	Modification of the physical functioning of habitats	Adverse	Negligible	none	-	-
	Marine species	None	-	-	-	-	-	-
Transport network, electricity supply and waste management	Transport network	Trspt-Op-1	Impact on the transport network	Adverse	Low	Inf-Mit-7	Restore road connections	Low
	Electricity supply	Elec-Op-1	Impact on electricity supply	Adverse	Low	None	None	Low
	Waste management	Sol-Wst-Op-1	Impact on the solid waste	Adverse	Low	None	None	Low
Socio-economics	Power, governance and civil society	SE-Gov-Op-1	Improved relations with directly and indirectly impacted communities	Positive	Medium	SE-Mit-5	Communication plan for the integration of external workers	High
						SE-Mit-15	Economic support plan for households	
	Land	SE-Land-Op-1	Increasing social tensions in relation to the land resource	Adverse	Major	SE-Mit-3	Communication plan, complaint management and internal support for relocation	Medium
		SE-Land-Op-2	Evolution of land management procedures	Adverse	Major	SE-Mit-3	Mitigation - Communication plan, complaint management and internal support for relocation	Medium
						SE-Mit-9	Agricultural technical support plan	
	Agriculture and livestock	SE-Agri-Op-1	Change in livestock breeding procedures and farming methods	Adverse	High	SE-Mit-9	Agricultural technical support plan	Medium
						SE-Mit-11	Community consultation plan for monitoring the evolution of the agro-pastoral system	
		SE-Agri-Op-2	Need to regenerate the farmland	Adverse	High	SE-Mit-9	Agricultural technical support plan	Medium
						SE-Mit-11	Community consultation plan for monitoring the evolution of the agro-pastoral system	
		SE-Agri-Op-3	Decrease in livestock breeding activity	Adverse	Major	SE-Mit-11	Community consultation plan for monitoring the evolution of the agro-pastoral system	Medium
						SE-Mit-12	Support plan concerning livestock breeding techniques	
		SE-Agri-Op-4	Change of livestock breeding practices	Adverse	High	SE-Mit-11	Community consultation plan for monitoring the evolution of the agro-pastoral system	Low
						SE-Mit-12	Support plan concerning livestock breeding techniques	
		SE-Agri-Op-5	Increase in the rehabilitation time of agricultural surfaces	Adverse	High	SE-Mit-11	Community consultation plan for monitoring the evolution of the agro-pastoral system	Medium
						SE-Mit-12	Support plan concerning livestock breeding techniques	

Context	Sub-context	Impact	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
	Local economic context	SE-Eco-Op-1	Decrease in household incomes	Adverse	Major	SE-Mit-14	Plan for consultation and support of the communities of the area concerning the development of income-generating activities	Medium
						SE-Mit-9	Agricultural technical support plan	
						SE-Mit-13	Support and fishermen's complaint management plan	
		SE-Eco-Op-2	Increase in local production prices	Positive	Low	SE-Mit-15	Economic support plan for households	High
		SE-Eco-Op-3	Increase in local production prices	Adverse	High	SE-Mit-14	Plan for consultation and support of the communities of the area concerning the development of income-generating activities	Medium
						SE-Mit-15	Economic support plan for households	
		SE-Eco-Op-4	Increase in local development initiatives	Positive	Medium	SE-Mit-15	Economic support plan for households	High
		SE-Eco-Op-5	Increase in household incomes	Positive	Medium	SE-Mit-7	Communication and hiring management plan	High
		SE-Eco-Op-6	Change of the local economic landscape	Adverse	Low	SE-Mit-15	Economic support plan for households	Medium
		SE-Eco-Op-7	Opportunities for partnerships or cooperative operations	Positive	Medium	SE-Mit-15	Economic support plan for households	High
		SE-Eco-Op-8	Reinforcement of professional skills	Positive	Medium	SE-Mit-7	Communication and hiring management plan	High
						SE-Mit-15	Economic support plan for households	
	Living environment and landscape	SE-Liv-Op-1	Noise and sound pollution	Adverse	Negligible	None	-	Negligible
Air quality and sound environment	Air quality	Air-Op-1	Deterioration of air quality due to increased airport capacity	Adverse	High	Air-Mit-6	If possible, limit the taxiing distance	High
						Air-Mit-7	Opt for technologies that limit aircraft pollutant emissions during taxiing	
						Air-Mit-8	Encourage pilots to shut down not needed engines when taxiing	
						Air-Mit-9	Limit congestion (aircraft queues) by making departures as fluid as possible	
						Air-Mit-10	Minimize the use of the APU and GPU	
						Air-Mit-11	Develop and implement procedures to limit the use of the thrust reverser	
						Air-Mit-12	Make ecological performance a criterion of choice for service vehicles and ground equipment	
						Air-Mit-13	Develop an efficient public transport system to limit the use of private vehicles	
	Noise	Noi-Op-1	Noise impact due to increased air traffic	Adverse	Medium	Noi-Mit-3	Limit air traffic at night and the use of noisy equipement	Medium
						Noi-Mit-4	Raise the ILS glide slope to reduce noise emissions during landing	
						Noi-Mit-5	Adapt departure procedures to minimize noise exposure on the ground during take-off	
						Noi-Mit-6	Limit the use of reverse thrust	
						Noi-Mit-7	Develop an efficient public transport system to limit the use of private vehicles	
Heritage resources and visual environment	Landscape	Vis-Op-1	Alteration of the living environment	Adverse	Major	Land-Mit-15	Airport buildings and infrastructures to reach architectural quality and soundness	High
						Land-Mit-7	Permanent fences and earthworks will be arranged to reduce visual intrusion	

Context	Sub-context	Impact	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
						Land-Mit-9	Plantings are designed and arranged to form visual screens	
						Land-Mit-16	Touristic infrastructure to respect the scale of Rodrigues' landscape and sense of place	
						Land-Mit-17	Urban development to foster the development of public places and public amenities	
		Vis-Op-2	Alteration to landform outside the Airport	Adverse	Medium	Land-Mit-18	Establishment of local Urban Development Master Plan to monitor urban development related to tourism growth, to value and enhance local landscape	Low
						Land-Mit-19	Set up of green and blue grids	
						Land-Mit-20	Set up of sustainable and resilient city guidelines and architectural guidelines	
						Land-Mit-13	Community support in construction process	
		Vis-Op-3	Alteration to the island forest cover	Adverse	Medium	Land-Mit-21	Investment in woodland planting to feed the timber industry	Negligible
						Land-Mit-22	Set up sustainable timber management plan	
						Land-Mit-19	Set up of green and blue grids	
						Land-Mit-23	Ravine preservation and sanctuarisation of associated woodlands	
	Paleonthology	Kar-Op	Impacts on hydrogeology and geotechnics	-	-	Impacts on hydrogeology and geotechnics	Impacts on hydrogeology and geotechnics	-

Note: when no impacts are foreseen, 'Impact ID' column is marked 'none' and the following columns are hence not populated and marked '-'

1.6 Environment and social management plans for construction phase

1.6.1 Environmental Management Plan for the construction phase

Table 12 lists the plans to be developed and implemented to monitor all the environmental measures in the impact study.

Specific guides for preparing plans are provided in Chapter 9.1.2 and 9.1.3. of the ESIA.

Table 13 summarizes all the environmental measures in the impact study. The precise description of the measures is given in the impact study, in Chapter 8 of the ESIA.

The estimated cost associated with the environmental management and monitoring are provided in Chapter 12. The costs are considered indicative at this stage and will be updated during the life cycle of the project.

Table 12: Environmental Management Plans for Construction Phase

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control	Activity / Procedures to include
Site and works facilities management and monitoring plan	Wor-Fac Inf-Mit-1 to 6 Phy-Kar-Mit-1 / 2 / 3 / 4 / 6 / 8 / 10 / 11 / 12 / 13 / 14 / 15 / 16 / 19 / 20 / 21 Phy-Wat-Av/Mit-4 Phy-Kar-Mit-19 Land-Mit-7 / 8	To be implemented by the Contractor Under ARL's control	- A waste management and monitoring plan, - An excavated soil management and monitoring plan, - A hazardous material management plan, - A spill risk management plan (Phy-Wat-Av/Mit-4), - A traffic management plan (inside and outside the works site), - A fencing plan and procedure, - A plants monitoring plan
Surface stormwater run-off, drinking and wastewater management and monitoring plan	Phy-Wat-Mit-1 Phy-Wat-Comp-2 Phy-Wat-Av-3 Phy-Hyd-Mit-1	To be implemented by the Contractor Under RRA and ARL's control	- A water management plan - A desalination skid, wastewater treatment plant and ponds monitoring - A water quality monitoring
Karst monitoring plan	Phy-Kar-Mit-5 / 7 / 18	To be implemented by the Contractor Under RRA and ARL's control	- Groundwater monitoring plan - Caves monitoring plan
	Phy-Kar-Comp-17	External specialist	- A plan to follow the sediments moving and storage

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control	Activity / Procedures to include
		Under ARL's control	
Marine environment monitoring plan	Phy-Mar-Mit-1 / 2 Phy-Mar-Av-3	External consultancy engineering Under ARL's control	- Current and turbidity monitoring plan
	Phy-Mar-Mit-4 / 5	Contractor Under ARL's control	- Marine Works monitoring plan
	BioM-Mit-1 / 2 BioM-Av-3	Shoals Rodrigues / SEMPA Under ARL's control	- Coral reef protection and monitoring
Air quality and noise environment management and monitoring plan	Phy-Kar-Mit-9 Air-Mit-1 to 5 Noi-Mit-1 / 2	To be implemented by the Contractor Under ARL's control	- Air quality management and monitoring plan - Noise environment management and monitoring plan
Biodiversity management and monitoring plan	BioT-Av-1 and 2 BioT-Mit-4 and 5 BioT-Comp-6 BioT-Comp-7	External biodiversity specialists / RRA services Under RRA and ARL's control	- A biodiversity management plan to follow the implementation of measures to be implemented before the works phase (BioT-Av-1 and 2 / BioT-Mit-4 and 5) - A biodiversity management plan to follow the measures to be carried out by RRA on an island scale (BioT-Comp-6 / BioT-Comp-7)
	BioT-Mit-3 and 8	External biodiversity specialists / Contractor Under ARL's control	- A biodiversity management plan to manage and follow the implementation of measures BioT-Mit-3 and 8.
Landscape management and monitoring plan	Land-Mit-1 / 2 / 3 / 4 / 5 / 6 / 8 / 9 / 10 / 15	Detail Design Engineer and Architects ARL Under ARL's control	- A landscape management plan to follow the implementation of measures to be implemented before the works phase (Land-Mit-4 / 6 / 8 / 9 / 10 / 15)

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control	Activity / Procedures to include
		Contractor Under ARL's control	- A landscape management and monitoring plan during the construction works (Land-Mit-1 / 2 / 3 / 4 / 5 / 6 / 8 / 9 / 10)
	Land-Mit-11 / 12 / 13 / 14 / 16 / 17 / 18	RRA Under RRA and ARL's control	- A management plan to follow the measures to be carried out by RRA on an island scale
Emergencies management plans		Contractor Under ARL's control	- Oil spill management plan - Fire Emergency plan - Archeological or patrimonial chance find procedure

Table 13: Summary of Environmental Measures and Monitoring for Construction Phase

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
Works facilities, buildings and plants	Wor-Fac	Works installations management plan	Plan describing each of the main works facilities and installations, and giving their emission limits, recommendation for installation on site and environmental measures	Works phase and prior to the works **Site and works facilities management and monitoring plan**	Control of the works environment chart and plans Site visits	Compliance of the installation to the recommendations	Replacement of installations which would not comply	To be implemented by the Contractor Under ARL's control
Marine environment	Phy-Mar-Mit-1	Control of backfilling processes	The construction processes must ensure a minimal volume of water in the low-lying embankment delimited area to insure the stability and sustainability of the runway.	Works phase and prior to the works **Marine environment monitoring plan**	Monitoring of turbidity level in the vicinity of the runway. Monitoring the water concentration in the embankment. Ensuring construction equipment are appropriate.	Compliance to water quality prevailing threshold.	Failure to meet the performance criteria shall be recorded as a non-conformance incident. In the case of structural failure or non-compliance turbidity level, works are to immediately cease. Incident has to be reported. Implementing protocol for depollution in case of spill.	External consultancy engineering Under ARL's control
	Phy-Mar-Mit-2	Optimisation of the location of discharges	The discharge should be located in order to promote a local settling of the inorganic matter. A hydrodynamic survey can be conducted to identify these optimal locations.	Works phase and prior to the works **Marine environment monitoring plan**	The discharge should be located in order to promote a local settling of the inorganic matter. A hydrodynamic survey can be conducted to identify these optimal locations.	Compliance for water quality prevailing threshold	Monitoring of turbidity levels.	External consultancy engineering Under ARL's control
	Phy-Mar-Av-3	Optimisation of the discharges timetable to avoid times when currents reverse and/or already turbid condition	In order to minimize the intensity and extent of the flume, discharge should occur with weak current and low level of turbidity.	Works phase and prior to the works **Marine environment monitoring plan**	Monitoring of turbidity levels in the vicinity of the runway. Monitoring of magnitude and direction of the current in the vicinity of the runway.	Compliance to water quality prevailing threshold. Compliance with current prevailing threshold.	Discharge to be stopped if non-compliance. Reducing the hydraulic flows of the deposited materials.	External consultancy engineering Under ARL's control
	Phy-Mar-Mit-4	Silt curtain around discharges	Silt curtains can be used to contain suspended sediments and to prevent sediment dispersal.	Works phase and prior to the works **Marine environment monitoring plan**	Monitoring of turbidity levels. Conducting daily visual inspection of the curtain.	Compliance to water quality prevailing threshold.	Failure to meet the performance criteria shall be recorded as a non-conformance incident. Discharge to be stopped if non-compliance. Verifying the operation of the equipment according to the	Contractor Under ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
							manufacturer's specifications	
	Phy-Mar-Mit-5	Silt curtain around dredging area	Silt curtain controls the suspended solids generated by the dredging and is placed around the excavation site.	Works phase and prior to the works **Marine environment monitoring plan**	Monitoring of turbidity levels. Monitoring of contaminants in the water column.	Compliance to water quality prevailing threshold.	Dredging to be stopped if non-compliance. Verifying the operation of the equipment according to the manufacturer's specifications.	Contractor Under ARL's control
Hydrology - Stormwater management Waste water management / Water resource and water supply	Phy-Hyd-Mit-1	Temporary sedimentation ponds	Stormwater management from the modified natural watersheds: During the construction works, excavation of the terrain will facilitate transfer of sediments to the lagoon. => Implementation of specific temporary drains and buffer storage/sedimentation ponds	Works phase **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	Monitoring of water quality at discharge; visual control.	Compliance with prevailing / target standards. Submission to local authorities once a month.	Discharge to be stopped if non-compliance. Informing of local authorities/client for remedial measures.	To be implemented by the Contractor Under RRA and ARL's control
	Phy-Wat-Mit-1	Install a desalination plant to supply drinking water to the workers' camp	Water supply for workers' site facilities and construction facilities: The construction works cannot create a burden on the existing water supply already suffering a severe deficiency Specific desalination skid for the water supply of the workers' site facilities and construction facilities	Works phase **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	Monitoring of water quality at inlet and outlet of Treatment Plant; monitoring of water quality on distribution line; regular manual sampling/analysis (once a week) and visual control; automatic real time monitoring of main parameters (at least pH, turbidity and residual free chlorine) on distribution line.	Compliance with prevailing / target standards. Submission to local authorities once a month.	Water production to be stopped if non-compliance. Informing of local authorities/client for remedial measures.	To be implemented by the Contractor Under RRA and ARL's control
	Phy-Wat-Comp-2	Temporary or permanent relocation of the captation of actual Caverne Bouteille	Propose a new location for Caverne Bouteille, including a seawater pumping, settle a new pumping system and upgrade the existing treatment plant to provide water to the people currently supplied by Caverne Bouteille plant	Works phase and prior to the works **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	Monitoring of water quality at inlet and outlet of Treatment Plant; monitoring of water quality on distribution line; regular manual sampling/analysis (once a week) and visual control; automatic real time monitoring of main parameters (at least pH, turbidity, salinity, temperature, TDS, electrical conductivity and residual free chlorine) on distribution line.	Compliance with prevailing / target standards. Submission to local authorities once a month. Significant change in the value of the measured parameters (e. g. +/- 20%) depending on the tolerance of the treatment system.	Water production to be stopped if non-compliance. Informing of local authorities/client for remedial measures. Temporary stop of pumping Identification of the source/cause of the water quality change Relocation of the catchment	To be implemented by the Contractor Under RRA and ARL's control
	Phy-Wat-Av-3	Works wastewater treatment plant	Wastewater management for the existing airport facilities and workers' site facilities: During the construction works, the existing wastewater treatment facilities will be	Works phase **Surface stormwater run-off, drinking and wastewater**	Monitoring of water quality at inlet and outlet of Treatment Plant; monitoring of water quality at discharge; regular manual	Compliance with prevailing / target standards. Submission to local authorities once a month.	Discharge to be stopped if non-compliance. Informing of local authorities/client for remedial measures.	To be implemented by the Contractor Under RRA and ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
			dismantled. The sewage from the airport facilities will need to be treated to avoid direct discharge into the environment => Wastewater treatment skid of adequate capacity for both the airport facilities and for the workers' site facilities	**management and monitoring plan**	sampling/analysis (once a week) and visual control; automatic real time monitoring on main parameters usually monitored.			
	Phy-Wat-Av/Mit-4	Preventive measures to reduce risks during the construction phase - Risk management plan	Oil and other spills related to chemical products used during construction =>Implementation of specific retention / confining zones for storage and use Identification of threat activity that will cease to be or not become a significant threat to drinking water	Works phase **Site and works facilities management and monitoring plan**	Monitoring of any leakage from the specific retention zones Ensure that all site managers are aware of the RMP and are able to apply it Verify that the resources to apply the RMP are present on the site	Zero leakage observed Regular meetings between the project manager, the contracting authority and all site managers	Implementation of remedial confining procedure Training workshops for all site managers	To be implemented by the Contractor Under ARL's control
Karst	Phy-Kar-Mit-1	Reduce speed of trucks' movement to an acceptable level	-	Works phase **Site and works facilities management and monitoring plan**	Speed limit ≤ 30 km/h	Speed controls	Warning violators	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-2	Reduce rotations between embankment site and material storage site Carry out and document baseline observations at potentially exposed buildings to check on the presence of cracks ahead of works	-	Works phase **Site and works facilities management and monitoring plan**	Mass haul diagram	Check of plant's yield	Earth-moving plan adaptation	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-3	Reuse of materials from cutting to embankment areas	-	Works phase **Site and works facilities management and monitoring plan**	Mass haul diagram	Check of reuse-ratio	Soil aeration/soil stabilization	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-4	Reuse of topsoil materials after works phase	-	Works phase **Site and works facilities management and monitoring plan**	Mass haul diagram	Check of topsoil balance	Reuse exceeding quantities for landscaping	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-5	Infilling of local erosion features and use of drainage system to manage rainwater responsible for local erosion	-	Works phase **Karst monitoring plan**	Daily site visits	No gullies development	Drainage system improvement	To be implemented by the Contractor Under RRA and ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	Phy-Kar-Mit-6	Open blasting and site excavation works to be done during dry season	-	Works phase **Site and works facilities management and monitoring plan**	Work schedule	Shift of planned tasks	Additional equipment implementation	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-7	Reduce unit explosive charge decreasing noise impact	-	Works phase **Karst monitoring plan**	Vibration monitor device by geophones	Meet the targeted particle velocity	Corrective action plan implementation	To be implemented by the Contractor Under RRA and ARL's control
	Phy-Kar-Mit-8	Concentrate open blasting operations in a short amount of time	-	Works phase **Site and works facilities management and monitoring plan**	Work schedule	Shift of planned tasks	Additional equipment implementation	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-9	Work only during the day and inform local authorities and communities bout the health and safety plan applicable on work site	-	Works phase **Air quality and noise environment management and monitoring plan**	Work schedule	Construction supervisor check	Stop works at the scheduled time	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-10	Avoid running excavator's engines in case of no use	-	Works phase **Site and works facilities management and monitoring plan**	Planning of equipment use	Construction supervisor check	Stop of not planned machines	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-11	Chose the closest extraction site for fill material / Forbid the export of cuttings	-	Prior to the works **Site and works facilities management and monitoring plan**	Trucks and boat traffic / Noise and air pollution monitoring	Distance of the extraction site / No export traffic	Change site extraction / Explore on site storage solutions for cuttings	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit/Av-12	Define a restricted area around the caverns with no allowed access to heavy vehicles	-	Works phase **Site and works facilities management and monitoring plan**	Enclosure tape around the restricted area	Construction supervisor check	Warning violators	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-13	Reduce trucks' movement's speed to an acceptable level to minimize the induced vibrations	-	Works phase **Site and works facilities management and monitoring plan**	Speed limit ≤ 30 km/h Checking visit inside the caves / Caves monitoring Plan	Speed controls	Warning violators	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Av-14	Adapt and reduce trucks' movements and rotations between embankment filling site and material storage site	-	Works phase **Site and works facilities management and monitoring plan**	Mass haul diagram	Check of plant's yield	Excavation rate adaptation	To be implemented by the Contractor Under ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	Phy-Kar-Av-15	Restrict traffic in close vicinity of the caves	Retention measure for unauthorized access	Works phase **Site and works facilities management and monitoring plan**	Daily inspection of the condition of the barriers	Damage to facilities	Additional mobile fences where needed Replacement of damaged parts	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Av-16	Installation of a protective formwork to ensure protection and controlled access by airport authorities	-	Works phase **Site and works facilities management and monitoring plan**	Security checkpoint	Airport security rules	Airport security corrective actions	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Comp-17	Remove the remaining fossiliferous sediments from all threatened caves	Safe storage of sedimentary materials containing palaeontological and paleoenvironmental information	Prior to the works **Karst monitoring plan**	Preventive paleontological searches Supervision of excavation by experts and scientists	Preventive research regulation Complete and detailed list of materials removed and compliance of storage sites	Implementation of the planned correctives actions Final inspection and relocation of undisplaced materials	To be implemented by an external specialist Under ARL's control
	Phy-Kar-Av/Mit-18	Daily maintenance and inspection of excavators	Liquid leakage prevention measure (oil and fuel)	Works phase **Karst monitoring plan**	Inspection of logbooks of the maintenance of equipment	Missing information in the logbook Number and intensity of accidental spills of hydrocarbons and other chemicals	In case of a surface spill, the environmental response plan must be implemented immediately.	To be implemented by the Contractor Under RRA and ARL's control
	Phy-Kar-Av/Mit-19	No maintenance and refuelling on the construction site (or with specific waterproof delimited zone)	Vehicles must be refuelled on a dedicated site	Works phase **Site and works facilities management and monitoring plan**				To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-20	Establishment of a storage site for earthworks wastes (wood from formwork, material and equipment wrappings, unusable cement / grouting mixes, damaged or contaminated construction material), close to the project site, in order to reduce pollution induced by traffic from storage activity	-	Works phase **Site and works facilities management and monitoring plan**	Installation of a network of observation wells upstream and downstream of the facilities to allow, on the one hand, sampling and analysis of groundwater to define reference values and, on the other hand, to establish a groundwater quality monitoring program (and levels) during the project development phases (construction and operation phases)	Number and intensity of accidental spills of hydrocarbons and other chemicals	In the event of a surface spill, the environmental response plan must be implemented immediately. In the event that there is a significant change in groundwater quality and/or a contaminant is detected, the environmental management plan will also have to be put in place to contain the contamination.	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Av-21	Proceed to an impact assessment of the extraction site and have the material origin validate priori the works phase	-	Prior to the works phase **Site and works facilities management and monitoring plan**	-	-	-	To be implemented by the Contractor Under ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
Biodiversity	BioT-Av-1	Avoid remarkable trees located at the edge of the project Targeted species*: Antirhea bifurcata , Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	This measure consists in avoiding the destruction of remarkable trees located at the boundaries of the project footprint by locally adapting the project boundaries. A total of 19 trees could be easily avoided.	Works phase Before the work begins. **Biodiversity management and monitoring plan**	These 19 trees must be marked prior to the works phase with permanent devices (fences, ribbons, paintings..) and tagged with an identification number (ID) in order to be properly followed during the works phase	Number of trees left after the works phase (out of the 19)	Reinforcing measure BioT-Mit-3	External biodiversity specialists / RRA services Under RRA and ARL's control Potential partners : Wildlife Foundation, Forestry Services
	BioT-Av-2	Moving the control tower out of the nature reserve	This measure consists in avoiding the destruction of approximately 1 hectare of the buffer area of the Anse Quitor nature reserve. This measure allows to save 6 specimens of the following species: Elaeodendron orientale, Sarcanthemum coronopus, Terminalia bentzoe subsp. rodriguesensis	This measure must be anticipated in the project design **Biodiversity management and monitoring plan**	The official boundaries of the nature reserve will be provided by the forestry services	- Surface area left inside the Anse Quitor nature reserve (objective: 0) - Project design with a repositioning of the control tower	Reinforcing measure BioT-Comp-7	External biodiversity specialists / RRA services Under RRA and ARL's control Potential partners : Wildlife Foundation, Forestry Services for the official limits of the nature reserve
	BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	This measure consists in planting 80 specimens of rare and endangered endemic species within the airport limits after the extension airstrip project. This aims to protect, preserve and create an arboretum of endemic seeds that will be used afterwards to produce endemic plants for nature reserves in Rodrigues.	Works phase This measure must be implemented way before the works phase, in particular as regards with the collection of plant material from specimens outside the project area. **Biodiversity management and monitoring plan**	A partnership with the Forestry Services or the Mauritius Wildlife Foundation will be conducted in order to produce seedlings of native species from seeds, cuttings or juveniles collected from the nature reserves of Rodrigues and/or Mauritius. Collection of plant material will be authorized in advance by the reserve managers in any case. A specific protocol will be designed for tree transplantation.	- number of plants produced (objective : 100) - number of species planted	Reinforcing measure BioT-Comp-7	External biodiversity specialists / Contractor Under ARL's control Potential partners : Wildlife Foundation, Forestry Services
	BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	This measure consists in transplanting all or part of the remarkable trees and ferns intended to be destroyed by the project: in priority, Diospyros, Terminalia, Foetidia, Antirhea, Nephrolepis	Works phase Before and or during works phase (machines will be available during the works phase which optimizes costs) **Biodiversity management and monitoring plan**	A competent and trained external coordinator on the transplantation protocol will be mobilized	- number of trees transplanted - number of trees transplanted which survive the 1st, 2nd, 3rd, 4th and 5th year after transplantation	Reinforcing measures BioT-Mit-3, BioT-Mit-5, BioT-Comp-6	External biodiversity specialists / RRA services Under RRA and ARL's control Potential partners : Wildlife Foundation, Forestry Services

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	BioT-Mit-5	Genetic conservation of populations of impacted rare species : production and reintroduction of clones and genetic ancestors of these species	In response to the destruction of several rare species specimens, this measure consists in ensuring the production and reintroduction of clones and genetic ancestors of these species in order to preserve their genetic lineage in the long term. A total of 14 to 35 specimens will be produced, depending on the results obtained by vegetative and sexual propagation.	This measure must be implemented way before the works phase, in particular as regards with the collection of plant material from specimens intended for destruction inside the project footprint. Several campaigns have to be scheduled in order to target the right periods of fruiting **Biodiversity management and monitoring plan**	A partnership with the Forestry Services or the Mauritius Wildlife Foundation will be conducted in order to produce seedlings of native species from seeds, cuttings or juveniles collected from the specimens located within the project footprint.	- number of plants produced (objective : 35) - number of species planted	Reinforcing measures BioT-Mit-3, BioT-Mit-4	External biodiversity specialists / RRA services Under RRA and ARL's control Potential partners : Wildlife Foundation, Forestry Services
	BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	This measure consists in initiating a new approach for the management of extensive agriculture on the island of Rodrigues by proposing a turnkey operational action plan.	Planning over 24 months will allow satisfactory consultation times for the implementation of the action plan in the short term **Biodiversity management and monitoring plan**	This action plan can be approached by: 1- the inventory and consultation of all agricultural and ecologist partners throughout the project; 2- the establishment of the development challenges of livestock breeding in Rodrigues; 3- drawing up an inventory of actions that can improve the quality and productivity of livestock farming by promoting local biodiversity; 4- proposing a fine cartographic work accompanied by spatialized actions throughout the territory of Rodrigues.	- Obtaining an action plan validated by the regional assembly in 2022	Reinforcing measure BioT-Comp-7	External biodiversity specialists / RRA services Under RRA and ARL's control Potential partners: Wildlife Foundation, Agricultural and Forestry Services, Regional Assemblee…

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	This measure consists in: • Rebuilding the fence around the Anse Quitor nature reserve, with one that would be similar to the fence around the airport in order to discourage grazing livestock inside the reserve. This measure is a short-term response to the grazing vs. biodiversity issue that has to be solved with the offset measure (BioT-Comp-6: Action plan towards more sustainable agricultural practices for native biodiversity). • Reinforcing native species populations by planting 500 native plant specimens within the Anse Quitor nature reserve buffer area, located besides the future airport boundaries (see map below).	Harvesting (seeds, cuttings) and production must take place well before the works phase as well as the fencing work **Biodiversity management and monitoring plan**	- Check the watering quality of the plants; - Identify, locate and count exotic species and define appropriate control methods against invasive and potentially invasive exotic species; - Quantify the mortality rate and health status of native species. - Establish corrective measures if necessary, in order to always orientate this rehabilitation project in an ecologically correct direction.	- Number of plants planted - Mortality rate (total/species) - Number of placettes - Number of linear metres of fence	Reinforcing measures BioT-Mit-3, BioT-Mit-4	External biodiversity specialists / RRA services Under RRA and ARL's control Potential partners: Wildlife Foundation, Forestry Services
	BioT-Mit-8	Collect arthropods from the Tropiphodora genus before and during earthwork	This measure consists in collecting living individuals of Tropiphodora within the project footprint boundaries. Several campaigns will be conducted before the works phase and during earthwork. Sampling planning will allow the entire project area to be visited in an equivalent manner. If species are more abundant in some areas, these areas will be collected more thoroughly.	Works phase This measure must be implemented before and during the earthwork phase. Several campaigns have to be scheduled. **Biodiversity management and monitoring plan**	Learn how to distinguish the two different species recorded on site	- number of living specimens collected - number of species collected - number of survey campaigns	None	External biodiversity specialists / Contractor Under ARL's control Potential partners: Vincent Florens (Department of Biosciences, University of Mauritius, Réduit, Mauritius)
	BioM-Mit-1	Installation of a floating boom to confine sediments and prevent their resuspension in the marine environment	To contain sediments and prevent their resuspension in the marine environment	Works phase During the construction works **Marine environment monitoring plan**	- Visual surveillance of the floating boom's good hold - Measurement campaign of turbidity and current	- Ensure that the floating boom is properly - Visual monitoring of corals at Pointe Palmiste in relation to the turbid plume - Monitoring turbidity with: Duration over an alert and a stop threshold Number of exceedance over a threshold Maximum concentration tolerated	- Decrease of the released flow - Temporary stop of the sediment discharge - Temporary stop of the dredging	Contractor Under ARL's control Potential partner : Shoals Rodrigues / SEMPA
	BioM-Mit-2	Monitoring for the possible presence of turtles in the project area and egg laying site on Crab Island	To preserve protected species and maintain local biodiversity	Works phase During the construction works Laying period **Marine environment monitoring plan**	Visual surveillance by boat, on foot Laying traces on beaches	GPS location, descriptive and photographic information Continuous consolidation of all published information	Stopping works if marine turtles are present and come to lay eggs on the beaches near the project	Shoals Rodrigues / SEMPA Under ARL's control
	BioM-Av-3	Avoid coral heads located at the edge of the project	To preserve protected species and maintain local biodiversity	Before the construction works	Identify corals in the work area Marking with buoys	Waypoint's position of each type of coral	None	Contractor Under ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
				Marine environment monitoring plan	Check their movements to SEMPA	Conservation status (Before/after the movements)		Potential partner : Shoals Rodrigues / SEMPA
Infrastructures and solid waste management	Inf-Mit-1	Transfer materials out of high traffic periods	To avoid creating traffic jams by adapting the works supply traffic schedules	Works phase **Site and works facilities management and monitoring plan**	Complaint collection	Zero additional traffic jam Zero unaddressed complaint	Re-adapting traffic schedules	To be implemented by the Contractor Under ARL's control Partner: RRA
	Inf-Mit-2	Anticipate and supervise exceptional convoys	To avoid creating traffic jams by adapting the exceptional convoys schedules and the communication before and during their passage	Works phase In case of exceptional convoys / before and during passage **Site and works facilities management and monitoring plan**	Complaint collection	Zero additional traffic jam Zero unaddressed complaint	Re-enforcing communication and exceptional convoys schedule adaptation	To be implemented by the Contractor Under ARL's control Partner: RRA
	Inf-Mit-3	Rehabilitate roads that were used during construction and at the end of works	Rehabilitate the roads that would be spoiled by the trucks traffic	Works phase **Site and works facilities management and monitoring plan**	Roads inspection	Zero road degradation during the works and at the end of the works	Re-enforcing roads inspection and rehabilitation	To be implemented by the Contractor Under ARL's control
	Inf-Mit-4	Adapt the period of work	To avoid traffic jam by adapting the works season, if possible (vacations, low touristic season)	Works phase / to be anticipated during the works' construction planning **Site and works facilities management and monitoring plan**	Complaint collection	Zero additional traffic jam Zero unaddressed complaint	Reinforce Inf-Mit-1	To be implemented by the Contractor Under ARL's control Partner: RRA
	Inf-Mit-5	Use generators	To avoid to create extra burden on the electricity network for works supply	Works phase **Site and works facilities management and monitoring plan**	Complaint collection	Zero deficiency in households' electricity supply	Replace more electricity for works supply with generators	To be implemented by the Contractor Under ARL's control Partner: RRA
	Inf-Mit-6	Recycling and reuse of materials	Sorting and recycling of works' solid waste	Works phase **Site and works facilities management and monitoring plan**	Solid Waste management Plan Environmental site visits and works environment supervision	Recycling objective to be proposed by the detailed design	Improve the sorting system and worker sensibilization	To be implemented by the Contractor Under ARL's control
Air quality	Air-Mit-1	Institute a speed limit on all unpaved roads around the site (max 30 km/h)	-	Works phase **Air quality and noise environment management and monitoring plan**	Air quality management and monitoring plan	air emission standards	-	To be implemented by the Contractor Under ARL's control
	Air-Mit-2	Regularly water the main roads and areas producing dust	-			air emission standards	-	
	Air-Mit-3	Limit the storage and handling of	-			air emission standards	-	

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
		materials that may create dust						
	Air-Mit-4	Reduce road traffic to a minimum by optimizing the truck loading for the site supply	-			air emission standards	-	
	Air-Mit-5	Minimize on-site travel distances and avoid as far as possible traffic close to inhabited areas	-			air emission standards	-	
Noise environment	Noi-Mit-1	Avoid night work and limit work during evening period	-	Works phase **Air quality and noise environment management and monitoring plan**	Noise environment management and monitoring plan	noise emission standards	-	To be implemented by the Contractor Under ARL's control
	Noi-Mit-2	Choose the least noisy techniques and equipements	-			noise emission standards	-	
Landscape	Land-Mit-1	Limit the vegetation clearing area during construction	-	Preliminary works (clearance and site installation): before site clearance starts and during working period. Preparation period of every subsidiary construction contract. **Landscape management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Visual check-up Pictures in the monthly environmental report	Compensation planting and seeding, site cleaning	Contractor Under ARL's control
	Land-Mit-2	Prevent encroachment of areas outside designated boundaries	-	Any phase of work **Landscape management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Visual check-up Pictures in the monthly environmental report	Compensation planting and seeding, site cleaning	Contractor Under ARL's control
	Land-Mit-3	Minimize the lighting of construction sites	-	Any phase of work **Landscape management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Visual check-up Pictures in the monthly environmental report	Contractor to change the lighting furnitures and orientation on request	Contractor Under ARL's control
	Land-Mit-4	Minimize visual intrusion	-	Prior to construction works, not later than preparation period of main contractor **Landscape management and monitoring plan**	A landscape architect	Preliminary Visual Assessment control and final report	To be defined in the visual assesment report	Detail Design Engineer and Architects ARL Contractor Under ARL's control
	Land-Mit-5	Ensure that platforms and construction work areas are maintained in a	-	Any phase of work **Landscape management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Visual check-up Pictures in the monthly environmental report	Contractor to proceed to cleaning and site management on request	Contractor Under ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
		clean and orderly manner						
	Land-Mit-6	Perform temporary seeding	-	Any phase of work **Landscape management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Regular billing for seeding	Contractor to proceed to seeding on request	Detail Design Engineer and Architects ARL Contractor Under ARL's control
	Land-Mit-7	Temporary fences and earthworks will be arranged to reduce visual intrusion	-	Any phase of work **Site and works facilities management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Visual check-up Pictures in the monthly environmental report	Contractor to adapt fence type and stock piles layout on request	To be implemented by the Contractor Under ARL's control
	Land-Mit-8	Ensure that earth and material storage areas are not located directly on the coast	-	Any phase of work **Site and works facilities management and monitoring plan + Landscape management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Visual check-up Pictures in the monthly environmental report	Contractor to adapt storage and stock piles layout on request	To be implemented by the Contractor / Detail Design Engineer and Architects Contractor Under ARL's control
	Land-Mit-9	Plantings are designed and arranged to form visual screens to mitigate visual impacts	-	As early as possible Prior to construction works **Landscape management and monitoring plan**	A landscape architect	Detailed Impact Assessment on site and report	To be defined in the Detailed Design report	Detail Design Engineer and Architects ARL Contractor Under ARL's control
	Land-Mit-10	Rehabilitate areas that were temporarily used during construction.	-	During preparation period of every subsidiary construction contract **Landscape management and monitoring plan**	A landscape architect	Visual check-up Photo report Compare Site Pictures before / after	To be defined	Detail Design Engineer and Architects ARL Contractor Under ARL's control
	Land-Mit-11	Favor dispersed relocation building in existing communities	-	Prior to agreement with families **Landscape management and monitoring plan**	Relevant government administration	Construction control	None	RRA Under RRA and ARL's control
	Land-Mit-12	Relocate families outside of the Zone of Visual Influence	-	Prior to agreement with families **Landscape management and monitoring plan**	Relevant government administration	Construction control	None	RRA Under RRA and ARL's control
	Land-Mit-13	Community support in construction process	-	**Landscape management and monitoring plan**				RRA Under RRA and ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	Land-Mit-14	Establishment of an Airport Urban Development Master Plan to monitor and frame urban development related to airport activity and ensure sustainable good living conditions	-	As early as possible Prior to construction works **Landscape management and monitoring plan**	Designer such as a landscape architect, urbanist or architect	Deliver an Urban Development Master Plan based on site study and three scenarios	None	RRA Under RRA and ARL's control
	Land-Mit-15	Airport buildings and infrastructures to reach architectural quality and soundness	-	All Design Phases Architect selection Construction contract selection Contractor selection Any phase of work **Landscape management and monitoring plan**	Architect in chief to be nominated	Rodrigues tourism officials and representatives demands met on visual representation, exhaustiveness of Detailed Design	None	Detail Design Engineer and Architects ARL Under ARL's control
	Land-Mit-16	Touristic infrastructure to respect the scale of Rodrigues' landscape and sense of place	-	All Design Phases Architect selection Construction contract selection Contractor selection Any phase of work **Landscape management and monitoring plan**	Relevant government administration	Rodrigues tourism officials and representatives demands met on visual representation, exhaustiveness of Detailed Design	None	RRA Under RRA and ARL's control
	Land-Mit-17	Urban development to foster the development of public places and public amenities	-	All Design Phases Architect selection Construction contract selection Contractor selection Any phase of work **Landscape management and monitoring plan**	Relevant government administration	Rodrigues tourism officials and representatives demands met on this particular concern	None	RRA Under RRA and ARL's control
	Land-Mit-18	Establishment of local Urban Development Master Plan to monitor urban development related to tourism growth, to value and enhance the local landscape	-	As early as possible Prior to construction works **Landscape management and monitoring plan**	Designer such as a landscape architect, urbanist or architect	Deliver an Urban Development Master Plan based on site study and three scenarios	None	RRA Under RRA and ARL's control

1.6.2 Social Management Plan for the construction phase

Table 14 lists the plans to be developed and then implemented to monitor all the environmental measures in the impact study.

Specific guides for preparing plans are provided in Chapter 9.2.2 of the ESIA.

Table 15 summarizes all the environmental measures in the impact study. The precise description of the measures is given in the impact study, in Chapter 8 of the ESIA.

The estimated cost associated with the social management and monitoring are provided in Chapter 12. The costs are considered indicative at this stage and will be updated during the life cycle of the project.

Table 14: Social Management Plans for Construction Phase

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
Base camp and works site social management plan	**-**	**Contractor + ARL**
Communication plan	SE-Comp-1 SE-Mit-3 SE-Mit-5 SE-Mit-7 SE-Mit-8 SE-Mit-10 SE-Mit-11 SE-Mit-12 SE-Mit-13 SE-Mit-14 SE-Mit-15 (and take into account SE-Mit-16, SE-Mit-18, SE-Mit-19)	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - ARL - Spokesperson of the village Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location) - Executive Committee of the RRA - ARL - Project managers for the works - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Local media (radio) - Rodrigues Agriculture Commission - Village Committee (Plaine Corail – Cascade Jean Louis) and non-resident livestock breeders - Possibly a specialised external entity such as an NGO - Optionally an independent external office

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
Base camp and works site social management plan	**-**	**Contractor + ARL**
		- Rodrigues fishing Commission - Rodrigues women and small entrepreneurship Commission To be monitored by: RRA / ARL and the Resettlement Monitoring Committee of Rodrigues Regional Assembly
Complaints management plan	SE-Comp-1 SE-Mit-3 SE-Mit-8 SE-Mit-10 SE-Mit-11 SE-Mit-13	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - ARL - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location) - Executive Committee of the RRA - ARL - Project managers for the works - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Optionally an independent external office - Rodrigues Agriculture Commission - Villagers and livestock breeders of the resettlement area - Rodrigues fishing Commission To be monitored by: RRA / ARL and the Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity)

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
Base camp and works site social management plan	**-**	**Contractor + ARL**
Action plan for relocation and compensation (including the livelihood restoration plan)	SE-Comp-1 SE-Comp-2 SE-Mit-10 SE-Comp-4 SE-Mit-14	- Relocation committee appointed by and in liaison with the Executive Committee of the Rodrigues Regional Assembly - ARL - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail and village committee of Cascade Jean Louis (proposed resettlement towns) - Optionally an independent external office - Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission To be monitored by: RRA / Resettlement Monitoring Committee of Rodrigues Regional Assembly
Community development plan	SE-Mit-9 SE-Mit-11 SE-Mit-12 SE-Mit-14	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues Agriculture Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Livestock breeders of the relocation area - Rodrigues women and small entrepreneurship Commission - Rodrigues fishing Commission - ARL To be monitored by: RRA / Resettlement Monitoring Committee of Rodrigues

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
Base camp and works site social management plan	-	**Contractor + ARL**
		Regional Assembly (with the help of an external specialized entity)
Public health and community safety plan	SE-Mit-16 SE-Mit-17 SE-Mit-18 SE-Mit-19	- ARL - Project managers - Rodrigues health Commission - Rodrigues infrastructure commissions - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Media (local radio) To be monitored by: RRA / ARL
Occupational health and safety plan	SE-Mit-18 SE-Mit-19	- ARL - Project managers - Rodrigues health Commission - Rodrigues labour Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Media (local radio) To be monitored by: ARL
Workforce management and training plan / Labour Management Plan	SE-Mit-5 SE-Mit-6 SE-Mit-7 SE-Mit-8 SE-Mit-18 SE-Mit-19	- ARL - Project managers - Rodrigues labour Commission - Executive Committee of the RRA - ARL

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
Base camp and works site social management plan	**-**	**Contractor + ARL**
		- Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Local media (radio) Labour management plan to be set up To be monitored by: RRA / ARL

Table 15: Summary of Social Measures and Monitoring for Construction Phase

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
Communication Ensure a harmonious implementation of the work at all stages of its performance with all the communities directly or indirectly impacted by the project **Communication plan**	**SE-Comp-1**- Implementation of a Resettlement Action Plan (RAP).	The RAP necessarily includes the establishment of communication with the affected communities to provide detailed information on the project, the issues it represents in general for the Rodrigues population and the issues of physical and economic displacement.	The relocation plan must be finalized before the works begin.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly Relocation Plan Report to be submitted by the Relocation Committee at the end of relocation plan and before resettlement.	- Number of communication activities carried out; - Number of communication media produced and distributed; - Number of organized sessions, meetings or information workshops; - Number of information activities organized.	Organise additional communication activities or meeting sessions in case of insufficient communication with involved stakeholders.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Airport of Rodrigues - Spokesperson of the village Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location
	SE-Mit-3- Complaint management and internal support for relocation.	An outcome of the RAP, complaint management is the attentive listening to the affected populations regarding relocation. It must be effective and transparent in order to take into consideration and share all the grievances expressed by the communities in order to define appropriate communication and support strategies.	The complaint management plan covers the entire project: from the implementation of the resettlement plan and throughout the period of adaptation of the displaced communities.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly Quarterly reports to be submitted by the Relocation Committee until full adaptation of resettled population	- Number of registered complaints and reports on actions taken for complaint management.	Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	
	SE-Mit-5- Communication plan concerning the integration of external workers.	The project will bring in foreign and specifically qualified labour. It is important to communicate about a considerable and temporary advent of an external population and to ensure transparency concerning the hiring procedures in relation to foreign workers.	This communication plan must begin prior to the arrival of the first workers and continue throughout all of the works phase.	To be monitored by: RRA / ARL Annual reports submitted by the Airport of Rodrigues in collaboration with Rodrigues Regional Assembly that include communication measures taken on the period as well as local surveys on inhabitants as well as external workers.	- Number of communication activities carried out; - Number of communication media produced and distributed; - Number of organized sessions, meetings or information workshops; - Results of carried out surveys; - Number and qualitative details on hired people; - Number of registered complaints and reports on actions taken for complaints management.	- Organise additional communication activities in case of insufficient communication and if required through surveys results. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Executive Committee of the RRA - Airport of Rodrigues - Project managers for the works - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Local media (radio)
	SE-Mit-7- Communication and hiring management plan **SE-Mit-8-** Communication and complaint management plan connected with employment	Specific communication concerning hiring procedures should be put in place so that impacted communities are informed about job opportunities and other related information.	This communication plan must begin and continue throughout the works phase.				
	SE-Mit-10- RAP follow-up plan	This follow-up plan is a continuation of the RAP communication procedures. It implies a continuous communication strategy aimed at	This follow-up takes place from the construction phase and continues during the period of	To be monitored by: RRA and the Resettlement Monitoring Committee	- Number of registered complaints and reports on actions taken for complaint management,	- Improve communication with local people according to reports' feedback.	- Relocation committee appointed by the Executive Committee of the RRA - Airport of Rodrigues

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
		maintaining the link with affected communities throughout the adaptation period.	adaptation of the displaced communities.	of Rodrigues Regional Assembly (with the help of an external specialized entity) Bi-annual Relocation Plan Report to be submitted by the Relocation Committee including complaints management and satisfaction surveys.	- Qualitative evaluation according to survey results.	- Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location) - Optionally an independent external office
	SE-Mit-11- Community consultation plan for monitoring the evolution of the agro-pastoral system. **SE-Mit-12**- Support measures concerning livestock breeding techniques.	These measures relate to the communication procedures to be employed concerning the specific and important subject of adaptation of agricultural and livestock breeding techniques by all communities.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by the Executive Committee of the RRA - Rodrigues Agriculture Commission - Village Committee (Plaine Corail – Cascade Jean Louis) and non-resident livestock breeders - Possibly a specialised external entity such as an NGO
	SE-Mit-13 - Support and fishermen's complaint management plan.	These measures relate to the communication procedures to be undertaken with the fishermen's community following relocation.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by the Executive Committee of the RRA - Rodrigues fishing Commission - Fishing station managers - Airport of Rodrigues
	SE-Mit-14- Plan for consultation and support of the communities of the area concerning the development of income-generating activities. **SE-Mit-15-** Economic support plan for households.	These measures relate to the communication procedures to be employed with the village communities in the area in order to promote the development of income-generating activities for households by becoming aware of the initiatives that the villages and villagers would like to implement.	These measures are developed from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
Complaint management Ensure that all complaints from communities or	**SE-Comp-**1- Implementation of a Resettlement Action Plan (RAP).	The RAP necessarily includes the establishment of a complaint management procedure issued by affected communities as part of the resettlement process.	*(before work)*	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly	- Number of complaints issued; - Number of complaints satisfactorily resolved.	- Ensure that all registered complaints have been satisfactorily treated. If not, complaints not well	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Airport of Rodrigues

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
individuals affected by the implementation of the project are received, reviewed and that appropriate action is taken within a reasonable time to arrive at a mutually acceptable solution. **Complaints management plan**		It requires an effective and transparent complaint management mechanism so that the first steps are taken to provide a solid foundation for the relocation process.		Relocation Plan Report including complaint management to be submitted by the Relocation Committee at the end of the relocation plan and before resettlement.		treated will have to appear positively handled before works begin.	- Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location)
	SE-Mit-3- Complaint management and internal support for relocation.	The relocation complaint management process requires careful listening to affected populations. It must be effective and transparent in order to take into consideration and share all the grievances expressed by the communities in order to define appropriate communication and support strategies.	*(entire project)*				
	SE-Mit-8 - Communication and complaint management plan connected with employment	This measure is the implementation of an effective and transparent complaint management mechanism concerning hiring procedures during the construction phase of the project, a period during which there will likely be many employment opportunities. This process helps mitigate some potential job-related frustrations.	This communication plan must begin and continue throughout the works phase.	To be monitored by: RRA / ARL Bi-annual reports submitted by the Airport of Rodrigues in collaboration with Rodrigues Regional Assembly that include communication measures taken on the period as well as local surveys on inhabitants as well as external workers.	- Number of registered complaints and reports on actions taken for complaints management, - Qualitative evaluation according to survey results.	- Improve communication with local people according to reports' feedback. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Executive Committee of the RRA - Airport of Rodrigues - Project managers for the works - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis)
	SE-Mit-10- RAP follow-up plan	This follow-up plan is a continuation of the RAP procedures. It implies a complaint management strategy concerning the following phases of the project to maintain the link with affected communities throughout the adaptation period.	This follow-up takes place from the construction phase and continues throughout the period of adaptation of the displaced communities.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity) Bi-annual Relocation Plan Report to be submitted by the Relocation Committee including complaint management and satisfaction surveys.			- Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - Airport of Rodrigues - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location) - Optionally an independent external office
	SE-Mit-11- Community consultation plan	This measure is the implementation of an effective and transparent complaint	The measures occur from the resettlement of displaced villagers and				- Relocation committee appointed by the Executive

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	for monitoring the evolution of the agro-pastoral system.	management mechanism concerning agriculture and livestock breeding. This mechanism makes it possible to become aware of the potential discontent of individuals or communities concerning the evolutionary process of the agro-pastoral system.	continue throughout the period of community adaptation.				Committee of the Rodrigues Regional Assembly - Rodrigues Agriculture Commission - Villagers and livestock breeders of the resettlement area
	SE-Mit-13 – Support and fishermen's complaint management plan.	This plan must implement a complaint management mechanism issued by the fishermen's community following relocation.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - Rodrigues fishing Commission - Relocated fishing post managers
Resettlement and compensation The set of measures to be taken for the resettlement and compensation of impacted communities must help to limit the socio-economic impacts resulting from the displacement of populations by restoring livelihoods and the standard of living of displaced people. **Action plan for relocation and compensation (including the livelihood restoration plan)**	**SE-Comp**-1- Implementation of a Resettlement Action Plan (RAP).	The RAP implements a procedure to delineate a land area prior to the organisation of the relocation of impacted villagers and compensation for farmland, pastures or even social infrastructure.	The relocation plan must be finalized before the works begin.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly Relocation Plan Report to be submitted by the Relocation Committee at the end of relocation plan and before resettlement.	- Verification that the levels of compensation meet at least the international requirements (IFC standards) on the basis of a price matrix to be established under the RAP. - Results of a questionnaire on the satisfaction rate of displaced and/or compensated people.	- Ensure updating to IFC standards according to the Relocation Plan Report before resettlement, - Provide particular emphasis on unsatisfying elements that have been pointed out with the questionnaire's results.	- Relocation committee appointed by and in liaison with the Executive Committee of the Rodrigues Regional Assembly - Airport of Rodrigues - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location)
	SE-Comp-2- Availability of farmland.	This measure incorporates the resettlement procedure for the replacement of farmland lost by impacted communities. This ties in with the livelihood restoration plan.	This measure must be effective before the construction phase begins.				- Relocation committee appointed by and in liaison with the Executive Committee of the Rodrigues Regional Assembly - Spokesperson of the village of Sainte Marie - Livestock breeder users of the impacted area - Villagers of Plaine Corail and village committee of Cascade Jean Louis (proposed resettlement towns)
	SE-Comp-4- Provision of pasture areas and new fishing infrastructures.	This measure incorporates the resettlement procedure for the replacement of grazing areas and fishing infrastructures lost by impacted communities. This ties	This measure must be effective before the construction phase begins.				- Relocation committee appointed by and in liaison with the Executive Committee of the Rodrigues Regional Assembly

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
		in with the livelihood restoration plan.					- Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail and village Committee of Cascade Jean Louis (proposed resettlement towns)
	SE-Mit-10- RAP follow-up plan.	This plan is a continuation of the procedures of the RAP to maintain the follow-up procedure by keeping the connection with affected communities throughout the adaptation period.	This follow-up takes place from the construction phase and continues during the period of adaptation of the displaced communities.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly Bi-annual Relocation Plan Report to be submitted by the Relocation Committee including complaint management and satisfaction surveys.		- Improve communication with local people according to reports' feedback. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Relocation committee appointed by the Executive Committee of the RRA - Airport of Rodrigues - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location) - Optionally an independent external office
	SE-Mit-14- Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	The goal of this measure is to keep communities on a viable and sustainable socio-economic dynamic by proposing to families that they diversify their economic activities.	This follow-up takes place from the construction phase and continues during the period of adaptation of the displaced communities.	To be monitored by RRA Annual report submitted by the Small Entrepreneurship Commission of Rodrigues Regional Assembly to Airport of Rodrigues and Rodrigues Regional Assembly Executive Committee.	- Quantitative and qualitative evaluation of local development according to survey results. - Number of local set up small activities and businesses.	- Enhance local economic environment through group consultations with specific and relevant themes according to evaluation results.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
Community development Medium-term planning of actions that should be implemented to achieve socio-economic development goals at the local level to trigger a virtuous process of improving living conditions	**SE-Mit-9-** Agricultural technical support plan.	This measure contributes to the consolidation of integration in the community environment through the support of technical services facilitating the adaptation of agricultural models and thereby promoting the viability of production.	These measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity) Annual report submitted by the Commission of Agriculture dealing with results obtained from	- Number of projects implemented; - Number of direct and indirect beneficiaries; - Geographical coverage of the projects implemented; - Diversity of topics discussed.	Projects reinforcement or implementation according to results obtained from field surveys and farmer consultations.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues Agriculture Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
	SE-Mit-11- Community consultation plan	These measures contribute to consolidating the integration of communities through the support	The measures occur from the resettlement of displaced villagers and				- Relocation committee appointed by and in liaison with

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
Community development plan	for monitoring the evolution of the agro-pastoral system. **SE-Mit-12**- Support plan concerning livestock breeding techniques.	of technical services facilitating the adaptation of farming methods to the new environment and thereby promoting the viability of production.	continue throughout the period of community adaptation.	field surveys and farmer consultations.			the Executive Committee of the RRA - Rodrigues Agriculture Commission - Livestock breeders of the relocation area - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
	SE-Mit-14- Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	The goal of this measure is to keep communities on a viable and sustainable socio-economic dynamic by proposing to families that they diversify their economic activities.	This follow-up takes place from the construction phase and continues during the period of adaptation of the displaced communities.	To be monitored by RRA Annual report submitted by the Small Entrepreneurship Commission of Rodrigues Regional Assembly to Airport of Rodrigues and Rodrigues Regional Assembly Executive Committee.		- Enhance local economic environment through group consultations with specific and relevant themes according to evaluation results.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
Public health and community safety Contribution to the mitigation of adverse impacts concerning the health and safety of local communities. **Public health and community safety plan**	**SE-Mit-16** - Communication plan for the communities and livestock breeders of the area concerning road safety.	• The objective of this measure is the implementation of a public awareness campaign for the population on road safety issues in the vicinity of construction sites.	This measure must take place from one month before the start of the site operations and must be carried out throughout the entire construction phase.	To be monitored by: RRA / ARL Annual reports submitted by the Commission of Public Health and the Commission of Transport of Rodrigues Regional Assembly to the Airport of Rodrigues and Rodrigues Regional Assembly Executive Committee.	- Number of accidents directly related to the activities of the project. - Number of pathologies detected directly related to the activities of the project.	Enhance and/or maintain communication campaigns in case of noticed accidents or detected pathologies.	- ARL - Project managers - Rodrigues health Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Media (local radio)
	SE-Mit-17- Facilitation of access to protected pedestrian lanes and safety signage management plan.	This measure is to design and construct structural elements for the protection of the public taking into consideration the risks to which they could be exposed in the vicinity of the site areas.	This measure must take place from one month before the start of the site operations and must be carried out throughout the entire construction phase.				- ARL - Project managers - Rodrigues infrastructure commissions - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
	SE-Mit-18- Coordination with the project managers involved in the work sites for the implementation of specific Health-Safety training.	The primary objective of this measure is to assess the health and safety risks and impacts to which affected communities are exposed and to take appropriate preventive measures.		To be monitored by ARL Annual report submitted by the Airport of Rodrigues.	- Number of training and communication activities implemented - Number of accidents directly related to the activities of the project.	Increased numbers of training and communication activities on Health and safety prevention.	- ARL - Project managers - Rodrigues health Commission

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	SE-Mit-19- Communication plan for the communities concerning the importance of complying with safety instructions.	The purpose of this measure is to ensure the safety of the project by prohibiting access to sites of unauthorized people and populations through promoting awareness of potential hazards in the work area.			- Number of pathologies detected directly related to the activities of the project.		- ARL - Project managers - Rodrigues health Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Media (local radio)
Health and safety of workers For the realisation of the project it does not present a nuisance to the health and safety of the workers on the site. **Occupational health and safety plan**	**SE-Mit-18**- Coordination with the project managers involved in the work sites for the implementation of specific health-safety training.	The objective of this measure is to establish a system for the protection of workers from occupational diseases and to establish a training program for workers in the project to ensure that these employees have the necessary skills to manage the risks associated with the position they are assigned to.	This measure must take place throughout the construction phase.	To be monitored by ARL Annual report submitted by Airport of Rodrigues.	- Number of incidents involving injury or mortality; - Number of cases of work-related illnesses.	Increased numbers of training and communication activities on health and safety prevention.	- ARL - Project managers - Rodrigues health Commission - Rodrigues labour Commission
	SE-Mit-19- Communication plan for the communities on the importance of complying with safety instructions on construction sites.	The goal of this plan is to initiate measures to prevent accidents, injuries and illnesses resulting from work by minimizing the causes of these hazards as much as possible.	This measure must take place throughout the construction phase.				- ARL - Project managers - Rodrigues health Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Media (local radio)
Workforce and training Encouragement to form a more rigorous workforce to improve the skills of local labour leading to economic growth linked to the creation of local jobs. **Workforce management and training plan**	**SE-Mit-5**- Communication plan concerning the integration of external workers.	These measures for the development of a management policy concerning the accommodation of external workers permit the improvement of incomes in the locations.	This measure must take place throughout the construction phase.	To be monitored by: RRA / ARL Annual reports submitted by the Airport of Rodrigues in collaboration with Rodrigues Regional Assembly that include communication measures taken on the period as well as local surveys on inhabitants as well as external workers.	- Number of communication activities carried out; - Number of communication media produced and distributed; - Number of organized sessions, meetings or information workshops; - Results of carried out surveys; - Number and qualitative details on hired people; - Number of registered complaints and reports on actions taken for complaints management, - Qualitative evaluation according to survey results.	- Organise additional communication activities in case of insufficient communication and if required through survey results. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- ARL - Project managers - Rodrigues labour Commission - Executive Committee of the RRA - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Local media (radio)
	SE-Mit-6 - Influx management plan						- ARL - Project managers - Rodrigues labour Commission - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis)

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	SE-Mit-7- Communication and hiring management plan **SE-Mit-8** - Communication and complaint management plan connected with employment	This measure is to showcase local skills, job opportunities and associated hiring conditions, and to foster local hiring to provide opportunities to obtain skills. This measure is to implement a worker complaint management process including the development of a labour law awareness and training program.	This measure must take place throughout the construction phase.				- ARL - Project managers - Executive Committee of the RRA - Rodrigues labour Commission - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Local media (radio)
	SE-Mit-18- Coordination with the contractors involved in the work sites for the implementation of specific Health-Safety training.	This measure allows the provision of a secure work environment and facilitates learning and therefore the gaining of skills.	This measure must take place throughout the construction phase.	To be monitored by ARL Annual report submitted by the Airport of Rodrigues.	- Number of incidents involving injury or mortality; - Number of cases of work-related illnesses.	Increased numbers of training and communication activities on health and safety prevention.	- ARL - Project managers - Rodrigues labour Commission - Rodrigues health Commission
	SE-Mit-19- Communication plan for the communities on the importance of complying with safety instructions on construction sites.	This allows employees to be trained more quickly on safety risk issues and on the procedures applicable to project employees.	This measure must take place throughout the construction phase.				- ARL - Project managers - Rodrigues labour Commission - Rodrigues health Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Media (local radio)

1.7 Environment and social management plans for operation phase

1.7.1 Environment Management Plan for operation phase

Table 16 lists the plans to be prepared prior to start of operation and then implemented during operation to monitor all the environmental measures in the impact study.

Specific guidelines for preparing plans are provided in Chapter 10.1.2 and 10.1.3. of the ESIA

Table 17 summarizes all the environmental measures in the impact study. The precise description of the measures is given in the impact study, in Chapter 8 of the ESIA.

The estimated cost associated with the environmental management and monitoring are provided in Chapter 12. The costs are considered indicative at this stage and will be updated during the life cycle of the project.

Table 16: Environmental Management Plans for Operation Phase

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control	Activity / Procedures to include
Surface stormwater run-off, drinking and wastewater management and monitoring plan	Design Phy-Hyd-Mit-2 / 3 / 4 / 6 Phy-Wat-Av-6 Phy-Wat-Mit-7 / 8	To be implemented by ARL or an external specialist/ engineer Under ARL's control	- A water management plan
	Operation monitoring of measures Phy-Hyd-Mit-2 / 3 / 4 / 6 Phy-Wat-Av-6 Phy-Wat-Mit-7 / 8	To be implemented by ARL or an external specialist/ engineer Under ARL's control	- A desalination plant, wastewater treatment plant and storm water management system monitoring - A water quality monitoring plan
Karst monitoring plan	Design – groundwater Phy-Kar-Mit-26	To be implemented by ARL or an external specialist/ engineer Under ARL's control	- Sizing note and plans - A follow-up plan to implement by ARL
	Operation monitoring – groundwater Phy-Kar-Mit-26	To be implemented by ARL or an external specialist/ engineer Under ARL's control	- A monitoring procedure to implement by the person in charge for the monitoring - A follow-up plan to implement by ARL
	Operation monitoring – caves Phy-Kar-Av-22	To be implemented by ARL or an external specialist/ engineer Under ARL's control	

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control	Activity / Procedures to include
	Phy-Kar-Mit/Comp-23 Phy-Kar-Mit/Comp-24		
Marine biodiversity and habitats monitoring plan	-	To be implemented by ARL or an external specialist/ engineer Under ARL's control	- A monitoring procedure to implement by the person in charge for the monitoring - A follow-up plan to implement by ARL
Infrastructures and access monitoring plan	Design ad post-commissioning monitoring Inf-Mit-7	To be implemented by ARL or an external specialist/ engineer Under ARL's control	- A future roads map and sizing notes - A 1 year post-commissioning monitoring plan
Air quality and noise environment management and monitoring plan	Design Air-Mit-6 to 11 Noi-Mit-3 to 5	To be implemented by ARL or an external specialist/ engineer Under ARL's control	- Air quality management plan - Noise environment management plan
	Operation monitoring Air-Mit-12 / 13 Noi-Mit-7	To be implemented by ARL or an external specialist/ engineer Under ARL's control	- Air quality monitoring plan - Noise environment monitoring plan
Landscape measures follow-up plan	Land-Mit-19 / 20 / 21 / 22 / 23	To be implemented by ARL or an external specialist/ engineer Under ARL's control / RRA	- A management plan to follow the measures to be carried out by RRA on an island scale
Emergencies prevention and management plans	Phy-Mar-Mit-6 / 7 Phy-Hyd-Mit-5 Phy-Kar-Av-25	To be implemented by ARL or an external specialist/ engineer Under ARL's control	- Oil spill prevention and management plan - Fire Emergency plan

Table 17: Summary of Environmental Measures and Monitoring during Operation Phase

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
Marine environment	Phy-Mar-Mit-6	Prevent spills and accidents: train staff to avoidance of spills.	-	Operational phase **Emergencies prevention and management plans**	Regular checking visits and tests	Zero spill	Improve training	ARL
	Phy-Mar-Mit-7	Implementing methodologies for quick confining and treatment of pollutants and protocol for depollution in case of spill	-	Operational phase In case of a spill **Emergencies prevention and management plans**	Monitoring of turbidity levels. Monitoring of contaminants in the water column.	Compliance to water quality prevailing threshold.	Informing of local authorities. The spill source will be immediately isolated, stopped and contained	ARL
Hydrology - Stormwater management Wastewater management / Water resource and water supply	Phy-Hyd-Mit-5	Treat chronic or accidental sources of pollution	Prevention / management of accidental pollution / water from firefighting Confining any accidental pollution / water from firefighting	Operational phase In case of a spill **Emergencies prevention and management plans**	Monitoring of water quality at stormwater outlet and nearby aquifer (control piezometer)	Compliance with prevailing / target standards.	Information of local authorities and implementation of remedial measures / dedicated pumping for evacuation if deemed necessary.	ARL
	Phy-Hyd-Mit-2 Phy-Hyd-Mit-3 Phy-Hyd-Mit-4 Phy-Hyd-Mit-6	Stormwater network Stormwater ditch located to restore the watershed boundary Climate change adaptation: buffering storage and works facilitating infiltration Vegetation of slopes and ditches and collection of infrastructures runoff	Stormwater management for the runway before discharge at sea: Implementation of oil separator/sedimentation works on outlet	Permanent as from the commissioning of the runway **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	The oil separator on the discharge point at sea will be equipped with an alarm to order a maintenance before leakage; monitoring of water quality at discharge at sea; regular manual sampling/analysis of outlet during discharge at sea and visual control.	Compliance with prevailing / target standards. Submission to local authorities once a month.	Discharge to be stopped if non-compliance. Informing of local authorities and implementation of remedial measures: confining / dedicated pumping for evacuation if deemed necessary.	To be implemented by the Detail Design Engineer Under ARL's control Operation Monitoring: ARL (or external specialist engineer under ARL and RRA's control)
			Stormwater management and collection in a buffer storage pond to reduce peak flows before discharge at sea: Implementation of oil separator/sedimentation works before outlet into the pond. Stormwater collection in a buffer storage pond. Implementation of a water treatment plant within an integrated water management plan including reuse of treated stormwater collected.	Permanent as from the commissioning of the new runway facilities **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	The oil separator on the inlet of the buffer storage pond will be equipped with an alarm to order a maintenance before leakage; monitoring of water quality at discharge at sea, regular manual sampling/analysis of outlet during discharge at sea and visual control.	Compliance with prevailing / target standards. Submission to local authorities once a month.	Discharge / reuse to be stopped if non-compliance. Informing of local authorities and implementation of remedial measures: confining / dedicated pumping for evacuation if deemed necessary.	To be implemented by the Detail Design Engineer Under ARL's control Operation Monitoring: ARL (or external specialist engineer under ARL and RRA's control)
	Phy-Wat-Av-6 Phy-Wat-Mit-7 Phy-Wat-Mit-8	Integrated water management plan Water treatment plant Reuse water plan	Wastewater management for the airport facilities before discharge at sea Wastewater integrated management for the airport facilities =>Implementation of a water treatment plant within an integrated water management plan including reuse of treated wastewater.	Permanent as from the commissioning of the treatment facilities **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	Monitoring of water quality at inlet and outlet of Treatment Plant; monitoring of water quality in industrial water storage and stored water quality is maintained including disinfection; regular manual sampling/analysis (once a week) and visual control; automatic real time monitoring on main	Compliance with prevailing / target standards. Submission to local authorities once a month.	Discharge / reuse to be stopped if non-compliance. Informing of local authorities and implementation of remedial measures: confining / dedicated pumping for evacuation if deemed necessary.	To be implemented by the Detail Design Engineer Under ARL's control Operation Monitoring: ARL (or external specialist engineer under ARL and RRA's control)

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
					parameters usually monitored.			
			Rainwater integrated management for the airport facilities: Implementation of a water treatment plant within an integrated water management plan including reuse / treatment of rainwater harvested for drinking water production.	Permanent as from the commissioning of the treatment facilities **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	Monitoring of water quality at inlet and outlet of Treatment Plant; monitoring of water quality in rainwater storage and stored water quality is maintained including disinfection; regular manual sampling/analysis (once a week) and visual control; automatic real time monitoring on main parameters usually monitored for drinking water production (at least pH and turbidity)	Compliance with prevailing / target standards. Submission to local authorities once a month.	Reuse to be stopped if non-compliance. Informing of local authorities and implementation of remedial measures: confining / dedicated pumping for evacuation if deemed necessary.	To be implemented by the Detail Design Engineer Under ARL's control Operation Monitoring: ARL (or external specialist engineer under ARL and RRA's control)
			Drinking Water supply integrated management for the airport facilities: Implementation of a water treatment plant within an integrated water management plan including reuse / treatment of rainwater harvested for drinking water production. Reuse and treatment of wastewater / stormwater collected if necessary.	Permanent as from the commissioning of the treatment facilities **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	Monitoring of water quality at inlet and outlet of Treatment Plant; monitoring of water quality in drinking water storage and stored drinking water quality is maintained including disinfection; regular manual sampling/analysis (once a week) and visual control; automatic real time monitoring of main parameters (at least pH, turbidity and residual free chlorine) on distribution line.	Compliance with prevailing / target standards. Submission to local authorities once a month.	Distribution to be stopped if non-compliance. Informing of local authorities and implementation of remedial measures: confining / dedicated pumping to empty drinking water storage if deemed necessary.	To be implemented by the Detail Design Engineer Under ARL's control Operation Monitoring: ARL (or external specialist engineer under ARL and RRA's control)
Karst	Phy-Kar-Av-25	All operations involving hydrocarbons must comply with current standards to prevent spills and, if necessary, implement emergency measures	-	Operational phase **Emergencies prevention and management plans**	Installation of a network of observation wells upstream and downstream of the facilities to allow, on the one hand, sampling and analysis of groundwater to define reference values and, on the other hand, to establish a groundwater quality monitoring program (and levels) during the project development phases (construction and operation phases)	Number and intensity of accidental spills of hydrocarbons and other chemicals	In the event of a surface spill, the environmental response plan must be implemented immediately. In the event that there is a significant change in groundwater quality and/or a contaminant is detected, the environmental management plan will also have to be put in place to contain the contamination.	ARL
	Phy-Kar-Mit-26	Do not allow groundwater use downstream of airport infrastructure	-	Operational phase **Karst monitoring plan**				To be implemented by the Detail Design Engineer Under ARL's control Operation Monitoring: ARL (or external specialist engineer under ARL control)
	Phy-Kar-Av-22	Supplementary geotechnical and geophysical investigations to characterize karstic network (caves and voids)	-	Operational phase **Karst monitoring plan**	Periodic topographic surveys	Non-compliance with the leveling tolerances	Geophysical and/or ground investigation launching	To be implemented by ARL or an external specialist Contractor

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	Phy-Kar-Mit/Comp-23	In situ investigation diagnostic of infilled cavities (televisual cavity inspections)	-	Operational phase **Karst monitoring plan**	Geophysical/geotechnical detection of underground cavity(ies)	Borehole log anomaly vertical to a leveling defect	Repair works as cavity filling/grouting	(as part of the 10-year guarantee) Under ARL's control
	Phy-Kar-Mit/Comp-24	Additional laboratory testings (Aggregate testings) to characterize erosive potential of in situ geological formations	-	Operational phase **Karst monitoring plan**	Detection of gully development as part of site visits	Slope instability, defect on drainage device	Slope reconstruction with coarse granular materials/Drainage system improvement works	
Infrastructures and solid waste management	Inf-Mit-7	Restore road connections	To adapt the surrounding airport routes to achieve overall network coherence	Operational phase **Infrastructures and access monitoring plan**	Post-commissioning assessment of persistent traffic problems	Zero additionnal traffic jam	Resizing of road network	To be implemented by the Detail Design Engineer and Contractor (as part of the 10-year guarantee) Under RRA and ARL's control
Air quality	Air-Mit-6	If possible, limit the taxiing distance	-	During operational phase **Air quality and noise environment management and monitoring plan**	Air quality and noise environment Management Plan	air emission standards	-	To be implemented by ARL or external specialist engineer Under ARL and RRA's control
	Air-Mit-7	Opt for technologies that limit aircraft pollutant emissions during taxiing	-		Air quality and noise environment Management Plan	air emission standards	-	
	Air-Mit-8	Encourage pilots to shut down unneeded engines when taxiing	-		Air quality and noise environment Management Plan	air emission standards	-	
	Air-Mit-9	Limit congestion (aircraft queues) by making departures as fluid as possible	-		Air quality and noise environment Management Plan	air emission standards	-	
	Air-Mit-10	Minimize the use of the APU and GPU	-		Air quality and noise environment Management Plan	air emission standards	-	
	Air-Mit-11	Develop and implement procedures to limit the use of the thrust reverser	-		Air quality and noise environment Management Plan	air emission standards	-	
	Air-Mit-12	Make ecological performance a criterion of choice for service vehicles and ground equipment	-	Before operational phase **Air quality and noise environment management and monitoring plan**	Air quality and noise environment Management Plan	air emission standards	-	To be implemented by the Detail Design Engineer Under ARL's control
	Air-Mit-13	Develop an efficient public transport system to limit the use of private vehicles	-		Air quality and noise environment Management Plan	air emission standards	-	
Noise	Noi-Mit-3	Limit air traffic at night and the use of noisy equipement	-	During operational phase **Air quality and noise environment management and monitoring plan**	Air quality and noise environment Management Plan	noise emission standards	-	To be implemented by ARL or external specialist engineer Under ARL and RRA's control
	Noi-Mit-4	Raise the ILS glide slope to reduce noise emissions during landing	-		Air quality and noise environment Management Plan	noise emission standards	-	
	Noi-Mit-5	Adapt departure procedures to minimize noise exposure on the ground during take-off	-		Air quality and noise environment Management Plan	noise emission standards	-	
	Noi-Mit-6	Limit the use of reverse thrust	-		Air quality and noise environment Management Plan	noise emission standards	-	
	Noi-Mit-7	Develop an efficient public transport system to limit the use of private vehicles	-	Before operational phase **Air quality and noise environment**	Air quality and noise environment Management Plan	noise emission standards	-	To be implemented by the Detail Design Engineer

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
				management and monitoring plan				Under ARL's control
Landscape	Land-Mit-19	Set up of green and blue grids	-	Any time **Landscape measures follow-up plan**	Environmental study	Environmental Assessment, guidelines and final report	None	RRA
	Land-Mit-20	Set up of sustainable and resilient city guidelines and architectural guidelines	-		Designer team: landscape architect, urbanist or architect with environmentalist and sociologist	Site Assessment, guidelines and final report	None	RRA
	Land-Mit-21	Investment in woodland planting to feed the timber industry	-		Private or relevant government administration	Yearly increase in wooded surfaces	None	RRA
	Land-Mit-22	Set up sustainable timber management plan	-		Forestry expert	Timber management assessment and report	None	RRA
	Land-Mit-23	Ravine preservation and sanctuarisation of associated woodlands	-		Relevant government administration	Extent of fence + yearly cost of maintenance	None	RRA

1.7.2 Social Management Plan for the operation phase

Table 18 lists the plans to be developed and then implemented to monitor all the environmental measures in the impact study.

Specific guides for preparing plans are provided in Chapter 10.2.2 of the ESIA.

Table 19 summarizes all the environmental measures in the impact study. The precise description of the measures is given in the impact study, in Chapter 8 of the ESIA.

The estimated cost associated with the social management and monitoring are provided in Chapter 12. The costs are considered indicative at this stage and will be updated during the life cycle of the project

Table 18: Social Management Plan during Operation Phase

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
Communication plan	SE-Mit-3 SE-Mit-5 SE-Mit-7 SE-Mit-11 SE-Mit-12 SE-Mit-13 SE-Mit-14 SE-Mit-15	- Executive Committee of the RRA - Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - ARL - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Rodrigues Agriculture Commission - Rodrigues women and small entrepreneurship Commission - Rodrigues fishing Commission - Villagers of Plaine Corail (proposed resettlement location) - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Local media (radio) - Possibly a specialised external entity such as an NGO To be monitored by: ARL/ RRA and the Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity)

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
Complaints management plan	SE-Mit-3 SE-Mit-11 SE-Mit-13	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - ARL - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location) - Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - Rodrigues Agriculture Commission - Villagers and livestock breeders of the resettlement area - Rodrigues fishing Commission - Relocated fishing post managers To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity)
Community assistance and communication plan for the development of income generating activities	SE-Mit-14	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - ARL - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) To be monitored by RRA
Community development plan	SE-Mit-9 SE-Mit-11 SE-Mit-12	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
	SE-Mit-14	- Rodrigues Agriculture Commission - Livestock breeders of the relocation area - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Rodrigues fishing Commission - Rodrigues women and small entrepreneurship Commission To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity)
Workforce management and training plan	SE-Mit-5 SE-Mit-7	- ARL - Project managers - Rodrigues labour Commission - Executive Committee of the RRA - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Local media (radio) To be monitored by: RRA / ARL

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system – reports to provide	Performance indicators	Corrective measures	Responsible managers for implementation
Communication Ensure a harmonious implementation of the work at all stages of its performance with all the communities directly or indirectly impacted by the project **Communication plan**	**SE-Mit-3-** Complaint management and internal support for relocation.	An outcome of the RAP, complaint management is the attentive listening to the affected populations regarding relocation. It must be effective and transparent in order to take into consideration and share all the grievances expressed by the communities in order to define appropriate communication and support strategies.	The complaint management plan covers the entire project: from the implementation of the resettlement plan and throughout the period of adaptation of the displaced communities.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly Quarterly reports to be submitted by the Relocation Committee until full adaptation of resettled population	- Number of registered complaints and reports on actions taken for complaint management.	Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - Airport of Rodrigues - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location)
	SE-Mit-5- Communication plan concerning the integration of external workers.	The project will bring in foreign and specifically qualified labour. It is important to communicate about a considerable and temporary advent of an external population and to ensure transparency concerning the hiring procedures in relation to foreign workers.	This communication plan must begin prior to the arrival of the first workers and continue throughout all of the works phase.	To be monitored by: RRA / ARL Annual reports submitted by the Airport of Rodrigues in collaboration with Rodrigues Regional Assembly that include communication measures taken on the period as well as local surveys on inhabitants as well as external workers.	- Number of communication activities carried out; - Number of communication media produced and distributed; - Number of organized sessions, meetings or information workshops; - Results of carried out surveys; - Number and qualitative details on hired people; - Number of registered complaints and reports on actions taken for complaints management.	- Organise additional communication activities in case of insufficient communication and if required through surveys results. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Executive Committee of the RRA - Airport of Rodrigues - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Local media (radio)
	SE-Mit-7- Communication and hiring management plan	Specific communication concerning hiring procedures should be put in place so that impacted communities are informed about job opportunities and other related information.	This communication plan must begin and continue throughout the works phase.				
	SE-Mit-11- Community consultation plan for monitoring the evolution of the agro-pastoral system. **SE-Mit-12**- Support measures concerning livestock breeding techniques.	These measures relate to the communication procedures to be employed concerning the specific and important subject of adaptation of agricultural and livestock breeding techniques by all communities.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.	To be monitored by: RRA and the Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity) Bi-annual Relocation Plan Report to be submitted by the Relocation Committee including complaints management and satisfaction surveys.	- Number of registered complaints and reports on actions taken for complaint management, - Qualitative evaluation according to survey results.	- Improve communication with local people according to reports' feedback. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Relocation committee appointed by the Executive Committee of the RRA - Rodrigues Agriculture Commission - Village Committee (Plaine Corail – Cascade Jean Louis) and non-resident livestock breeders - Possibly a specialised external entity such as an NGO
	SE-Mit-13 - Support and fishermen's complaint management plan.	These measures relate to the communication procedures to be undertaken with the fishermen's community following relocation.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by the Executive Committee of the RRA - Rodrigues fishing Commission - Fishing station managers - Airport of Rodrigues

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system – reports to provide	Performance indicators	Corrective measures	Responsible managers for implementation
	SE-Mit-14- Plan for consultation and support of the communities of the area concerning the development of income-generating activities. **SE-Mit-15-** Economic support plan for households.	These measures relate to the communication procedures to be employed with the village communities in the area in order to promote the development of income-generating activities for households by becoming aware of the initiatives that the villages and villagers would like to implement.	These measures are developed from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
Complaint management Ensure that all complaints from communities or individuals affected by the implementation of the project are received, reviewed and that appropriate action is taken within a reasonable time to arrive at a mutually acceptable solution. **Complaints management plan**	**SE-Mit-3-** Complaint management and internal support for relocation.	The relocation complaint management process requires careful listening to affected populations. It must be effective and transparent in order to take into consideration and share all the grievances expressed by the communities in order to define appropriate communication and support strategies.	*(entire project)*	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly Relocation Plan Report including complaint management to be submitted by the Relocation Committee at the end of the relocation plan and before resettlement.	- Number of complaints issued; - Number of complaints satisfactorily resolved.	- Ensure that all registered complaints have been satisfactorily treated. If not, complaints not well treated will have to appear positively handled before works begin.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Airport of Rodrigues - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location)
	SE-Mit-11- Community consultation plan for monitoring the evolution of the agro-pastoral system.	This measure is the implementation of an effective and transparent complaint management mechanism concerning agriculture and livestock breeding. This mechanism makes it possible to become aware of the potential discontent of individuals or communities concerning the evolutionary process of the agro-pastoral system.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity) Bi-annual Relocation Plan Report to be submitted by the Relocation Committee including complaint management and satisfaction surveys.	- Number of registered complaints and reports on actions taken for complaints management, - Qualitative evaluation according to survey results.	- Improve communication with local people according to reports' feedback. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - Rodrigues Agriculture Commission - Villagers and livestock breeders of the resettlement area
	SE-Mit-13 – Support and fishermen's complaint management plan.	This plan must implement a complaint management mechanism issued by the fishermen's community following relocation.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - Rodrigues fishing Commission - Relocated fishing post managers

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system – reports to provide	Performance indicators	Corrective measures	Responsible managers for implementation
Resettlement and compensation The set of measures to be taken for the resettlement and compensation of impacted communities must help to limit the socio-economic impacts resulting from the displacement of populations by restoring livelihoods and the standard of living of displaced people. **Action plan for relocation and compensation (including the livelihood restoration plan)**	**SE-Mit-14-** Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	The goal of this measure is to keep communities on a viable and sustainable socio-economic dynamic by proposing to families that they diversify their economic activities.	This follow-up takes place from the construction phase and continues during the period of adaptation of the displaced communities.	To be monitored by RRA Annual report submitted by the Small Entrepreneurship Commission of Rodrigues Regional Assembly to Airport of Rodrigues and Rodrigues Regional Assembly Executive Committee.	- Quantitative and qualitative evaluation of local development according to survey results. - Number of local set up small activities and businesses.	- Enhance local economic environment through group consultations with specific and relevant themes according to evaluation results.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
Community development Medium-term planning of actions that should be implemented to achieve socio-economic development goals at the local level to trigger a virtuous process of improving living conditions **Community development plan**	**SE-Mit-9-** Agricultural technical support plan.	This measure contributes to the consolidation of integration in the community environment through the support of technical services facilitating the adaptation of agricultural models and thereby promoting the viability of production.	These measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity) Annual report submitted by the Commission of Agriculture dealing with results obtained from field surveys and farmer consultations.	- Number of projects implemented; - Number of direct and indirect beneficiaries; - Geographical coverage of the projects implemented; - Diversity of topics discussed.	Projects reinforcement or implementation according to results obtained from field surveys and farmer consultations.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues Agriculture Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
	SE-Mit-11- Community consultation plan for monitoring the evolution of the agro-pastoral system. **SE-Mit-12**- Support plan concerning livestock breeding techniques.	These measures contribute to consolidating the integration of communities through the support of technical services facilitating the adaptation of farming methods to the new environment and thereby promoting the viability of production.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues Agriculture Commission - Livestock breeders of the relocation area - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system – reports to provide	Performance indicators	Corrective measures	Responsible managers for implementation
	SE-Mit-14- Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	The goal of this measure is to keep communities on a viable and sustainable socio-economic dynamic by proposing to families that they diversify their economic activities.	This follow-up takes place from the construction phase and continues during the period of adaptation of the displaced communities.	To be monitored by RRA Annual report submitted by the Small Entrepreneurship Commission of Rodrigues Regional Assembly to Airport of Rodrigues and Rodrigues Regional Assembly Executive Committee.		- Enhance local economic environment through group consultations with specific and relevant themes according to evaluation results.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
Workforce and training Encouragement to form a more rigorous workforce to improve the skills of local labour leading to economic growth linked to the creation of local jobs. **Workforce management and training plan**	**SE-Mit-5**- Communication plan concerning the integration of external workers.	These measures for the development of a management policy concerning the accommodation of external workers permit the improvement of incomes in the locations.	This measure must take place throughout the construction phase.	To be monitored by: RRA / ARL Annual reports submitted by the Airport of Rodrigues in collaboration with Rodrigues Regional Assembly that include communication measures taken on the period as well as local surveys on inhabitants as well as external workers.	- Number of communication activities carried out; - Number of communication media produced and distributed; - Number of organized sessions, meetings or information workshops; - Results of carried out surveys; - Number and qualitative details on hired people; - Number of registered complaints and reports on actions taken for complaints management, - Qualitative evaluation according to survey results.	- Organise additional communication activities in case of insufficient communication and if required through survey results. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- ARL - Project managers - Rodrigues labour Commission - Executive Committee of the RRA - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Local media (radio)
	SE-Mit-7- Communication and hiring management plan	This measure is to showcase local skills, job opportunities and associated hiring conditions, and to foster local hiring to provide opportunities to obtain skills. This measure is to implement a worker complaint management process including the development of a labour law awareness and training program.	This measure must take place throughout the construction phase.				- ARL - Project managers - Executive Committee of the RRA - Rodrigues labour Commission - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Local media (radio)

Table 19: Summary of Social Measures and Monitoring during Operation Phase

1.8 Cumulative Impact Assessment

Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity (collectively referred to in this document as “developments”) when added to other existing, planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities.

Multiple and successive environmental and social impacts from existing developments, combined with the potential incremental impacts resulting from proposed and/or anticipated future developments, may result in significant cumulative impacts that would not be expected in the case of a stand-alone development.

The ESIA has already identified the Valued environmental and Social component s (VECs) of concern both during construction and operation phases, inter alia

- Physical Environment
    - Terrestrial geology and geotechnics
    - Marine and shores geology and marine turbidity
    - Hydrology
    - Hydrogeology
    - Water resource and waste water management
- Biological Environment
    - Terrestrial Biological Environment
    - Marine Biological Environment
- Utility and Services
    - Transport network
    - Electricity supply
    - Water supply
    - Wastewater management
    - Solid waste management
- Socio-Economic Environment
    - Land Use Planning
    - Housing
    - Heritage Conservation
    - Education, Health and Community Facilities
    - Employment Uses
    - Agriculture and Fisheries
    - Mineral Resources
    - Tourism

The assessment and/or estimation of the future condition of selected VECs, as the result of the cumulative impacts that the development is expected to have, when combined with those of other reasonably predictable developments as well as those from natural environmental and external social drivers, will be done upon receipt of the final design of the project.

It is however foreseen that the cumulative impact will be significant both at construction and operation stages on the natural and built environment.

1.9 Scope of Studies for the finalisation of the ESIA Report

As part of the finalisation of the ESIA report, all the environmental and social field surveys and studies undertaken in 2018/2019 for the preparation of the ESIA 2019 will have to be updated. These comprise but are not limited to

- terrestrial and marine biodiversity surveys,
- studies of relevant available data gathered during the period,
- further studies/modelling once the detailed design of the Project is received.

Chapter 2 hereafter provides the Terms of Reference & Methodology for Updating the ESIA.

2 Terms of Reference & Methodology for Updating the ESIA

2.1 Terms of Reference for Consultancy Services to Update an Environmental and Social Assessment for the Expansion of the Rodrigues Airport Project.

The terms of Reference below have been prepared by the World Bank and serve to update the existing ESIA prepared in 2018-2019.

2.1.1 Introduction

An ESIA for the expansion of the Rodrigues Airport was prepared in 2019 to meet the requirements of the Government of Mauritius and those of the Agence Française de Développement (AFD) and the European Union (EU).

Airport of Rodrigues Ltd is proposing to seek financing support from the World Bank and is therefore required to update the existing ESIA to meet the requirements of the World Bank Environmental and Social Framework (ESF).

The proposed project is currently classified as a High-risk project under the World Bank Environmental and Social Policy, due to the anticipated long-term and permanent adverse direct, indirect and cumulative impacts. In particular the construction of the new runway will have direct impacts on endangered and critically endangered tree species which will require relocation, furthermore it is anticipated that marine construction activities may have an impact on critically endangered marine turtles and near threatened coral species, which will require further investigation and mitigations as part of the final ESIA. Even though the expansion of the airport may contribute to positive socio-economic benefits of Rodrigues, potential cumulative impacts may negatively impact on scarce natural resources, sense of place, and potential social impacts such as security, loss of land for agriculture etc. The full extent of the potential downstream cumulative impacts will be further assessed as part of the final ESIA.

2.1.2 Objectives of the Assignment

This assignment aims to update the existing ESIA to address the gaps identified to meet the requirements of the World Bank ESF in addition to the legislative requirements of the Republic of Mauritius. The Consultant will further update the ESIA, taking into consideration the design changes and final design considerations. The updated ESIA must aim to identify and assess all positive and negative environmental and social risks and impacts potentially generated by all phases of the Rodrigues Airport expansion project (collectively referred to as the “Project” in this Terms of Reference – ToR) and propose technically feasible mitigation measures to manage the identified environmental and social risks and impacts. The ToR focuses on the ESIA aspects that need to be updated firstly to meet early disclosure requirements. The output of this ToR will be the delivery of an updated “draft” ESIA.

A final version of the ESIA will be prepared and disclosed before project appraisal (preliminarily planned for April 23) based on the additional studies identified in the draft ESIA (this document) and the finalization of the airport design.

Therefore, the updated draft ESIA shall describe the current information gaps and their potential impacts and risks to the project and provide information on how the consultant

anticipates collecting information to close the information gap during the finalization of the ESIA. The updated draft ESIA will inform the additional studies and information gathering required to finalization of the ESIA and Environmental and Social Management Plan (ESMP) to meet the requirements of the World Bank ESF.

2.1.3 Relevant Standards and Legal Requirements

The updated draft ESIA and relevant environmental and social studies should take into consideration the following national environmental legal framework, relevant standards and guidelines

- Mauritius environmental legislation
- International Law, including conventions and treaties adopted by Mauritius and applicable to the Rodrigues airport Project;
- World Bank Environmental and Social Framework;
- The World Bank Group General Environmental, Health and Safety Guidelines (EHSG), and;
- The World Bank Group EHSG for Airports projects
- Any other relevant legal requirement

2.1.4 Scope of Work

2.1.4.1 Draft ESIA

The Assignment corresponds to the following task: Update the “draft” ESIA to meet the requirements of the World Bank ESF.

As part of preparing the updated draft ESIA, the Consultant must prepare a chapter that substantiates the current Project information gaps and how they could pose a risk to the Project and identify the scope of work required to fill those gaps. This chapter should provide information on the methodology and parameters, if relevant, that will be followed to fill in the existing gaps and the relevant additional studies required detailing the respective scope of work. The Consultant will further update the ESIA to clarify/amend the information provided in the existing document as stipulated in this ToR.

The above requirements are fulfilled in section 1.2 below.

2.1.4.2 Final ESIA

A final version of the ESIA will be prepared and disclosed before project appraisal (preliminarily planned for April 23) based on the additional studies identified in the draft ESIA (this document) and the finalization of the airport design.

2.2 Methodology for updating the ESIA

As at date, the Detailed Design of the Project is still ongoing by the consultants, with the geotechnical investigations currently underway at Plaine Corail Airport.

The Final alignment of the runway shall be finalised once the geotechnical investigation has been completed and the outcome thereof incorporated into the detailed design.

Hence, as at date, there is no significant information concerning the new design, to the exception of the location of the Air Traffic Control and the Rescue and Fire Fighting Services that have been moved outside the Nature Reserve.

2.2.1 Draft ESIA

The improvements and corrections brought to the existing ESIA (2018) are provided in Table 20 below. Where the required updates cannot be done at this stage, the later has been justified and is moved to the ESIA finalisation stage; the methodology to achieve the update is hence provided.

Table 20: Draft ESIA update - Corrections and Amendments to the existing ESIA

No	GAP ANALYSIS	DRAFT ESIA UPDATE
a	Update the ESIA to reflect the latest version of the project description, including the new location of the Control Tower and the new layout of buildings and infrastructure;	Architectural drawings of the following buildings have been received: ATC, RFFS, incinerator, boat house, met. Services, quarantine, power centre A plan of the repositioning of the ATC and RFFS outside AQNR has been received. This positive aspect is discussed in the present draft ESIA update. It was a recommendation of the initial ESIA 2018. A plan of the possible repositioning of the runway 75m to the east has been received. The client has indicated that same should not be taken into consideration for now There is currently no latest version of the master plan with proper positioning of all buildings and their setbacks to potential environmental sensitive areas. There is no technical data on the incinerator, jetty/slipways, etc enabling a review of the impact assessment The ESIA will be finalised once the project is signed off and necessary data is made available
b	(Introduction - chapter 2): Explain the ESIA update regarding the compliance with the World Bank ESF requirements;	chapter 2 Introduction has been updated accordingly
c	(Introduction - chapter 2): Include and explain the risk rating according to each ESS;	chapter 2 Introduction has been updated accordingly
d	Clarify and harmonize the definitions of the project's areas of influence (eg Anse Quitor Natural Reserve – AQNR, and ending of river's edge should be part of the area of influence) and define criteria for the selection of the areas;	Project area of influence has been partly amended. The area of Influence will be reviewed further, in a manner consistent with the requirements of the ESSs, in the light of the detailed design and technical information gathered on the project on the one hand, and the collection and analysis of environmental and social baseline information and data on the other hand. The area of influence and hence studies, reports and maps will be amended during the ESIA finalisation for a complete coverage of the marine

		and terrestrial environment including riverine land and estuary
e	Climate and disaster risk (section 3.3.1.2): Include analysis on sea level rise, including projections for future rise and on the possible increase in frequency and intensity of tropical cyclones;	The 'update of the nationally determined contribution of the Republic of Mauritius' published on 1 October 2021 and the MMS give some figures which are included in section 3.3.1.2 and 3.3.1.3 A specific section 3.3.1.4 has been created. Hence renumbering of all other sections
f	(section 3.3.1.8): Address the needs of water during construction (including calculations and sources);	Section updated Water requirement during construction is not known at this stage Water source proposed is a temporary desalination plant
g	(section 3.3.1.8): Clarify the dismantling or updating of the existing wastewater treatment system;	Section updated The existing wastewater treatment plant will be dismantled once the new plant is operational.
h	(section 3.3.1.9): Given the lack of information and uncertainty regarding the hydrogeological karstic environment, review the sensitivity of all three receptors;	The sensitivity has been reviewed. Refer section 3.3.1.9; Section 6.3.7.6.3 and Section 6.3.9
i	(section 3.3.2.1): Complete the information on AQNR: aims of the reserve, date of creation, gazetting status	Section 3.3.2.1 updated
j	(section 3.3.2.1 – Table 1): Classify habitats as per ESS6 and update the IUCN status of threatened species	Section 3.3.2.1.1 updated with reference to ESS6. IUCN status updated with latest data available from IUCN Red List of Threatened Species website
k	(section 3.3.2.1.4): Revise the statement that the project avoids impacts on AQNR, considering it is located within the area of influence of the runway;	The statement has been deleted in the present updated 'draft' ESIA. The risk assessment will be reviewed when finalising the ESIA in the light of the detailed design.
l	(section 3.3.2.2.1): Review the IUCN status of Acropora formosa (NT);	IUCN latest update 2008 classified as Near Threatened. No change
m	(section 3.3.3.3): Provide additional information on solid waste management – capacity of the landfill site in Grenade to absorb waste generation during construction and operation; final disposal of hazardous and e-waste during construction and operation	Data received from RRA and included
n	(section 3.3.6.2): Provide additional information, including mapping, of the impacts on fossils and the mitigation proposed;	Information available in the draft ESIA has been included in this section of the executive summary. Should further studies be required, these will be undertaken as part of the ESIA final update A conservation plan will need to be set up
o	(section 3.4.2): Include impacts on Acropora formosa and reconsider the risk rating;	Acropora formosa is included in marine habitat BioM-Hab-W-Temp-1 Risk rating low base on studies undertaken in 2018 A fresh assessment of the marine biodiversity may be required as part of the ESIA final update
p	(section 3.4.2): Identify and assess potential impacts on bat populations in the caves (or other species present at the caves), and on coastal habitats, including areas suitable for turtles nesting;	Terrestrial and marine fauna and flora have been assessed Study on marine turtle will be updated as part of the ESIA final update to include seasonal representativity

q	(section 4.1): Add information on legislation on protected areas, national legislation on environment, health and safety, gender-based violence, land acquisition, compensation, resettlement, cultural heritage; Include a final section on the gap between the applicable ESS and the national legislation;	Section 4.1 updated
r	(section 4.1.2.2): Provide details on the EIA process in Mauritius, including the requirements for consultation	Refer to section 4.1.1 Updated
s	(section 4.3.2): Update the reference to the Kyoto Protocol, no longer effective, and include the Paris agreement	Section 4.3.2 updated
t	(section 4.3.2): Include the ILO Conventions ratified by Mauritius;	Section 4.3.2 updated
u	(section 5.): Provide the demonstration that the project, including infrastructures (eg storm water drainage) are climate resilient;	it is understood that the terms of reference of the design includes resilience to climate change. The consultant shall provide such demonstration at detailed design stage
v	(section 5.2): Update the timeline for the project;	Section 5.2 updated with data from ARL
w	(section 5.3.1.2): Add the capacity of the water tower	Section 5.3.1.2 updated a minimum volume of 30 m^3 as per firefighting guidelines
x	(Figure 21): Adjust the legend	Figure 21 deleted. Figure 13 provides the latest master plan provided by ARL
y	(section 5.3.14.5): Substantiate application of the mitigation hierarchy (avoid discharges in sensitive areas (eg coral, marine habitats);	Section 5.3.14.5 is now 5.3.10.5 in the updated 'draft' ESIA the effects of the discharges will be analysed and avoidance measures will be defined in the marine environment and in particular in the sensitive areas, previously determined by the additional field investigations and the bibliography
z	(section 5.4): Update budget and financing	The financial update will be undertaken in as part of the ESIA final update in the light of the information provided by the client and Main Consultant.
aa	(section 5.6.4.1): Provide details about the workers camp and its location	Details not available. Will be requested for evaluation as part of the ESIA final update
bb	(section 5.6.4.2): Provide details about the desalination plant;	Section 5.6.4.2 updated However these are assumptions/recommendations given that the provision of water will be under the responsibility of the contractor
cc	(section 5.6.4.3): Provide data about the water needs and sources for the concrete and asphalt plants;	Details not available. Will be requested for evaluation as part of the ESIA final update
dd	(section 5.6.4.4): Provide details about the incinerator and its potential environmental impacts;	Section amended and Removed
ee	(section 5.6.4.4): Identify and assess the impacts of the management of the waste during construction, including the transport to Mauritius	Details not available. Will be requested for evaluation as part of the ESIA final update against possibilities in Rodrigues

ff	(section 5.7): Revise definition of "associated facilities" according to the meaning on the ESF;	Section renamed Ancillary facilities
gg	(section 6.3.8.1): Update and revise the table on water supply	Table updated
hh	(section 6.3.9): Revise the sensitivity of water supply	Sensitivity revised to high
ii	(section 6.4.1.2.2): Revise the classification of AQNR as per ESS6;	Same comment as item j above
jj	(6.4.1.5.3): Replace the AFD definition of Critical Habitat with the definition of ESS6	Both definitions are found in section 6.4.1.5.3 AFD and WB. Ref to ESS6 added
kk	(section 7.2.1.1.1.2): Detail the footprint of the shoreline reclaimed, habitat types and area affected	Extent of reclamation will be available at final design stage The assessment will be updated as part of the ESIA final update with assessment of the localised effects on the relevant coastal areas, zones, habitats and species
ll	(section 7.2.1.1.3): Provide detail about disposal of the dredging material, dredging equipment, operation conditions (eg noise), acceptable thresholds for suspended sediments and revise impact analysis and mitigation	No information available to date This major assessment will be undertaken as part of the ESIA final update receipt of design elements. It is necessary to make a multi-criteria study for the dredging techniques, the technology available on the island or the islands around, the zone of deposit of minimum impact according to the risks of habitats and a toxicological analysis of dredging sediments. A hydro-sedimentary model would be interesting to establish the dispersion profile of sediments in the lagoon. Measures can also be applied to reduce the impacts depending on the method (e.g. bubble curtain to limit the sediment transfer and dispersion, and noise reduction). The impact analysis and mitigation measures will be revised, especially for corals
mm	(section 7.2.1.4.5): Provide the identification and assessment of the impacts of the construction and operation of a desalination plant	A preliminary assessment is included as chapter 7.2.1.4.5 (new)
nn	(section 7.2.2.3.1.2): Revise the assessment of the impacts on coral	the assessment of the impacts on coral will be revised in as part of the ESIA final update once the detailed design is complemented, the extent of dredging and reclamation at sea is known and the sediment plume dispersion modelling reviewed
oo	(section 7.2.2.4.2.1): Provide details about the model used for the dispersion of sediment plume	Details are provided in sections 6.3.3.1 and 7.2.1.1.1.1).
pp	(section 7.3.1.2): Assess the risk of leakage to the karstic environment	The risks have already been discussed in the following sections: 7.2.1.3: Geotechnics and Hydrogeology of the karstic system 7.2.1.4: Impact Phy-Wat-W-Temp-2: impact of works on water resource due to impact on karstic groundwater 7.3.1.3: Geotechnics and Hydrogeology 7.3.1.4: Water resource and wastewater management

		Also, as discussed in Section 6.3.7.4.2 of the EISA, when the amount of data on karst soils and hydrogeological conditions is sufficient, a vulnerability analysis of the karst aquifer could be developed based on GIS tools and possibly the EPIK method
qq	(section 7.3.2.3.5): Provide details about the mitigation BioT-MIt-8 (eg relocation sites, density/numbers)	Details added in section 6.3.3.1.and already in section 7.3.2.3.2.2 Further details if required will be provided as part of the ESIA final update
rr	(section 7.3.2.4.3): Revise the assessment of the residual impacts; clarify the mitigation measure of coral relocation, not listed in the table, but referred in the text of section 7.3.2.4.1	Rephrased Marine habitat - BioM-Hab-W-Def-1 - Destruction of natural habitats, including areas characterized by presence of Acropora formosa
ss	(section 7.4.4.1): Please elaborate and contextualize the concept of improvement measures	Inadequate translation of 'mesures de bonification' 'Bonus measures' replaced by 'improvement measures' throughout the document
tt	Include a specific chapter on cumulative impact assessment, including a preliminary analysis of indirect impacts during operation (increase of the number of tourists will put additional pressure on water resources, energy demands, etc.).	Given the short timeframe to undertake the draft ESIA update, a specific chapter on cumulative impact assessment has been created yet it contains basic generic items in relation to the World Bank Group IFC Good Practice Handbook. The chapter will be substantiated as part of the ESIA final update

2.2.2 Final ESIA

a) Update the marine fauna baseline study, including marine mammals, turtles, and habitats with seasonal representativity, covering the estuarine area and Crab, Fregate and Destinee islands. This study should include a map of the coral habitat and reassess the technical feasibility of the coral relocation proposed as a mitigation measure based on evidence obtained from other projects where this measure was adopted;

In order to strengthen the elements relating to the description of marine species and habitats it is necessary to carry out two complementary actions:

1) Additional literature review

The available documents and studies concerning marine species date back to several years and are partial in their knowledge of the presence of marine species, such as marine mammals, turtles and habitats, particularly in the project's area of influence.

In order to reinforce the initial state, the local associations in charge of ecological monitoring will be contacted. Possibility to complete some information by additional bibliography or discussions with local associations, Data is certainly available from the association CARET (Comité d'Action Rodriguais d'Etude et de Protection des Tortues Marines), and by undertaking desk research with universities and the IUCN.

2) Marine Field investigation

In order to complete the knowledge, especially over a summer period, including the Crab, Frégate and Destinee Islands, as well as the estuarine zone, hge are of area the

sea outfalls and the jetties/slipway, additional underwater investigations are necessary. These investigations will allow on the one hand to specify the map of habitats (corals, sea grass, coralligenous) but also to establish a map of the sensitivity of the habitats allowing to define the various impacts of the project.

These field missions will also aim to reassess the technical feasibility of relocating coral by identifying the corals concerned and the habitats suitable for transplants, and to carry out an assessment with regard to other projects that have required such transplantation measures.

As regards the marine turtles, it is proposed to carry out the field study during the breading season (generally October to March).

As part of the scope an understanding of the seabed type of habitats and conditions and diversity of species in the areas affected by the marine works, particularly the locations of the sensitive receptors (coral reefs, potential nesting sites for the turtles etc.) and the sensitivity of the intertidal zone need to be assessed. Based on the outcomes of the supplementary studies, biodiversity management plans will need to be developed. The ESMP should include a requirement for a Dredging and Reclamation Management Plan to be developed prior to initiating any dredging or reclamation works.

b) Update the terrestrial biodiversity baseline study of the species Pteropus rodricensis to determine the probability of its occurrence in the project's area of influence, and provide additional information on potential forest areas, trees or caves that this specie could potentially utilize as roosting areas that the project activities may impact;

The terrestrial biodiversity baseline study shall be updated with seasonal representativity.

For Pteropus rodricensis, we propose 2 sessions (dry season and wet season to cover the annual cycle) of 2 days with 2 people. We will make focal points of observations at different times of the day (dawn and dusk in particular) to characterize the use of the site: number of individuals, flight paths, resting site, feeding site. Note that this species is generally not cave-dwelling and that specific prospections in lava tunnel are of no interest for this species. However, new ultrasonic recordings can again be implemented at these locations to confirm the absence of microchiroptera in Rodrigues Island.

A terrestrial biodiversity management plan will be included in the ESMP based on the outcome of the updated studies.

c) Update the baseline study of the gastropod Tropidophora articulata, including an assessment of the current population on the island of Rodrigues;

For Tropidophora articulata, we will complete the bibliographic data collected by a survey giving presence absence by cells. Specific research of this species will be organized in the area of influence on a 250m side grid to reveal a potential range and abondance on the area of influence. Coupled with knowledge related to the ecology of tropidophora, we can obtain from this field campaign an approach to suitable habitats for the species. The campaign will have to take place in the wet season for a better relevance.

A terrestrial biodiversity management plan will be included in the ESMP based on the outcome of the updated studies.

d) Obtain baseline information on the geological and geotechnical characteristics of the project's area of influence, including volcanic activity, voids, groundwater patterns, and vulnerability analysis of the aquifer and undertake a detailed assessment of the geotechnical and hydrogeological risks of building the runway upon a fractured karstic base;

Part 1 – Geological Aspects

The current ESIA report section 6.3.4.1.4: Geology of the restricted area of influence provides details about the geology of the area. That section was largely developed based on the investigations carried out in three stages from January 2017 to September 2018.

The works carried out provided enough information to understand the ground model within that area. The intrusive works show that the area consists of the following

(a) Calcarenites – composed of alternating fine to coarse sands and grained corals, separated by clayey beds (average thickness of 5 m),

(b) Basalts – composed, from top to bottom of Basalt series, of highly to slightly weathered basalts, with high plasticity silty clays with intervals of gravels and cobbles (average thickness of 9.5m),

(c) Breccias – composed of highly weathered breccia, often located beneath Calcarenite deposits up to depths of 10 m, with high plasticity silty clays and medium to fine gravels of weathered basalts (average thickness of 3 m).

Sections drawn across the site shows that the Calcarenites layer varies from the St Marie mount area increases towards the coastline.

Ground penetrating radar (GPR) surveys were carried out over the area and revealed that **541 voids** were determined this way, but more can be found deeper. Over the **541 voids determined with the following distribution:**

- none are found between 0 and 5 m below the surface.
- 11% are found between 5 and 10 m
- 38 % between 10 and 15m,
- 30% between 15 and 20
- 21% beyond 20 m.

Most of voids are thus located between 10 and 20 m below the surface. The effect of karstic dissolution in the formation of the voids identified was not investigated considering the absence of ground water monitoring.

The following works are recommended to be carried out

(a) Further assessment of underground ground features associated with Karstic Action with particular reference to the identified caves.

It is strongly recommended to carry out additional GPR surveys in area adjacent to the ground features to assess the existence of underground ground features. The GPR shall

be specified to have an accurate model. For example,with survey lines at centres not less than five metres, characteristics of the voids can be accurately mapped. The findings shall then be used to relate the likelihood of positions of these underground features (voids and tunnels) with the proposed locations of the runway and embankments.

(b) Assess impact of offshore works

Also, along the South East, with the proposed graded area embankment forming the runaway partly built beyond the existing coastline, it is recommended to carry out additional investigations offshore to not only determine the geotechnical design parameters but more importantly extend the ground models in that area. The new structure will have an implication on the coastal geomorphology and therefore must be investigated.

Surveys, assessment, and modelling of metocean, hydrological, sedimentological and coastal geomorphological conditions should be carried out together with an identification of potential adverse impacts on coastal processes such as erosion and accretion, from the placement of new earth retaining structures and land reclamation.

The design, siting considerations and coastal protection measures with particular reference to groynes and proposed seawalls shall be considered to minimize adverse impacts from these structures.

(c) Understand the impact of the land reclamation on the coast processes

As part of a coastal processes monitoring and management plan, projects should conduct a risk assessment of littoral sediment transport, shoreline morphology and erosion patterns and trends, and coastal inundation profiles.

In addition, the source of materials to carry out the land reclamation works shall be identified. Risk assessments shall be carried out to identify potential impact of such works and importing of materials from the source.

Part 2 – Hydrogeology.

As discussed in Section 6.3.7.2 of the ESIA, the implementation of a network of piezometers and monitoring of water levels with automatic loggers on the Plaine Corail Peninsula would help identify the subsurface flow pattern and understand the behaviour of the flow as a function of climatic contingencies. It would then be necessary to install new observation wells upstream of existing and future facilities. A water level monitoring campaign will be required to determine the relationship of groundwater flow in the karst and basaltic aquifer to tidal and climatic events. A water sampling campaign should also be scheduled and an analytical program instituted to determine the variation in groundwater quality over time.

Also, as discussed in Section 6.3.7.4.2 of the ESIA, when the amount of data on karst soils and hydrogeological conditions is sufficient, a vulnerability analysis of the karst aquifer could be developed based on GIS tools and possibly the EPIK method.

e) Prepare or update the biodiversity management plan with additional information obtained from the additional terrestrial and marine baseline studies to be conducted;

The biodiversity management plan shall be updated in the light of the existing and additional surveys and studies to be commissioned for the project

f) Assess the potential risks associated with the construction-induced traffic to transport workers, materials, and equipment from Port Mathurin to the project site and prepare a Traffic Management Plan (including maritime traffic) for the construction and operation phases;

Terrestrial Traffic.

Construction phase. A Traffic Impact Assessment should be carried out for the construction phase with regards to transport of material, labours etc, on the main arteries of the island and in the vicinity of the airport. In this context, the existing baseline infrastructure conditions are to be surveyed, and an analysis undertaken of the project related induced traffic on aspects such as level of service, safety, traffic control and diversions, possible infrastructure upgrade required.

Operation phase. Likewise, a Traffic Impact Assessment should be carried out for the operation phase; based on the expected flight schedules and requirements associated thereto

Marine Traffic

Should marine transport be considered, the analysis of the effects and impacts on the marine environment will be carried out, integrating for example the risks of disturbance or collision with marine fauna, such as turtles.

The analysis of the initial state of the transport network highlights an important modal share of road transport for domestic traffic to ensure the service of the most dispersed towns and hamlets. Because of its island context, airport and maritime traffic are equally important and constitute the backbone of the development of economic activities such as trade, tourism, fishing, and the supply of consumer products to the island, etc.

The ESIA identifies that during the construction phase, the road network will be affected by:

- The circulation of construction machinery around the study area;
- Convoys of construction materials arriving in Port Mathurin by boat which will have to be transferred to Plaine Corail airport.

These factors will increase and slow down road traffic.

About air transport, some of the construction materials could be transported by air, directly to Plaine Corail airport. This should not affect the passenger air traffic; however, the cargo traffic could be increased.

For Maritime routes, as for the air traffic, there should be only minor impact on the port traffic of Rodrigues. The supply of materials will lead to an increase in the volume of goods arriving at the port. However, this will only have a little impact on passenger traffic or other freight traffic. The impact severity is low. Considering the receptor sensitivity assessed as low, the impact magnitude is low.

Additions will be made during the updating of the ESIA to better identify the risks for workers and local residents as well as road and seaway users, and the sources of danger and conflicts to which they will be exposed. In this regard, ARL will have to indicate the origin of the materials and the locations of the industrial bases and any data likely to be used in this section.

The mitigation measures will include, in addition to the elements in the ESIA, recommendations and guidelines for the contractors, who will be responsible for drawing up a safety and traffic management plan induced by the movement of construction equipment and trucks.

Project activities, as well as the development and use of temporary infrastructure sites (construction sites, storage areas and camps), may impact traffic on public roads. The Traffic and Access Control Management Plan serves as a traffic management plan for the appropriate government authorities and provides guidance to contractors on the minimum requirements to maintain safe work environments and minimize traffic disruptions to the traveling public.

We understand that the plan will include, at a minimum, the requirements that all contractors will be expected to meet in developing traffic management plans for each construction segment and for the operations phase.

Details of the plan include current and forecasted traffic volumes, a description of traffic flows, identification of potential staging storage sites, camps and construction sites, and an assessment of potential impacts and associated mitigation measures for key Project activities and locations.

Contractors will develop complementary traffic detour and management plans for their work areas during final construction planning.

Mitigation measures are site-specific and may include the use of traffic control devices, signalization, and traffic control personnel, as well as measures to minimize local impacts from light, dust, and noise. Project workers will congregate at designated locations and be transported to work sites where possible.

g) Assess the potential risks associated with the project water supply needs (during construction and operation phases) and prepare a Water Management Plan;

Rainwater harvesting – a holistic and endogenous solution: The challenge is to ensure that the increased water needs associated with the project does stress further an already water stressed island. The airport already relies on rainwater harvesting even though it is connected to the public network. Hence, the project will use treated rainwater (from rooftops, run off storm water) and recycled treated wastewater, as a primary source of water instead of the public network which will only be used as backup. All of which will be properly captured, stored and treated.

In particular, the different types of water sources, within the “integrated” water management approach, will be mobilised according to the specific use to be made of. For instance, drinking water needs will be fulfilled mainly by the drinking water network, but all other uses not necessarily requiring drinking water standards, will be fulfilled with the other water sources, after an adequate level of treatment and water quality monitoring, as proposed

Integrated water management design assumptions: In addition to securing the rainwater as a reliable source, the water management approach adopted in this project is an integrated water management that will be put in place to optimize water usage (domestic, industrial and potable) during all phases.

The water management plan is part of the global integrated water management plan presented in the ESIA. As an overview, the integrated water management will consist namely of:

- The capture and storage of rainwater (from rooftops) and runoff stormwater (from “clean” surfaces) at the time of availability in order to use them whenever required after an adequate treatment and quality monitoring.

- The reuse of the domestic wastewater after an adequate treatment and quality monitoring for industrial and irrigation uses.

- An eventual backup of the drinking water network, if necessary, after an adequate treatment and quality monitoring.

- A zero liquid discharge, as far as possible during normal operating conditions by mobilising the different sources of water available.

The main objective of this integrated management plan is the optimization of the water uses that will lead to a reliable and sustainable water system.

The challenge of designing the different parts of the management plan is the input data of the various water management solutions - actual potable water daily demand, volume of wastewater produced that is expected to increase from the future airport development. For instance, the water consumption is usually at its highest during the month of November and December when Rodriguans visit family at the end of the year. However, this may change with increased tourism travel which may take place at other times of the year. Increased tourism will indeed increase the number of airport employees, passengers and overall general traffic. Hence, water demand and wastewater production are expected to increase proportionally to the total number of people expected to visit or work at the airport. The assumptions used to design the different units will be confirmed at the end of the current detailed design being carried out by the Detailed Design Consultant.

Climate change integration: Finally, it must be noted that any water supply plan that depends on rainfall availability must inevitably be assessed with regards to climate change - it’s impact on the frequency and intensity of the rain events as well on the infrastructure works built. These design considerations (decrease in rainfall quantity, unpredictability of rainfall events, potential drought) must be fully taken into account in the detailed design of the water management of the new airport.

The General Principle proposed for the Integrated Water Management envisaged was presented in Figure 22 of ESIA 2019 (now Figure 21 of the updated ESIA).

The final ESIA will furthermore assess the potential impacts associated with the wastewater treatment plant based on the final design and location. Aspects such as marine

outfall and capacity of the receiving body including impacts on the marine biota based on the location of the WWTP will be assessed.

The ESIA will further identify potential areas or sources of soil and ground water pollution within the footprint of the existing airport and assess the likelihood of any existing soil and ground water contamination.

h) Update and provide a detailed assessment of the stormwater drainage project;

The stormwater drainage will be updated and detailed as part of the ESIA final update once the final detailed design will be communicated. It will include:

- The stormwater drainage plan according to the new detailed design,
- The sizing of the stormwater network (pipes, ditch, etc.),
- The sizing of the buffer tanks,
- The sizing of the hydraulic works.

The details of the calculation will be inserted in the final ESIA with the hydrological data taken into consideration and the formulas used for the hydraulic part.

The sizing of the stormwater drainage will take into consideration the evolution of rainfall associated to climate change. Higher intensity of the synthetical events obtained by the current rain data of Rodrigues will be used depending on climate change prediction in the region.

For this part, we will need the final design plans of the study area in DWG, PDF and shapefiles format and the topography of the study area including the project (DEM).

The general concept of the land drainage is to reuse and recycle the water as much as feasible. The overflow at times of heavy rainfall will be channelled to the sea.

Mitigation measures envisaged include but are not limited to

- Ensure the sea outfall(s) is (are) located in least concerned /no concern areas of marine biodiversity,
- Ensure the engineering design of the outfall(s) does not cause further erosion of the coastline than the natural erosion due to natural runoff to the sea.

<u>Marine environment:</u>

The project may increase stormwater runoff and thus increase the discharge rate. The following points should be considered:

- Change from the current state (position and flows)
- If changes exist, then:
    - Is the discharge into the marine environment?
    - Is the discharge likely to impact on marine biodiversity?

If changes to the stormwater discharge may impact marine biodiversity, then numerical modelling of the freshwater plume and turbidity should be undertaken. This will allow the extent of the freshwater plume to be compared to the current state and thus estimate the impact of the proposed stormwater discharge.

This will require reusing the existing numerical model and incorporating salinity. The simulations will incorporate a heavy rainfall event which will generate a high runoff and therefore a high freshwater input. The parameters modelled will be the salinity of the water as well as the input of suspended sediments if necessary.

The results will lead to a comparative analysis of the areas of the different plumes modelled, which will then be cross-referenced with the identified sensitive areas. These results will be provided in the form of maps and time series at strategic points.

In case of discharge of rainwater and drainage water into the marine environment, depending on the quality of the discharge, flows, etc., the effects and impacts on the marine environment will be assessed and measures to avoid and reduce the effects of the discharge on fauna, flora and the quality of marine waters will be analysed

i) Update the noise baseline and impact assessment modelling, including maximum noise values, sampling points near the airport, identification of landing/takeoff events and aircraft types; consider noise from airport ground equipment and the ambient acoustic baseline;

The noise impact assessment will be updated where necessary.

Relevance of baseline update will be discussed in the light of possible changes in the built environment. Displacement of population do not necessarily warrant a baseline update.

On the other hand, the modelling may be reviewed in the light of design considerations (substantial changes from 2019 concept design) and the impact assessment reviewed in the light of the changes in the built environment.

The final ESIA shall further assess the impacts associated with noise based on the projected activities and propose mitigation measures based on ICAO requirements, and long-term noise monitoring plan. The ESMP will include a requirement for the preparation of a noise monitoring plan to be developed for both construction and operational phases.

j) Prepare a feasibility study for the relocation of water abstraction from Caverne Bouteille;

It will be necessary to specify the needs in drinking water connected to the current water intake of the Bouteille cave. The capacity of the treatment plant is currently about 540 m3/day. The feasibility study will have to evaluate the groundwater resources on the left bank of Anse Quitor. Given the potential impacts of the project, it is not recommended that the new intake be located on the right bank of Anse Quitor.

As part of the ESIA the potential impacts of the abstraction on the ecosystem services and biodiversity features of the Anse Quitor will be assessed as part of the finalization of the ESIA.

Water exploration work will include updating the inventory of existing springs, searching for new springs, and potentially using surface geophysical methods to try to identify preferential flow areas in the basalts and limestones.

All the relevant studies carried out since 2019 will be provided in the final ESIA. Otherwise, similar water exploration will be required for investigation of new ground water resources.

Social aspect. In the site identified for the relocation of water abstraction, the feasibility study will consider the following social variables:

- Presence of houses or other private or public buildings
- Presence of economic activities in the area: crops, grazing areas, fisheries
- Presence of cultural heritage sites
- Catchment of water for domestic, agricultural or other uses

If any of these variables are verified, a degree of social risk will be estimated and will be taken into account in the evaluation of the feasibility of the relocation. In this case, a specific assessment will be carried out.

k) Prepare detailed guidelines for elaborating the Environmental and Social Management Plans (ESMPs) for the construction and operational phases;

The ESMP will be prepared in compliance with the World Bank's Environmental and Social Standards (ESS).

The ESMP identifies environmental and social management measures to be implemented during construction and operational phases of the Project and will be integrated into all contractual and responsible party agreements with partners involved in project implementation.

Besides the legal and institutional requirements for the successful implementation of the relevant management plans, ESMP also determines the roles and responsibilities of the Client, consultants and the contractor / sub-contractors. The main objectives of ESMP are as follows:

• To provide an overview of the environment, health and safety (EHS), socio-economic and cultural heritage policies, standards and legal legislation that the Project is obliged to comply with,

• To provide guidance on how to manage EHS risks in the construction phase of the Project in compliance with ESS, EHS policies, standards and legal regulations and to ensure that Project commitments are fulfilled,

• To determine the roles and responsibilities of the Client and contractors to ensure compliance with EHS requirements during the construction phase of the project,

• To ensure that construction activities are properly checked by the Client and Consultants to ensure that the Project is in compliance with EHS policies, standards and legal regulations;

• Ensure reporting systems are developed and streamlined to deliver EHS compliance performance;

• Enabling ongoing development and EHS compliance coverage

The ESMP shall be in accordance with ESS1—annex 1. Environmental and social assessment – section E: Indicative outline of ESMP. The content of the ESMP will include the following:

a) Mitigation
b) Monitoring
c) Capacity Development and Training
d) Implementation Schedule and Cost Estimates
e) Integration of ESMP with Project

The ESMP to be prepared as part of the final ESIA will set out the need for the preparation of the required management plans, including a waste management plan, water management plan including groundwater monitoring, stormwater management plan, hazardous material management plan, quarry management and rehabilitation plan, among others, to be prepared during implementation.

l) Prepare a Cumulative Impact Assessment (CIA) considering the overall development planned for the Rodrigues Airport (considering the increased pressure on public utilities, such as water supply and sanitation, energy generation and transmission, and to other infrastructure (transportation, for example) and services (health, habitation, among others), increased damages to the natural environment, etc.);

It is proposed to use IFC's Good Practice Handbook - Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets for the preparation of a Cumulative Impact Assessment.

Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity (collectively referred to in this document as "developments") when added to other existing, planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities.

Multiple and successive environmental and social impacts from existing developments, combined with the potential incremental impacts resulting from proposed and/or anticipated future developments, may result in significant cumulative impacts that would not be expected in the case of a stand-alone development.

The expected outcomes of a good Cumulative Impact Assessment can be summarized as follows:

- Identification of all Valued Environmental and Social Components (VEC) that may be affected by the development under evaluation.
- In consultation with stakeholders, agreement on the selected VECs the assessment will focus on.
- Identification of all other existing and reasonably anticipated and/or planned and

- potentially induced developments, as well as natural environmental and external social drivers that could affect the selected VECs.
- Assessment and/or estimation of the future condition of selected VECs, as the result of the cumulative impacts that the development is expected to have, when combined with those of other reasonably predictable developments as well as those from natural environmental and external social drivers.
- Evaluation of the future condition of the VECs relative to established or estimated thresholds of VEC condition or to comparable benchmarks.
- Avoidance and minimization, in accordance with the mitigation hierarchy, of the development's impact on the VECs for the life of the development or for as long as the impacts continue to be present.
- Monitoring and management of risks to VEC viability or sustainability over the life span of either the development or its effects, whichever lasts longer.
- Provision of project-related monitoring data to governments and other stakeholders for the life of the development, and material support for the development of collaborative regional monitoring and resource management initiatives.
- Continuous engagement and participation of the affected communities in the decision-making process, VEC selection, impact identification and mitigation, and monitoring and supervision

Social aspects

The ESIA conducted in 2019 considered only the direct impacts of the Project. In parallel to the realization of the ESIA, a specific study requested by the Rodrigues Regional Assembly, on the cumulative and indirect impacts of the Project on the island. The study was entrusted to KPMG-Deloitte of Mauritius. The study was intended to investigate essentially the socio-economic aspects induced by the improvement of air transport services to Rodrigues (due to the widening of the runway).

The document will be reviewed, and information will be used as part of the CIA during the final ESIA.

The EU supported strategic development plan for Rodrigues should also be considered, if available at the time prior to finalizing the ESIA.

The update of the cumulative and indirect impact study will have to take into account all the variables that could be impacted by the increase in the volume of passengers transported to the island. In particular, it will be necessary to evaluate:

- With regard to the increase in tourist flows
  - The current capacity of tourist reception (number and typology of reception structures: accommodation, catering, transport, services to tourism: leisure, sports, cultural tours, etc.)
  - The economic contribution of tourism through the circuit of reception structures (accommodation, catering, etc.)
  - The number of employments in the sector (by sub-sector of activities)
  - Evaluation of the needs arising from the increase in demand
- About the possible demographic evolutions

    - Migration to Rodrigues of economic operators (which also includes the resettlement or return of Rodrigues inhabitants settled in Mauritius or abroad)
- Assessment of the increase in pressure on the island's resources and services:
    - Assessment of the current state of service provision and evaluation of possible scenarios of increased demand, with respect to:
        - Water supply
        - Food supply, especially for local production (fishing, breeding, market gardening)
        - Transportation
        - Solid waste management
        - Health
- Assessment of the possible increase in pressure on critical habitats
- Evaluation of the institutional framework and the capacities of the regional administration to respond to the increase in demand for goods and services resulting from the increase in flows to the island. The study of the policy orientations of the regional administration in the areas of tourism, housing, environment and basic services will be included.
  The study should also take stock of other major projects underway or in the planning phase in Rodrigues and identify the cumulative effects of the various projects. An inventory of major infrastructure and service strengthening projects is to be drawn up.

  The study will be based on available data and on the collection of primary data from economic operators and service delivery structures. The databases produced in 2019 during the first study will serve as the basis for the work.

  A management plan for the cumulative and indirect impacts of the project will be produced and will contain recommendations on the measures to be adopted to enhance the positive impacts and mitigate the negative impacts.

  Marine environment:

  All cumulative effects will be considered with regard to the project in the construction phase and in the operation phase, including the cumulative effects on the marine environment.

  A newly created public body, namely the Rodrigues Public Utilities Corporation (RPUC), is currently carrying a complete review of the water management in Rodrigues with a view to improve the water production and distribution. This includes the rehabilitation of existing desalination plants but also the optimisation of the use of inland water.

  In order to cater for increased water needs the island may require the installation of additional desalination plants which may depending on its location and treatment, brine (from desalination plants) and wastewater can impact the natural environment. In the event of a discharge into the marine environment, the impact of these discharges on marine biodiversity should be verified.

  If the modification of these discharges can have consequences for marine biodiversity, then numerical modelling of the wastewater and brine discharge should be carried out. This will allow the extent of the different plumes (wastewater and brine) to be compared to the current state and thus estimate the potential impact of the project on marine biodiversity.

This will involve re-using the existing numerical model and incorporating salinity. The simulations will incorporate the brine and/or wastewater discharge assumptions defined in the project with current oceanic weather conditions. The parameters modelled will be the salinity of the water as well as possible bacterial inputs.

The results will lead to a comparative analysis of the areas of the different plumes modelled, which will then be cross-referenced with the identified sensitive areas. These results will be provided in the form of maps and time series at strategic points.

In the case of a desalination plant, great attention will be paid to the effects of seawater pumping and brine discharge into the marine environment, by providing expertise on avoidance and mitigation measures for the project and related infrastructure.

m) Update the Stakeholder Engagement Plan

A Stakeholders Engagement Plan was produced in 2019 and is an appendix to the ESIA. The following points address the requirements for updating the document.

1. Legislative and regulatory framework

SEP refers to :

- The legislation and guidelines of the Government of Mauritius;
- International standards and guidelines

The international guidelines are to be updated, incorporating the World Bank's ESS 10 as the primary tool for stakeholder engagement planning. A Stakeholder Engagement Plan should be produced, following the requirements listed in sections 13 to 18 of ESS 10, and according to the instructions provided in the ESS 10 guidance notes.

A gap analysis between the national legislation and the EHS 10 will be used to check for consistency and inconsistencies between the two regulatory frameworks.

2. Approach

The SEP approach follows the principles outlined in ESS 10.

However, the following elements need to be updated:

- A description of the project's anticipated environmental and social effects must be included in the
- Concerned area. As the project design and technical options evolve, and as the final footprint and impact area is identified, the size of the stakeholder identification area should be updated
- Engagement activities already carried out. The record of activities should be updated, taking into account the evolution of the Project and the stakeholder engagement activities that have taken place between 2019 and 2022. In particular, take into account the engagement processes that have taken place during the design and implementation of the RAP.
- Methodology and limits. To be updated based on next steps

3. Identification and analysis of the stakeholders

The list of stakeholders should be updated as the project evolves

Above all, the stakeholder analysis must include the identification and consideration of disadvantaged or vulnerable people or groups.

4. Stakeholder consultation: a summary of perceptions of the project

The chapter provides an interesting synthesis and analysis of the positions and views of various stakeholders on key issues.

In order to update the document, new public consultations will be undertaken to update the data and document the evolving views on the Project. It is especially important to update views on involuntary resettlement issues, as the process has clearly evolved since 2019. Issues of communication, project information, and livelihoods will be revisited in public consultations in each affected locality.

5. Stakeholder engagement strategy

The chapter is to be updated, incorporating all of the guidelines in ESS 10. For each stage of the project and for each major issue (e.g., ESIA update, resettlement, implementation of a livelihoods restoration plan, etc.), it is necessary to identify the stakeholders to be engaged, how stakeholders will be notified, methods of engagement, a list of information/documents to be made available, the languages in which this information will be disseminated, the length of the consultation period, and opportunities for comment, as outlined in the ESS 10 Guidance Note.

In the SEP update phase, the framework for NGOs involvement will be reviewed to ensure that the scope and nature of their involvement in stakeholder engagement is well calibrated. NGOs can facilitate all information, consultation and engagement activities. Support in relation to the grievance mechanism can also be provided by specialized stakeholders who should be identified.

6. Complaint and grievance management mechanism

A grievance management mechanism is proposed in the 2019 SEP. In the updating of the document, it is necessary to verify what have been, between 2019 and 2022, the channels and methods of complaint management, and to integrate the current practices into the design of the mechanism.

7. Monitoring and reports of stakeholder's engagement activities

The chapter needs to be updated. It is requested that the following two points be specified:

- Clear indications of the division of responsibilities for implementing mobilization activities. Note that the contact information for the plan leaders should be included in the document.
- Indication of the resources required

Resources required to update the SEP

The resources required to update the Stakeholder Engagement Plan are as follows

- Mobilization of a sociologist expert for 10 to 12 days
- Individual interviews with institutional and political leaders
- Individual interviews with the managers of each component of the Project
- Collective interviews (focus groups) with the impacted communities (according to the definition of the project's area of influence)
- Interviews with other involved informants: local media, civil society organizations

n) Review of the policy framework of the study, Institutional framework and legislative and regulatory framework

In addition to the above, we propose to review the general documentation of the Project made available to the public and provided by the Client, in order to have a preliminary overview of the intervention context, to identify the main issues and problems and to proceed to a first identification of the institutional actors

The following points are proposed:

- Policy framework of the study
  The policy framework underpinning the studies will be analysed and determined, including national policy on environmental and social protection and management.
- Institutional framework
  With regard to the institutional framework, the Consultant will describe the said framework through an inventory of the various ministerial departments, the private sector, the local administrations of the site that will host the project. Their specific activities must also be described in a succinct manner, with emphasis on their relevance to the implementation of the present project.
- Legislative and regulatory framework of the study
  The Consultant will determine the legal framework of the study on the basis of existing documentation, laws and various regulatory texts governing environmental and social protection and safeguarding in force in Mauritius, in particular the environmental code, decrees and application orders.
  In addition to these regulatory texts, there are international and sub-regional conventions signed or ratified by Mauritius and dealing with the environmental and social aspects of this type of project.

- Donor policies and guidelines, including but not limited to
  - World Bank's Environmental and Social Standards (ESS)
  - World Bank EHS Guidelines, general and sectoral

- Comparison of the different standards and their application in the project
  The consultant's comprehensive presentation of all international and national standards will enable him to highlight divergences and convergences. In effect, he will compare the applicable regulations and make recommendations on the policy applicable to the project. This analysis will establish the standards to which the project will have to conform in the construction phase, but also those which the study will have to respect

3 Introduction

3.1 The ESIA 2019

The Project refers to the New runway at Plaine Corail Airport in Rodrigues island, a dependency of the Republic of Mauritius.

With a runway length of 1200 m, the largest aircraft that it can accommodate currently is the ATR 72, which carries passengers only. The number of flights at PCA amounts to three per day during the low season and can rise to a maximum of twelve flights during the peak season which coincides with the Christmas and New Year holidays.

The airport is managed by Airport of Rodrigues Ltd. (ARL), a subsidiary of the Airports of Mauritius Co. Ltd. (AML).

Due to its remote location, 620 kilometres from Mauritius, air transport is vital to the island in every respect and particularly important from a social and economic perspective. Rodrigues Island, through the Rodrigues Regional Assembly, wishes to increase the capacity of its airport in order to accommodate the A321 Neo / B737 aircraft type, which carries up to a maximum of 244 passengers and is capable of transporting cargo.

The objectives of the construction of the new longer runway as well as the associated facilities and amenities, are to:

provide Rodrigues with an efficient, reliable, safe and affordable air transport facility to improve the national, regional and international connectivity and accessibility of the island and;
contribute to its social and economic development in key economic sectors such as tourism, agriculture and fishery.

The initial Environmental and Social Impact Assessment report 2019 had two objectives:

- Compliance to the procedure for obtaining the EIA Licence from the Government of Mauritius
- Evaluation of the environmental and social impacts of the project in line with the requirements of the two Funding Agencies: Agence Française de Développement (AFD) and the European Union (EU).

3.2 The ESIA Update 2022/2023

3.2.1 The World Bank Context

ARL is now proposing to seek financing support from the World Bank for the Expansion of the Rodrigues Airport; and is therefore required to update the ESIA to meet the requirements of the World Bank Environmental and Social Framework1 (ESF).

The World Bank Environmental and Social Framework sets out the World Bank's commitment to sustainable development, through a Bank Policy and a set of Environmental and Social Standards that are designed to support Borrowers' projects[2].

[2] The World Bank Environmental and Social Framework, The World Bank – IBRD – IDA – World Bank Group, 2017

The Borrower and the project will need to comply with the ten **Environmental and Social Standards** through the project life cycle, namely:

- Environmental and Social Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Environmental and Social Standard 2: Labor and Working Conditions;
- Environmental and Social Standard 3: Resource Efficiency and Pollution Prevention and Management;
- Environmental and Social Standard 4: Community Health and Safety;
- Environmental and Social Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement;
- Environmental and Social Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- Environmental and Social Standard 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities;
- Environmental and Social Standard 8: Cultural Heritage;
- Environmental and Social Standard 9: Financial Intermediaries; and
- Environmental and Social Standard 10: Stakeholder Engagement and Information Disclosure.

The Bank will classify all projects (including projects involving Financial Intermediaries (FIs)) into one of four classifications: High Risk, Substantial Risk, Moderate Risk or Low Risk.

The proposed project is currently classified as *a High-risk project* under the World Bank Environmental and Social Policy. In determining the appropriate risk classification, the Bank takes into account relevant issues, such as the type, location, sensitivity, and scale of the project; the nature and magnitude of the potential environmental and social risks and impacts; and the capacity and commitment of the Borrower (including any other entity responsible for the implementation of the project) to manage the environmental and social risks and impacts in a manner consistent with the ESSs.

As per the Works Bank's Terms of Reference, 'This assignment aims to update the existing ESIA to address the gaps identified to meet the requirements of the World Bank ESF in addition to the legislative requirements of the Republic of Mauritius. The Consultant will further update and finalise the ESIA, taking into consideration the design changes and final design considerations. The updated ESIA must aim to identify and assess all positive and negative environmental and social risks and impacts potentially generated by all phases of the Rodrigues Airport expansion project (collectively referred to as the "Project" in this Terms of Reference – ToR) and propose technically feasible mitigation measures to manage the identified environmental and social risks and impacts'.

A final version of the ESIA will be prepared and disclosed before project appraisal (preliminarily planned for April 23) based on the additional studies identified in the draft ESIA (this document) and the finalization of the airport design.

3.2.2 The Project Status

As at date, the Detailed Design of the Project is still ongoing by GIBB (Mauritius) Ltd, with the geotechnical investigations currently underway at Plaine Corail Airport.

The Final alignment of the runway shall be finalised once the geotechnical investigation has been completed and the outcome thereof incorporated into the detailed design.

Hence, as at date, there is no new information concerning the new design, to the exception of the location of the Air Traffic Control and the Rescue and Fire Fighting Services that have been moved outside the Nature Reserve.

The ESIA will be updated and finalised, taking into consideration the design changes and final design considerations, which hare expected by April 2022.

3.3 Environmental and Social Standards applicable to the project

The following Environmental and Social Standards of the World Bank Environmental and Social Framework are regarded as relevant to the project at this stage namely:

- ESS 1: Assessment and Management of Environmental and Social Risks and Impacts.
- ESS 2: Labor and working conditions
- ESS 3: Resource Efficiency and Pollution Prevention and Management.
- ESS 4: Community Health and Safety.
- ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement.
- ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.
- ESS 8: Cultural Heritage.
- ESS: 10: Stakeholder Engagement and Information Disclosure.

It should be noted that the following two standards are not considered relevant namely:

- ESS 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities. The standard is not considered to be relevant because in Rodrigues no historical or social situation corresponds to the cases considered by the standard
- ESS 9: Financial Intermediaries. This standard is not considered to be relevant as no FIs are engaged

4 Legal and institutional framework

4.1 National legal requirements

4.1.1 The Environment Protection Act 2002

The Environment Protection Act 2002 (EPA2002), as amended, provides for the protection and management of the environmental assets of Mauritius so that their capacity to sustain the society and its development remains unimpaired and to foster harmony between quality of life, environmental protection and sustainable development for the present and future generations. More specifically, it is designed to provide for the legal framework and the mechanism to protect the natural environment, to plan for environmental management, to co-ordinate the inter-relations of environmental issues, and to ensure the proper implementation of governmental policies and enforcement provisions necessary for the protection of human health and the environment of Mauritius.

Part IV of the EPA2002 sets out the legal framework for the Environmental Impact Assessment, a tool for sound decision-making and a formal process for ensuring that potential environmental impacts are considered in approval of major projects.

The Environment Protection (amendment of Schedule) Regulations 2006, includes “Undertakings Requiring a Preliminary Environmental Report” (Part A) and “Undertakings Requiring an Environmental Impact Assessment” (Part B).

The construction of a new runway is listed among the undertakings requiring an Environment Impact Assessment (item 6).

The Environment Protection (Amendment of Schedule) Regulations 2022 (Government Notice No. 252 of 2022) amends the Fifth Schedule as follows:

3. The Fifth Schedule to the Act is amended, in Part B, by deleting items 6, 7 and 21 and replacing them by the following items –

6. Construction of airports and runways, except for the construction of runways in the Island of Agaléga and the Island of Rodrigues

7. Construction of breakwaters, groins, jetties, revetments and seawalls, except for the construction of –

(a) jetties in the Island of Agaléga; and

(b) the jetty associated with the new runway at Plaine Corail Airport in the Island of Rodrigues

21. Incineration of municipal solid waste, quarantine waste, medical and clinical wastes, except for the construction of incinerators, for quarantine and medical waste, at the Plaine Corail Airport in the Island of Rodrigues

4. These regulations shall come into operation on 17 September 2022.

4.1.1.1 Main regulations under the Environment Protection Act 2002

Regulations, promulgated under the EPA2002 (as amended), deemed applicable to the proposed project include, but are not limited to, the following:

4.1.1.1.1 Air pollution

Standards are set under the Environment Protection (Standards for Air) Regulations 1998 (Government Notice No. 105 of 1998).

4.1.1.1.2 Noise pollution

Standards are set under the Environment Protection (Environmental Standards for Noise) Regulations 1997 (Government Notice No. 17 of 1997). Control of Noise is regulated by the Environment Protection (Control of Noise) Regulations 2008 (Government Notice No. 114 of 2008).

4.1.1.1.3 Water pollution (effluent discharge)

Standards for discharge on land/underground and to surface water courses are set under the Environment Protection (Standards for effluent discharge) Regulations 2003.

The water treatment plant proposed for the project complies with the Environmental Guideline No. 16 for Wastewater Treatment Plant published by the Ministry of Environment.

4.1.1.2 The requirements for Environmental Impact Assessment (EIA)

The requirements for environmental impact assessments are outlined in Section IV of the Environment Protection Act 2002, as amended. It sets the conditions for the realization of a Preliminary Environmental Report and for an Environmental Impact Assessment.

Section 18 of the EPA, in particular, sets out the contents of an EIA. Here are the main points that must appear in the report:

- the precise location and surroundings of the undertaking, the zoning of the site and the number of similar undertakings in the area;
- the principle, concept and purpose of the undertaking;
- the direct or indirect effects that the undertaking is likely to have on the environment;
- such data as may be necessary to identify and assess the effects that climate change may have on the undertaking; [Inserted 11/2020 (cio 22/4/021).]
- the measures which the proponent proposes in order to mitigate the adverse effects that climate change may have on the project; [Inserted 11/2020 (cio 22/4/021).]
- any action or measure that the proponent proposes to promote the use of alternatives, best available techniques and environmental practices to minimise the use, release and emission of hazardous substances, including mercury; [Inserted 11/2020 (cio 22/4/021).]
- an assessment of the social, economic and cultural effects which the undertaking is likely to have on the people and society;
- any action or measure which the proponent proposes to take to avoid, prevent, change, mitigate or remedy, as far as possible, the likely effects of the undertaking on the environment;
- an assessment of the inevitable adverse environmental effects that the undertaking is likely to have on the environment, people and society, where it is implemented in the manner proposed by the proponent;
- an accurate assessment of the irreversible and irretrievable commitment of resources which will be involved in the undertaking, where it is implemented in the manner proposed by the proponent;
- any alternative manner or process in which the undertaking may be carried out so as to cause less harm to the environment;
- an environmental monitoring plan;

- information pertaining to the decommissioning of the project at the end of its life cycle and associated impacts, proposed measures to return the site as far as possible to its former state, or rehabilitation measures;
- in the case of a new infrastructure proposal, an environmental management plan to be implemented during the construction phase; [Amended 11/2020 (cio 22/4/2021).]
- information on eco-friendly practices to promote sustainable development such as waste minimization, reuse, recycling, composting, energy efficiency, renewable energy supply, green building practices, water conservation and management, rainwater harvesting and recycling of waste water; and [Inserted 11/2020 (cio 22/4/2021).]
- such other information as may be necessary for a proper assessment and review of the potential impact of the undertaking on the environment, people and society.

The proponent may, where applicable, be required to include, in the EIA report:

- an ecological assessment of the site;
- a vulnerability assessment and proposed adaptation measures with respect to climate change;
- an estimation of greenhouse gas emission attributed to the undertaking, and associated activities within the physical boundary of the undertaking, over its life cycle. [Added 11/2020 (cio 22/4/021).] [S. 18 amended by s. 30 of Act 11 of 2020 w.e.f. 22 April 2021].

From the previous points it appears that the national legal requirements in relation to the realization of the EIA have evolved, integrating new requirements in 2021.

It is therefore necessary to integrate an analysis of the compliance or possible gaps between the national requirements (also taking into account the updates of 2021) and the international standards.

4.1.1.3 Requirements on public consultations and disclosure

Paragraph 92 of the Environment Protection Act establishes the specific regulations for Rodrigues: the Regional Assembly may, after consultation with the Rodrigues Environment Committee, make regulations applicable to the island of Rodrigues. These include projects requiring preliminary environmental reports and environmental impact assessment licences.

With respect to the consultations, the Environment Protection Act, in paragraph 19, establishes that the environmental impact assessment should defer the details of any public consultation held in the project area. The act therefore contains a very clear indication that any environmental impact assessment process should include a stakeholder consultation approach.

The guidelines for the environmental impact assessment, published in 2004 by the Environment Department of the Ministry of the environment of Mauritius, provide specific guidance on the requirement and nature of the reporting of consultations to be carried out within the framework of the EIA. It indicated that the engagement documentation should include :

- Statutory bodies, environmental and accreditation groups and local residents likely to be affected by the proposals;
- The means to contact and advertise the project (leaflets, public postings, questionnaires, letters, etc.);
- A brief summary of their responses detailing the emphasized issues of concern and their contribution to the EIA.

For any development project namely the construction of hotels, golf courses, piers, etc. in the coastal area, the developer must consult the fishermen in the area to explain their project. The consultation is under the aegis of the ministry of fishing

4.1.2 Legislation on land acquisition, compensation, resettlement

According to Section 54 of the Rodrigues Regional Assembly Act 2001, any land or other property which was formerly under the jurisdiction of the Government of Mauritius (post Autonomy of Rodrigues) is, under the State Lands Act, transferred to the RRA.

90% of the land in Rodrigues is State land against 10% which is private land. As it is the domain under the management of the State, leases are issued for residential, commercial/industrial or agricultural use. The duration of a residential lease only is 60 years and in return the person pays an annuity to the ARR varying from Rs 100 to Rs 1000 on average per year (depending on the salary of the beneficiary). The land remains the property of the RRA but any property on the land belongs to the beneficiary of the lease. Once the 60-year term of the lease has passed, the lease is usually renewed if the person is still alive. Otherwise, the lease is transferred to the name of an heir or spouse.

For agricultural uses (livestock and plantations), the RRA issues the beneficiary an agricultural permit for a period of 5 years, renewable, thus giving the holder the right to exploit the land during this period.

According to the Land Acquisition Act - Act 54 of 1973, provision is made for the possibility of Compulsory Acquisition" by the State of any land under its governance. its governance. Although this type of acquisition also gives rise to the payment of compensation from those affected by the project, the person whose lease is to be requisitioned is to be requisitioned by the State, is not entitled to have a choice or even to refuse the refuse the State's offer even if the offer does not suit him.

It should be noted that the option of "Compulsory Acquisition" and expropriation of land was not the one chosen by the RRA in the case of the present Project. A gap analysis with regard to World Bank standards, and in particular against ESS 5, is required. Compliance with the ESS 5 indications is to be adopted.

4.1.2.1 The different policies involved in this project of population displacement Project

4.1.2.1.1 Social housing construction policy

The RRA has a social housing policy aimed at low-income families that allows them to have access to a suitable house in return for a minimal contribution to the total cost of the construction of the house. In fact, this house construction project is carried out in collaboration with local banks where the RRA contributes the majority of the cost of the house, i.e. 80%. The construction work is undertaken by a contractor from a list of contractors registered with the Construction Industry Development Board (CIDB).

4.1.2.1.2 Marine Park Protection Policy

The provisions of the South East Marine Protected Area (SEMPA) Regulations 2011 have to be taken into account in the selection of sites identified by those with fishing activities - given that several categories of areas exist in SEMPA, including in-take and in-take" and "no-take"

areas and the same law also stipulates the activities that are also stipulates the activities that are permitted in these zones

4.1.3 Other main applicable legislation

4.1.3.1 The Climate Change Act 2020

An Act to establish a legal framework towards making Mauritius a climate-change resilient, and low emission, country.

Part V – Climate Change Measures include in Sub-Part A the formulation of

- the National Climate Change Adaptation Strategy and Action Plan,
- the National Climate Change Mitigation Strategy and Action Plan and
- the National Inventory Report.

4.1.3.2 The Fisheries and Marine Resources Act 2007

This Act amends and consolidates the law relating to the management, conservation, protection of fisheries and marine resources, and protection of marine ecosystems.

The Protection of the aquatic ecosystem is regulated by Section 69 of the Fisheries and Marine Resources Act 200, as follows:

No person shall place, throw, discharge or cause to be placed, thrown or discharged into the maritime zones or into a river, lake, pond, canal, stream, tributary or wetland any poisonous substance,
No person shall – except with the written approval of the Permanent Secretary - cut, take, remove or damage a mangrove plant,
No person shall place, construct or cause to be placed or constructed any structure within the territorial sea or internal waters, as defined in the Maritime Zones Act 2005, except with the written authorization of the Permanent Secretary,
The Permanent Secretary may, on granting an approval under the paragraph above, impose such terms and conditions as he may deem fit.

4.1.3.3 The Forest and Reserves Act 1983

An Act to amend and consolidate the law relating to forests, reserves and related matters.

As per the Second Schedule (section 2), Anse Quitor is a declared Nature Reserve.

As per the Fourth Schedule (section 2), Riviere Anse Quitor is a declared river. Where there is no escarpment, the river reserve means the land extending from the edge of the river to a distance of 16 metres measures on the horizontal plane; where there is an escarpment the river reserve means the land extending from the edge of the river to the top of the escarpment.

4.1.3.4 The Wildlife and National Parks Act 1993

An Act to amend and consolidate the law relating to the conservation and management of wildlife and to provide for the preservation of National Parks.

Part IV of the Act refers to ‘National Parks and Other Reserves’ and applies to Anse Quuitor Nature Reserve

Part V of the Act refers to ‘Protection of Fauna and Flora’ and applies to protected wildlife.

4.1.3.5 The Rivers and Canals Act 1863

As per the Act, “rivers and streams” includes all natural rivers of water and watercourses, but does not include any artificial watercourse; all rivers and streams are public property (du domaine public).

4.1.3.6 The National Heritage Fund Act 2003

An Act to provide for the establishment and management of the National Heritage Fund and for matters relating to national heritage.

Section 12 of the Act reads

Designation of national heritage

The Minister may, on recommendation of the Board, designate by regulations -

(a) any monument;

(b) any object or site of cultural significance;

(c) any intangible heritage;

(d) any natural feature consisting of physical and biological formation or group of such formations which are of outstanding value; and

(e) any geological and physiographical formation or precisely delineated area which constitute the habitat of animals and plants of outstanding value, in Mauritius to be a national heritage.

Schedule 2 of the Act lists the six declared National Heritage of Rodrigues; none of which being located in the project area of influence.

4.1.3.7 The Beach Authority Act

The Authority shall, in respect of the management of public beaches, have such functions as are necessary to further most effectively its object, and in particular, shall regulate activities on public beaches and ensure the security and safety of users of public beaches (section 5.(b)).

4.1.3.8 The Occupational Safety and Health Act, 2005

OSHA is the main legal instrument governing occupational health and safety issues. Among the obligations established by the act, we mention:

- General duties of employers
- Special duties of employers
- Special duty of employers using machinery
- Prohibitions regarding young persons
- Duties of employer regarding Safety and Health Officers
- Risk assessment by employer
- Record of risk assessments
- Duties of Safety and Health officers
- Establishment of Safety and Health Committees
- Functions of the Safety and Health Committee
- Meetings of Safety and Health Committees

An analysis must be made to verify the possible gaps in relation to the World Bank's ESS 2

4.1.3.9 The National Development Strategy 2003 and Planning Policy Guidance 2004

The National Development Strategy was developed in 2003 in replacement of the 1993/1994 National Physical Development Plan.

The National Development Strategy, Ministry of Housing and Land, seeks to improve the environment by adapting the following measures:

To safeguard valued elements of the natural and built environments
To use natural resources in a sensitive and sustainable manner
To promote land and property development and management practices which will benefit the environment and all Mauritians, and
To ensure that development makes a positive contribution to the environment

4.1.3.10 The Rodrigues Outline Planning Scheme

The Outline Planning Scheme of Rodrigues 2001 was prepared under the requirement of the Town and Country Planning Act 1954. The Outline Scheme covers the main island of Rodrigues as well as the islets surrounding it.

4.1.4 Legal requirements about gender and gender-based violence[3]

4.1.4.1 National Policies

The National Gender Policy Framework, adopted in 2008, was designed as a fundamental framework that sets out guiding principles, broad operational strategies and institutional arrangements for gender equality at the national level. The NGPF calls for a strategic partnership between the government, the media, private institutions and civil society organizations to achieve gender equality and equity in a comprehensive manner.

According to the national policy, ministries are responsible for developing gender-sensitive policies, programs and budgets within their scope. They are also responsible for producing sex-disaggregated administrative data for the planning, implementation and monitoring of their interventions from a gender perspective. Also, gender focal points (GFPs) are identified at the administrative and technical levels within each within each organization.

4.1.4.2 Institutional framework

The Minister of Gender Equality, Child Development and Family Welfare is responsible for the design and implementation of social policies and programs that promote women's empowerment, child development, family well-being, and community well-being. Among the objectives of the Ministry:

- Promote and defend women's rights as human rights, work for the elimination of all forms of discrimination against women and ensure that legal measures are taken to promote equality between men and women.

- Implement gender-sensitive macroeconomic policies and strategies, including those related to poverty reduction.

Within the framework of the Project, it remains to be verified which are the legal measures and the specific policies taken by each Ministry as regards :

- gender equity in access to employment

[3] Source: Profil Genre Maurice, 2016, AFD (Profil-Genre-Maurice.pdf (plateforme-elsa.org)

- specific vulnerability issues in environmental and social impact assessments
- specific measures regarding women and vulnerable people in resettlement processes

4.2 Rodrigues Sustainable Integrated Development Plan

The Sustainable Integrated Development Plan for Rodrigues (SIDPR) was prepared by KPMG in 2009.

The Terms of Reference where prepared by the United Nations Development Programme, a key extract of which is provided hereafter: 'The SIDPR is a project which uses the Millennium Development Goals (MDGs) as the basis for the formulation of the island's long term sustainable development plan … The SIDPR will be a showcase for the relevance of MDGs at sub-national level."

This SIDPR is presented in terms of the three constituent parts of sustainable development, namely environmental, economic, and social sustainability. How to move towards achieving sustainability is presented in five distinct parts:

- Part I: Awakening and Envisioning;
- Part II: Getting the basics right (Kick-starting the process of Sustainable Development);
- Part III: Ensuring environmental sustainability;
- Part IV: Promoting economic sustainability; and
- Part V: Strengthening the 'soft infrastructure' for a thriving Rodriguan community.

A Short-Term Action Plan that accompanies this long-term strategy document contains a route map for the next 1-5 years as well as a set of objectives and key performance indicators that need to be attained. As far as possible, the use of logical framework matrices is preferred but flexibility is maintained in the design of the Action Plans.

The update of the 'Sustainable Integrated Development Plan for Rodrigues' is a request from the European Union (EU) in the context of the airport development project.

4.3 Water Development Strategies

A consultancy for the Development of Rodrigues Water Resources Strategy and the Definition of Priority Action Plan was commissioned and the revised version was issued in May 2022.

The main objective expressed by the Rodrigues Regional Assembly is to 'Secure a regular access for all at least one day out of the week', and also to 'Ensure and secure the quality of the water distributed to the consumers'.

4.4 International standards

4.4.1 International Guidelines for Environment and Social Standards

Also carried out in order to obtain approval of the project by international lenders, this impact assessment is carried out in accordance with the international requirements and guidelines:

- World Bank's "Environmental and Social Framework"
- World Bank Group's Environmental, Health and Safety (EHS) guidelines
- World Bank Group's General EHS Guidelines (v) Industry sector Guidelines
- World Bank Group's EHS Guidelines for Airports

- World Bank Groups' EHS guidelines for Construction Material Extraction
- World Bank Group EHS guidelines for Waste Management Facilities
- Relevant ICAO standards and guidelines

It should be noted that a full gap analysis between Mauritian legislation, Rodrigues' specific regulations and World Bank standards will be undertaken as part of the final ESIA. The most stringent requirements will be applicable to the project. Where gaps between the legislation and World Bank Standards exists, the ESIA will indicate actions taken to ensure that the gaps have been adequately addressed.

4.4.2 International Conventions and Treaties

Mauritius is signatory of a number of multilateral conventions/treaties signed/ratified/acceded to after independence.

Most relevant conventions/treaties to the project are provided in the Table below.

Table 21: Most Relevant conventions/treaties

Environmental Aspects	
Convention on International Trade in endangered species of Wild Flora and Fauna (CITES)	Ratified on 28.04.75
United Nations Framework Convention on Climate Change	Ratified on 17.8.92
Convention on Biological Diversity	Ratified on 17.8.92
Vienna Convention for the Protection of the Ozone Layer	Acceded on 18.08.92
Montreal Protocol on Substances that Deplete the Ozone Layer	Acceded on 18.08.92
London Amendment to the Montreal Protocol (1990)	Acceded on 20.10.92
Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary movement of Hazardous Wastes within Africa	Ratified on 29.10.92
Basel Convention on the Control of Transboundary movement of Hazardous Wastes	Ratified on 24.11.92
Copenhagen Amendment to the Montreal Protocol (1992)	Ratified on 30.93
International Convention to Combat Drought and Desertification	Acceded on 11.01.96
Convention for the Protection, Management and Development of the Marine and Coastal Environment in the Eastern African Region and Related Protocols (Nairobi Convention)	Acceded on 10.07.2000
1992 Civil Liability Convention CLC and Fund Convention	Acceded on 06.12.2000
Paris Agreement on Climate Change	Ratified on 22.04.16
The Stockholm Convention on Persistent Organic Pollutants	Ratified on 05.07.04
Ramsar Convention on Wetlands of International Importance (Ramsar)	Ratified on 25.05.01
Cartagena Protocol on Biosafety	Ratified on 09.05.01

Montreal (1997) and Beijing (1999) Amendments to the Montreal Protocol	Accepted on 03.03.03
Marine Pollution	
International Convention for the Prevention of Pollution from Ships (MARPOL), 1973 as amended by the Protocol, 1978	Acceded on 06.04.1995
International Convention on Oil Pollution Preparedness, Responses ans Cooperation (OPRC) 1990	Acceded on 03.02.2000
The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (London Convention)	1972
Labour Aspects	
Occupational Safety and Health Convention, 1981 (ILO No. 155)	Ratified on 25.07.2014
Promotional Framework for Occupational Safety and Health Convention, 2006 (ILO No. 187)	Ratified on 19.11.2012
C100 - Equal Remuneration Convention, 1951 (ILO No. 100)	Ratified on 18.12.2002
Discrimination (Employment and Occupation) Convention, 1958 (ILO No. 111)	Ratified on 18.12.2002
Violence and Harassment Convention, 2019 (ILO No. 190)	Ratified on 01.07.2021

5 Project description and justification

5.1 Introduction to the project and background information

5.1.1 Project objective

Rodrigues Island is a territory of the Republic of Mauritius, autonomous since October 2012, located about 650 km east of the other two Mascarene Islands: Mauritius and Reunion. The island, small in size (110 km²), however, is tasked with the development of its economy while preserving cultural values strongly linked to the sectors of agriculture, fishing and tourism. The latter sector has the support of local authorities as part of a sustainable development policy that seeks to grow the reputation of the island both in terms of environmental protection and as an exemplary destination for ecotourism.

Rodrigues, due in particular to its small size, relies upon an economy which remains fragile. The island remains dependent on regular imports by sea, with only a very small proportion of imports arriving by air. As such, the Rodrigues Plaine Corail Airport is currently equipped with a fairly small landing strip of 1,200 m long, which can accommodate aircraft of type ATR 72. Operational and technical issues related to the length of the runway mean that the airport cannot operate at full capacity. This situation inexorably leads to some pressure on the carriers during peak periods, a higher cost rate application for airline tickets, and an inability to develop a viable air cargo sector.

In response to this situation, the government has expressed the wish for the construction of a new runway which will boost the economic and social development of the island. The new runway will be approximately 2,100 m in length x 45 m wide. This new infrastructure would support larger aircraft like the A321 Neo/B737, which carries up to a maximum of 244 passengers and is capable of transporting cargo. With this new configuration, the potential of operating new regional routes will be feasible, which may further enhance the economic growth of the island.

The airport is managed by Airport of Rodrigues Ltd. (ARL), a fully-owned subsidiary of Airports of Mauritius Ltd. (AML). It should be noted that the project to equip Rodrigues with a new and longer airstrip stems from a political will shared by the Rodrigues Regional Assembly (RRA) and the Government of Mauritius to consolidate the economy of Rodrigues in order to facilitate the island's socio-economic development. The goal is to foster economic development while taking steps to ensure that Rodrigues is an exemplary island in terms of sustainability and sustained management of its scarce resources.

This environmental and social impact study concerns the project to build a new runway to accommodate larger aircraft, as well as the construction of associated equipment.

5.1.2 Brief history of the project

The following section provides a brief history of the New Runway project for Rodrigues. Chapter 7 details the steps involved in selecting a preferred alternative for the project after giving due consideration to several development options.

April 2016, GIBB (Mauritius) Ltd. (GIBB) was commissioned by the Rodrigues Regional Assembly to develop the design for the extension of the runway into the sea to the west of the

existing airport, based on the 2011 feasibility study (Ecorys Report). The commission also included assessment of all the other airport facilities together with a masterplan for the future development of the airport for a planning horizon that extends to 2040.

As a result of the discovery of deeper bedrock than expected, the expected impacts in regard to fill material needed to compensate the deepness, and expected technical challenges and high costs associated with the runway extension into the sea, the RRA decided to amend the Consultant's Terms of Reference to prepare the Preliminary Design for a new Land-Based Runway. The Preliminary Design consists of the design of a new 2,100m long eastward runway with connecting taxiways and apron expansion suitable for Airbus A321 series.

In December 2017, GIBB submitted the "New Runway Options Report", which presents the different new runway alignment options and the required associated facilities, including budget estimates, to RRA. The Consultant recommended Option C, with a budget estimate of MUR 3.6 B, as being the most appropriate siting for the new runway according to the environmental, risk and cost analyses.

Figure 11: Alignment of Option C (Dec 2017)

In November 2018, GIBB submitted the Preliminary Design **based on option C but with a new runway alignment based on maximising its siting on the existing land with minimal maritime works, as well as avoiding the existing caves Petit Lac and Grotte Fougère**. This was made possible by finally a little bit more marine work than option C.

The preliminary design report as updated prepared by GIBB (Mauritius) still serves as basis for the ESIA update. The final ESIA shall be reviewed in the light of the Detailed Design scheduled for April 2023.

It is understood that the terms of reference of the design includes resilience to climate change. The consultant shall provide such demonstration at detailed design stage.

In February 2018, the Ministry of Finance and Economic Development (MOFED) submitted a request for the financing of the project to the Agence Française de Development (AFD) in the form of a loan and a grant from the European Union (EU).

Subsequently, a policy decision was made for the Airport of Rodrigues (ARL) to become a fully-owned subsidiary of Airport of Mauritius ltd (AML). Discussions were underway for AML to be the bearer of the loan / grant for the financing of the Rodrigues runway project. The change in ownership went into effect in March/April 2018. The decision was also made for AML to take over the lead for the new runway project, with any necessary support provided ARL.

5.1.3 Studies received since ESIA 2019

The following studies have been received with reference to the project at hand

- Strategy and Action Plan for the protection and preservation of native and endemic plants that will be affected by the Airport Development Project at Plaine Corail, Rodrigues, Republic of Mauritius, Mauritian Wildlife Foundation, Rodrigues, 28 October 2021
- Projet de Construction d'une Nouvelle Piste d'atterrissage a l'aéroport de Plaine Corail Rodrigues, Plan d'action de Réinstallation des Résidents et Non-Résidents du Village de Sainte Marie, Bangelique et Pointe Corail, Bureau du Chef Commissaire, Assemblee Régionale De Rodrigues, 2021
- Status on Airport Development Project, Relocation of Households (Plan d'Action de Réinstallation) - the implementation status of the Resettlement Action Plan (RAP) and Livelihood Restauration Plan (LRP), 10 December 2022
- Review of the New Runway of Plaine Corail Airport Environmental and Social Impact Assessment Report As part of Gap Analysis to Suit the new requirements – **Geological Aspects**, B. Dabee, 19 December 2022

The studies have not been incorporated in the present ESIA draft update but have served to measure the progress.

It is understood that the following study has also been completed, but not received:

- Socio-Economic impact of the runway for Rodrigues - A general study on the socio-economic aspects generated by the airport project on the whole of Rodrigues Island, KPMG-Deloitte

Information from the recently completed and ongoing studies will serve to update the plans and programmes during the finalization of the ESIA.

5.1.4 Studies under-way and way forward for the project

The following studies are still ongoing:

- Geotechnical and geophysical investigation and reporting. The study is expected to be completed by February 2023
- The consultancy for the 'Detailed Design, Tender Documents and Construction Supervision of a New Runway at Plaine Corail Airport' was entrusted to GIBB (Mauritius) Ltd. The study is expected to be completed by April 2023,

5.2 Project Time Line and Milestones

Project Time Line and Milestones have been updated worked out as follows by ARL/AML:

Appointment of Consultant for Detailed Design & Construction Supervision
Award of Contract : End June 2019
Detailed Design Report & Bid Doc : April 2023

Pre-construction and Construction:
Floating of tenders for works : July/August 2023
Award of Construction works : October 2023
Construction start : October /November 2023 (27 months duration)

Completion of works/ start operation: early 2026

5.3 Description of the projected infrastructures and airport management

5.3.1 Scope of works

The construction works include the following:

Infrastructure works:

- New Runway 2100 m* 45 m
- Taxiway and Aprons
- Isolated Apron
- Airfield Ground Lighting
- Approach Lights
- Flood Light Masts
- PAPIs
- CNS equipment and Landing Procedures
- Landside Car Park
- Stormwater Network
- Potable Water Network
- Sewerage Network
- Sewerage Treatment Plant
- Maritime Rock Revetment Works
- Desalination plant

Buildings

- Air Traffic Control Tower
- Airport Rescue and Fire Fighting Station
- Meteo building
- Quarantine building
- Incinerator and associated building
- Boat House for the National Coast Guard
- Power Centre
- Cold Storage Building

Infrastructure and buildings to be constructed under phase 1 (this project) and 2 (future development) are specified in Figure 12 hereafter.

Design parameters

1. Design to ICAO Annex 14 Regulations
2. New Runway -Code 4C, instrument
3. Runway -45m wide with 2.5m shoulders (Total 50m) -140m Runway strip
4. Existing Runway to be downgraded to Taxiway
5. Taxiways 15m wide with 5m shoulders
6. Design Aircraft A321 neo
7. Apron designed to 30 year life, Runway to 15 years
8. Taxiway provided
9. Apron to accommodate 3No. A321 Neo type aircraft
10. Portable Ground Power units to be provided
11. New ATC (with 3 Operator positions), ARFFS Building + Sea Rescue Facility
12. Fire Rescue vehicles to have maximum 3 minutes response time
13. Navaids –NDB and DVOR DME

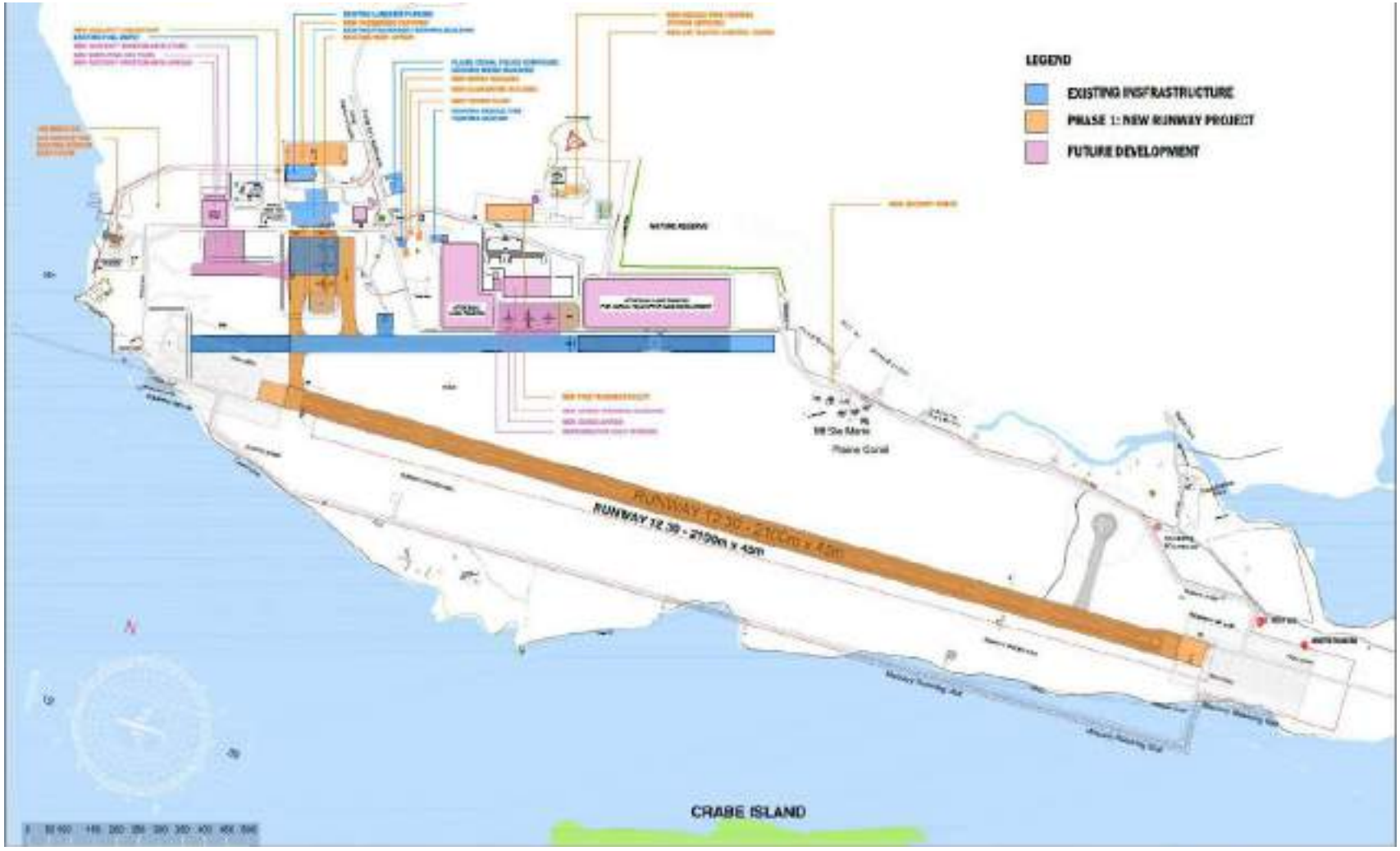


Figure 12: Updated Master Plan (ARL, Nov. 2022)

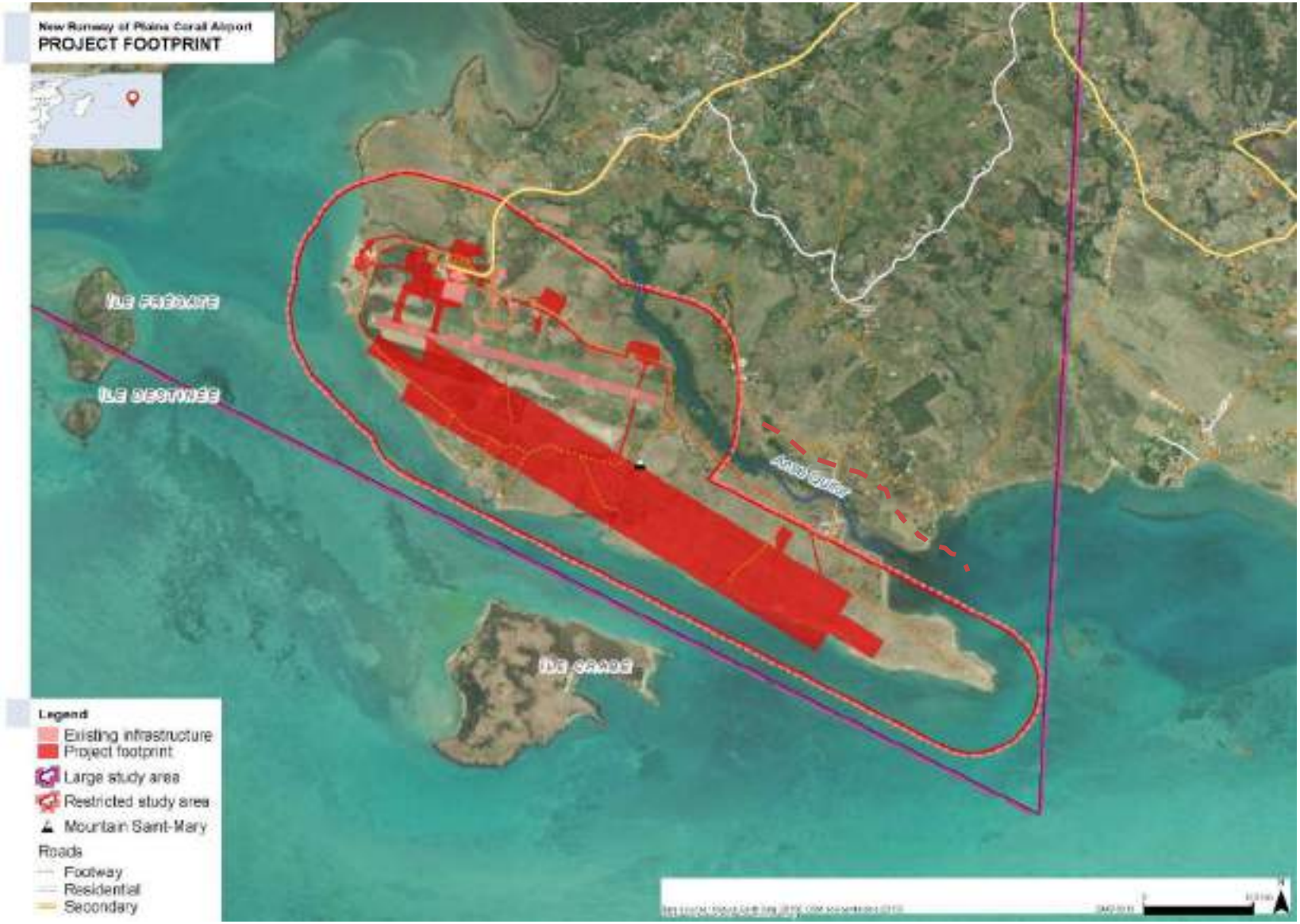


Figure 13: Existing infrastructures and projected facilities (to include the river and estuary)

5.3.2 Runway

5.3.2.1 New runway footprint and geometry

The existing runway at 30m wide x 1280m long (with a declared runway distance of 1,217m) does allow for the safe operation of the ATR72 type of aircraft. In order to replace ATR72s by the larger A319 type aircraft, which will significantly increase the number of passengers per flight, the length, the width and the strength of the pavement have to be adapted.

The Preliminary Design was mandated to design a new runway with a **length of 2,100m and a width of 45 m** as per ICAO requirements, including Turn Pads for the A321 Neo type aircraft, and taking into account a Runway End Safety Area (RESA) on both ends of the runway.

This defines the Aerodrome Reference Code as per ICAO Annex 14 as 'Code Number 4'. Furthermore, the design aircraft is the A321 which is categorised as 'Code C'. Therefore, the new Runway is classified as '4C'.

The **orientation** of the new runway is aligned in respect to the primary wind direction: the geometric orientation of the new runway aligns with its designation as 12-30 on the island geographical grid.

NB: Although the existing runway is designated as 12-30, its actual orientation relating to the geographical grid of the island is 11-29. It is not unusual for runway designations to be different from the geographical grid. However in this study, as in the Preliminary Design Report, the existing runway designation will be considered as 11-29 as this correlates to its geographical grid.

A **45m wide** runway that caters up to a Code C aircraft does not require any **shoulders** under ICAO Annex 14. However, the design includes 2.5m-wide shoulders on each side of the runway rather than a grass surfaced strip to increase the runway edge lights conspicuity.
The primary landing will be on Runway 12 and aircrafts will therefore need to complete a 180 degrees turn before taxiing along the Runway towards the apron. Accordingly, a **runway turn pad** has been provided to facilitate a 180 degree turn at Runway 30 for the A321.

A **Runway End Safety Area (RESA)** has been provided on both ends of the new Runway in accordance with ICAO Annex 14. The RESA provided is of a recommended length of 240m beyond the Runway Strip and 90m wide.

A **Runway Strip** of 2,220m by 300m (length by width), which includes the Runway and a Clear and Graded Areas, has been provided in accordance with ICAO Annex 14. This provides a 150m strip on either side of the runway centreline and the 60m length of strip beyond both ends of the Runway.

The **runway vertical** profile is continuous cross fall and its levels are tied in to existing at 20% gradient beyond the Clear and Graded Areas of the Runway Strip.

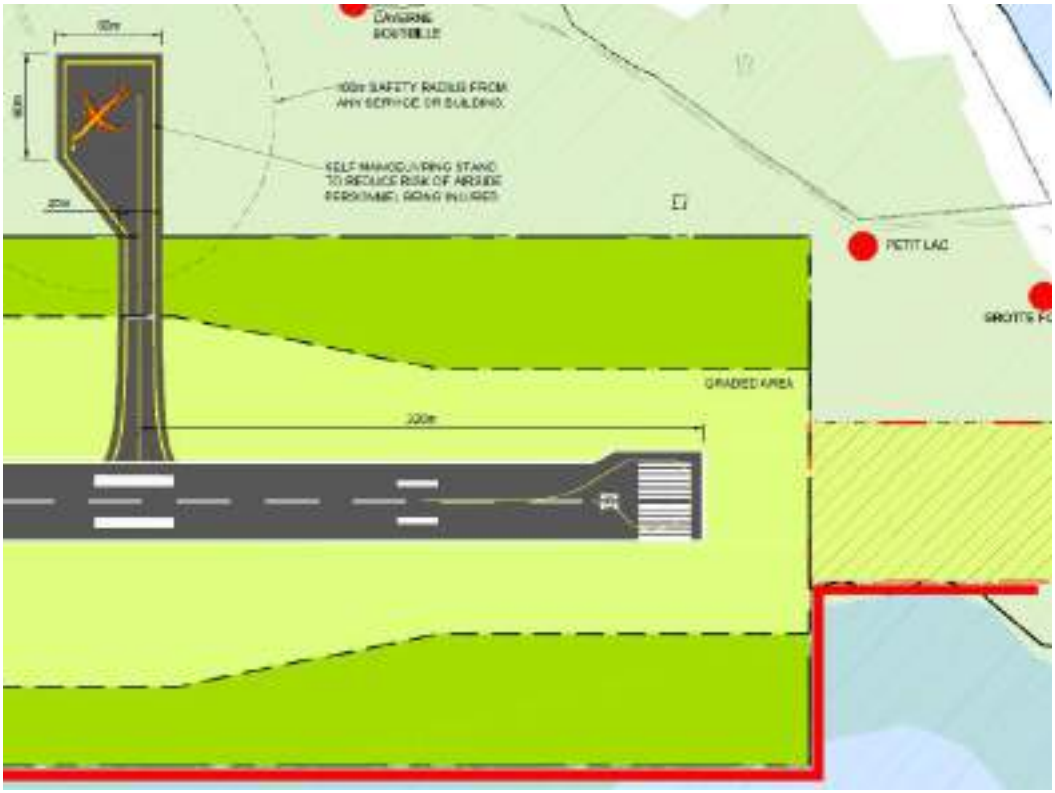


Figure 14: Turn pad on the 30 end of the runway – to be updated based on final design

The new inland runway alignment will entail massive earthworks to be able to connect to the existing taxiway pavement and parking on the extended apron. To minimize the need to import fill from the other quarry sites, the earthworks in the Preliminary Design has been optimised and will involve the cutting of the Sainte Marie Hill and surrounding area including the Bangelique reservoir.

Suggestions for improvement in Detailed Design
The Preliminary Design study confirmed the new runway orientation (12- 30) as the optimal alignment. However, to optimize the design, building closer to the two caves, Grotte Petit Lac and Grotte Fougère, could drastically reduce marine works and consequently would have a reducing impact on the project cost. The possibility of building closer than the 50 m buffer zone provided in the PDR will depend on the ESIA conclusion about critical sensitivity level of the caves and on the technical feasibility determined by the detailed design studies.
Also, the detailed design will work to meet the objective to optimise the earthwork and achieve a balance in the cut and fill volumes.

5.3.2.2 Pavement for the new runway

The structural pavement consists of four layers above the upper part of the earthwork:

Marshall Asphalt Surface Course (50mm)
Marshall Asphalt Binder Course (75mm for the runway, 50mm for the shoulders)
Cement Bound Granular Base (140mm for the runway and no granular base for the shoulders)
Crushed Aggregate Base (150mm for the runway and 315mm for the shoulders)
Select Fill (400mm)

5.3.2.3 AGL, Navaids and illuminated signage for the new runway

All AGL, Navaids and illuminated signage will be compliant with the ICAO Annex 14. All circuits shall be run in underground sleeves. All light fittings shall be inset (except for elevated approach lights) LED type, mounted on deep FAA compliant transformer cans.

The AGL system will consist of new circuits powered from new constant current regulators (CCRs) which will be located at the CCR room of the new Power Centre.

The runway lighting circuits will have a minimum brilliancy control of 100%, 30% and 10%.
The new runway AGL includes:
AGL;
High intensity PAPIs;
Illuminated signs;
Illuminated Windsocks;
Runway Threshold Identification Lights (RTILs) flashing white lights with a frequency between 60 and 120 per minute;
Runway Guard Lights are a visual aid intended to caution pilots that they are about to enter an active runway. These lights shall be provided on all taxiways/runway intersections and flash unidirectional yellow light;
Runway Approach Lights.

5.3.2.4 Dismantling of the existing runway

The existing runway shall be decommissioned without necessarily demolishing the pavement structure. Part of the existing runway shall be converted into a taxiway to connect to the new runway, this will be subject to the detailed design.

5.3.3 Taxiways

The Preliminary Design was mandated to design and provide:

- Construction of 15 m-wide new Code C taxiways with shoulders to link the existing runway or apron to the new runway;
- Construction of a new taxilane to provide flexibility of connections from the apron to the new runway;
- Full assessment of the existing taxiway and upgrade to suit the operational requirements of A321 series and similar aircraft types: rehabilitation, strengthening, and widening of pavement of existing taxiway;
- Rehabilitation and strengthening of a part of the existing runway to be used as a taxiway;
- Surface markings and illuminated signage to the runways, taxiways and apron.

5.3.3.1 Taxiways footprint and geometry

The taxiways have been designated starting from west to east. Therefore, the new taxiway designations will be as follows:

- Taxiway Alpha - New taxiway which links the apron expansion to the existing runway 11-29.
- Taxilane Bravo - New taxilane behind the expanded apron to serve the aircraft parking stands
- Taxiway Charlie - Existing taxiway A. This taxiway will need to be widened and strengthened. Furthermore, the taxiway connecting existing runway 11-29 and new runway 12-30 will be an extension to the taxiway Charlie and therefore will also be known as ‘Taxiway Charlie’

- Taxiway Echo – New taxiway connecting the new runway to the isolated pad.
- (These names refer to the preliminary design and may evolve in the detailed design, in particular due to changes concerning the taxiway D. Please report to 8.5.2.2 Taxiway or access road for fire fighting).

The width of the new taxiways must meet the requirement for the design aircraft of A321 that is 15.0m minimum.

Moreover, the design of the taxiway fillets should allow for a minimum of 3.0m clearance from the outer edge of the aircraft main gear to the edge of the taxiway in accordance with Clause 3.9.3 of ICAO Annex 14. Thus, the width of the taxiway shoulders is 5 m on either side of the taxiway.

Therefore, a 26 m-wide taxiway strip on either side from the taxiway centreline has been designed.

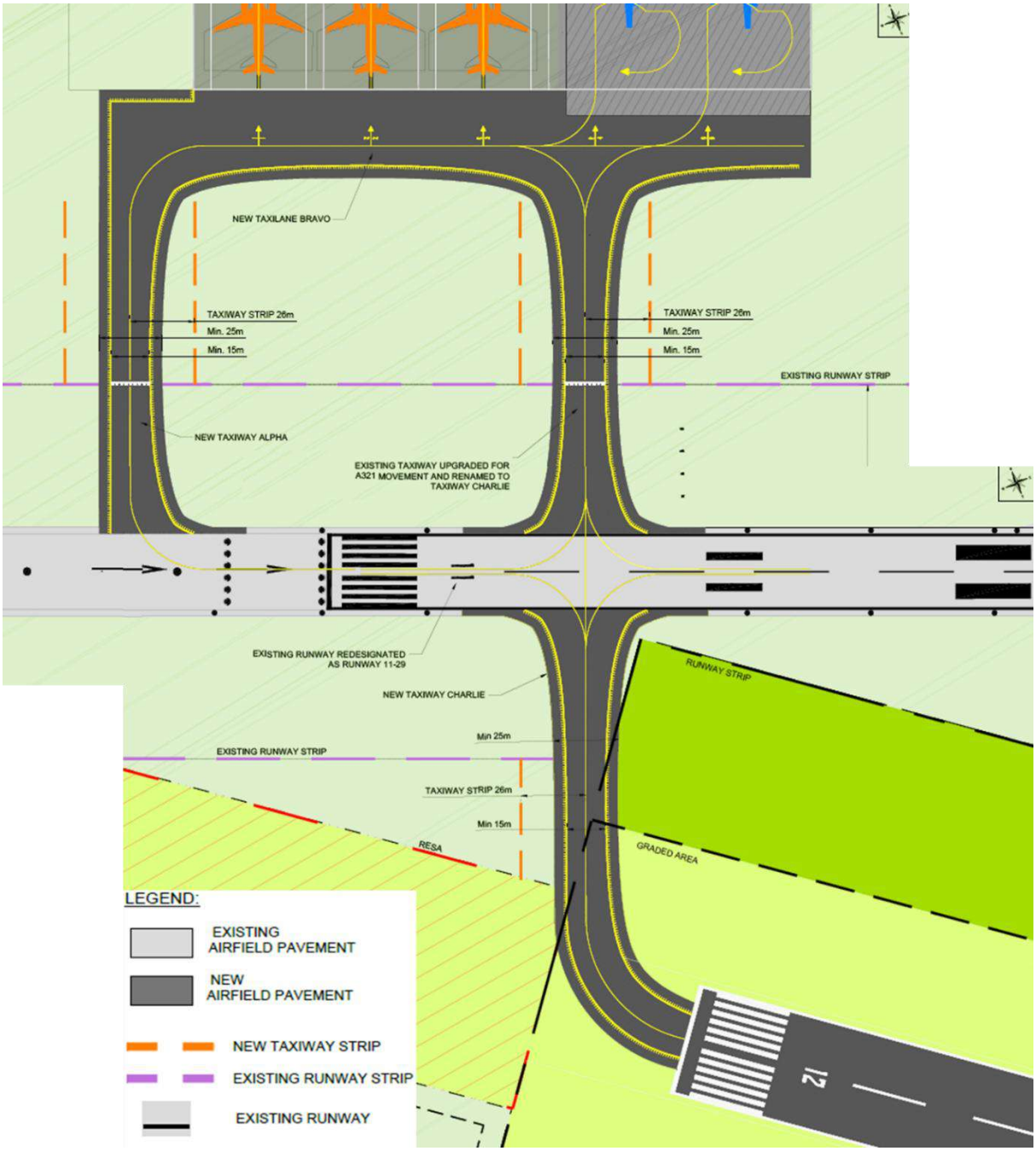


Figure 15: Taxiways Alpha, Bravo and Charlie (Preliminary Design Report) – to be updated based on final design

14 : isolated aircraft parking position

Figure 16: Taxiway Echo (Preliminary Design) – to be updated based on final design

5.3.3.2 Pavement for the taxiways

The proposed taxiway system serving the new runway utilises parts of the existing runway and the existing apron access taxiway. These pavements were constructed/upgraded in 2003 and designed to cater to the ATR 72 aircraft. Consequently the proposed use by A321 neo size aircraft requires significant strengthening of the existing flexible (asphalt) pavements. The rigid (concrete) pavement of the existing parking apron was designed to cater for larger aircraft and thus its life whilst catering to the forecast traffic must be evaluated as it is impractical to strengthen by simple overlay.

Three new taxiways are to be developed: new Alpha, Bravo and south part of Charlie.

The existing taxiway Alpha (redesignated as Charlie - north part - in the project) has to be strengthened, as well as the existing runway located between new taxiways Alpha and Charlie, which will be used as a taxiway in the project.

5.3.3.2.1 New taxiways

The new taxiways Alpha and Bravo, and the south part of the new taxiway Charlie will be constructed on fill. The structural pavement consists of five layers:

- Marshall Asphalt Surface Course (50mm)
- Marshall Asphalt Binder Course (75mm)
- Cement Bound Granular Base (140mm)
- Crushed Aggregate Base (150mm)
- Select Fill (400 mm)

5.3.3.2.2 Existing taxiways

For the existing runway between taxiways Alpha and Charlie, an overlay will be put above the existing materials. The pavement is structured as follows:

- Material for overlay (total thickness 200 mm)
- Marshall Asphalt Surface Course Overlay (50mm)
- Marshall Asphalt Binder Course Overlay (65mm)
- Marshall Asphalt Binder Course Overlay (75mm)
- Existing materials (240 mm)
- Existing Marshall Asphalt Surfacing (90mm)
- Existing Crushed Aggregate Base (150mm)

Thus, the total pavement thickness will be 440 mm.

In the same way, for the existing taxiway Alpha redesignated Charlie (north part), an overlay will be put on the existing materials. The pavement is structured as follows:

- Material for overlay (total thickness 200 mm)
- Marshall Asphalt Surface Course Overlay (50mm)
- Marshall Asphalt Binder Course Overlay (65mm)
- Marshall Asphalt Binder Course Overlay (75mm)
- Existing materials (240 mm)
- Existing Marshall Asphalt Surfacing (90mm)
- Existing Crushed Aggregate Base (150mm)

Thus, the total pavement thickness will be 440 mm.

5.3.3.3 AGL, Navaids, and illuminated signage for the taxiways

As for the new runway, the taxiway AGL design is compliant with the ICAO Annex 14. All light will be of LED type and all instruments will be powered from the new power centre through circuits run in underground sleeves.

The AGL and navaids for the taxiway will include direction signs and edge lighting consisting of blue omnidirectional LED.

5.3.4 Apron

5.3.4.1 Main apron

The existing apron has two stands which can support an ATR72. It requires enlargement to accommodate an A321 aircraft and a number of larger aircraft stands needs to be provided.

The Preliminary Design mandated the design of an extension to the existing apron including a fuel hydrant system, floodlighting and ground power, and the ability to accommodate the operations of a minimum of three parking stands for the A321 and two stands for the ATR72.

The table below highlights the design parameters for the new stands (A321 type). The stands will be designated as Stand 1 to 5 starting from the west and heading east.

Table 4-2: Aircraft Stands Design Parameters

Design Parameters	Distance (m)
Length of Stand	62.0
Width of Stand	38.0
Wingtip Clearance to Edge of Stand	1.0
Head of Stand to A321 Nose	10.5
A321 Tail to Back of Stand	4.5
Back of Stand to Taxilane Bravo Centreline	22.5

The 3 new stands designed for A321 aircrafts will be operating as nose-in and pushback. Existing stands, designed for the ATR72, will be operated in autonomy.

Static ground power units shall be provided to the aircraft parking stands. Two 90 KVA units capable of feeding full load 400 Hz power will be provided at each stand.

A new hydrant refuelling system will have to be provided to serve all the new aircraft parking stands. A complete loop will start and end at the new pump house that will have to be located within the fuel depot. The pumping system will be designed to fuel or de-fuel one aircraft at a time. A control room will also be provided within the fuel depot which will have to be equipped with all the appropriate telemetry and controls to facilitate the operation, control and monitoring of the system.

We also can note the existence of an air-conditioned system.

5.3.4.2 Isolated apron

The Isolated Aircraft Parking Position (Isolation pad) is planned to be located such that an emergency incident does not stop operations at the airport and that any potential threat does not cause damage to critical buildings, equipment or facilities.

The Isolated Aircraft Parking Position has been located towards the end of Runway 12 approximately 320m from Threshold 30. This location has been determined to ensure a landing aircraft will be able to evacuate the Runway as soon as possible.

Furthermore, the location is such that the Isolated Aircraft Parking Position is far away from any other airport service including the Terminal Building and the Apron.

The Isolated Aircraft Parking Position is operated as a self-manoeuvring stand, so the aircraft will be able to complete a 180 degree turn on the pad before taxiing back to the Runway.

The dimensions of the Isolated Aircraft Parking Position are 60m x 60m plus a 25m wide access Taxiway including shoulders, to allow for all Code C aircraft including both the A321 and the ATR72. The length of the Taxiway leading up to the Isolation Pad will be 180m.

In normal circumstances, this stand could be utilised to park any long layover flight or to use as a remote stand should it become necessary.

5.3.4.3 Pavement for the apron

5.3.4.3.1 New apron

The extension to the parking apron is to be constructed with Pavement Quality Concrete (PQC) slabs as the existing apron.

Three courses of material will be used:

- PQC (375 mm)
- Cement Bound Granular Base (150 mm)
- Crushed Aggregate Base (150 mm)

5.3.4.3.2 Existing apron

The apron pavement consists of 266No 5m x 5m x 350mm thick concrete slabs. No further strengthening is considered necessary.

5.3.4.4 AGL, Navaids, and illuminated signage for the apron

As for the new runway, the apron AGL design is compliant with the ICAO Annex 14. All light will be of LED type, and all instruments will be powered by the new power centre through circuits run in underground sleeves.

The AGL and navaids for the apron will include:

AGL:

- Edge lighting consisting of blue omnidirectional LED;
- Flood lighting: the height of these masts has been determined so as not to penetrate the OLS. Apron floodlighting shall be provided by 18m high steel masts supporting LED floodlights;
- VDGS (Visual Docking Guidance System);
- Constant Current Regulators (CCRs).

5.3.5 Air Traffic Control Tower and facility (updated 2022)

The ATC facility is currently only an advisory service with all operations based upon visual decisions by the pilots. A new control tower is required to be compliant with the new runway and with the A321 type of aircraft.

Considering the sighting requirements, the most suitable location identified for the new ATC tower is due east of the existing location.

The Preliminary Design located the new control tower east of the airport, close to the Anse Quitor River, i.e. within the limits of the critical habitat.

The intial ESIA 2019 recommended the relocation of the ATC tower outside the Reserve.

The latest design received confirms the relocation of the ATC tower outside the environmental sensitive area. Hence the risk rating will be amended accordingly.

The specific components of the ATC include

- A control cab
- A tower shaft and
- A base building

The first component of ATC tower is the **Control Cab**. It provides the best unobstructed view for air traffic controllers. Size depends on the level of airport activity and the number of operating personnel required.

To avoid an obstructed view, construction is by a steel structure so that the structural loading is minimum. The perimeter glazing is fully covered by inclined 15 degrees glasses to avoid glare/reflections.

The operating level height or optimum visual surveillance is obtained from the OLS.

The second component of ATC tower is the **Tower Shaft**. The main function of this shaft is to provide the required height for the tower determined by the operating level or optimum visual surveillance for the control cab. It encompasses an elevator/s and a stair/s for access.
There is a junction level between the Tower Shaft and Control Cab that provides space for Mechanical & Electrical equipment together with a break out space and a lavatory.

The last component of ATC tower is the **Base Building**. Here, training, conference & telecommunication rooms, radar & communication and equipment rooms are located. It could be located included within the ATC tower or as a separate component building itself. Combinations could be:

1. Separate (entirely separated away from tower)
2. Base (horizontally at the base of the tower)
3. Stacked (Vertically around the tower)
4. Stacked Split (Attached to the tower yet)

4.8 Latitudinal & Longitudinal Sections

4.2 Ground (Base Building) Plan

Figure 17: Updated Architectural Drawings of the ATC (Preliminary Design)

5.3.6 Rescue and Fire Fighting Services (updated 2022)

5.3.6.1 Fire station

The current CAT5 provision with swift and direct access to the runway is adequate for the safe operation of the ATR72 type aircraft. To cater to A321 aircraft type, the Preliminary Design was mandated to propose a location and sizing for new rescue and fire fighting services (RFFS) of type CAT7.

Due to its location, the travel time between the current fire station and both ends of the new runway is not compliant with the ICAO regulations. Thus, a new location had to be proposed. Following the Feasibility Studies, it was decided to integrate the new RFFS with the new control tower.

The new Fire Station will need to provide all the necessary facilities to comply with ICAO Airport Services Manual Part 1 including accommodation for staff and vehicles, administrative and support requirements and a watch room.

Four fire vehicles can be parked with allowance made for servicing.

New water storage tanks will need to be provided near the fire station to safeguard water supplies during emergency situations. The capacity of the new water storage tanks will need to cater to the enhanced service requirements.

The Preliminary Design located the new RFFS together with the ATC east of the airport, close to the Anse Quitor River, i.e., within the limits of the critical habitat.

The initial ESIA 2019 recommended the relocation of the ATC and RFFS outside the Reserve.

The latest design received confirms the relocation of the ATC tower & RFFS outside the environmental sensitive area. Hence the risk rating will be amended accordingly.

The current architectural drawing received show a G+2 building

Figure 18: Rescue and Fire Fighting Services – South Elevation (updated 2022)

5.3.6.2 Fire training facility

A fire training facility pad is projected along the perimeter road between the airport terminal and the new control tower.

Limitation

There is currently no information on the new fire training facility. However should fire exercise be considered at the facility same should be assessed in as much as air pollution (from burning) and ground/underground pollution (from run off of water/foam dispersion from firefighting) are concerned.

Impacts associated with the fire fighting and training facility will be further assessed during the finalization of the ESIA.

5.3.6.3 Sea rescue facility

The airport is on the coast and aircraft will be passing over the lagoon at a low-level. The RFFS should be able to react to any incident adjacent to the airport and so the provision of a fast rescue boat is recommended. It should be equipped to provide an initial response and to undertake routine patrols of the immediate area.

Thus, the Preliminary Design projected the construction of a boat house and jetty facilities. The boat house will be located on the coast, west of the airport building, linked to it by a 7 m wide driveway.

The boat house will be equipped for two jetties. A specific car park will be associated.

Limitation:

The current design of the sea rescue facility comprises of a set of drawings of the building. There are no details on the siting of the facility, on the slipe way etc to enable an assessment of the potential impact(s) of the facility on the environment (coastal environment predominantly). However, impacts can be anticipated on the coastal and marine environment.

Potential impacts associated with the construction and operations of the sea rescue centre will be assessed as part of the finalization of the ESIA.

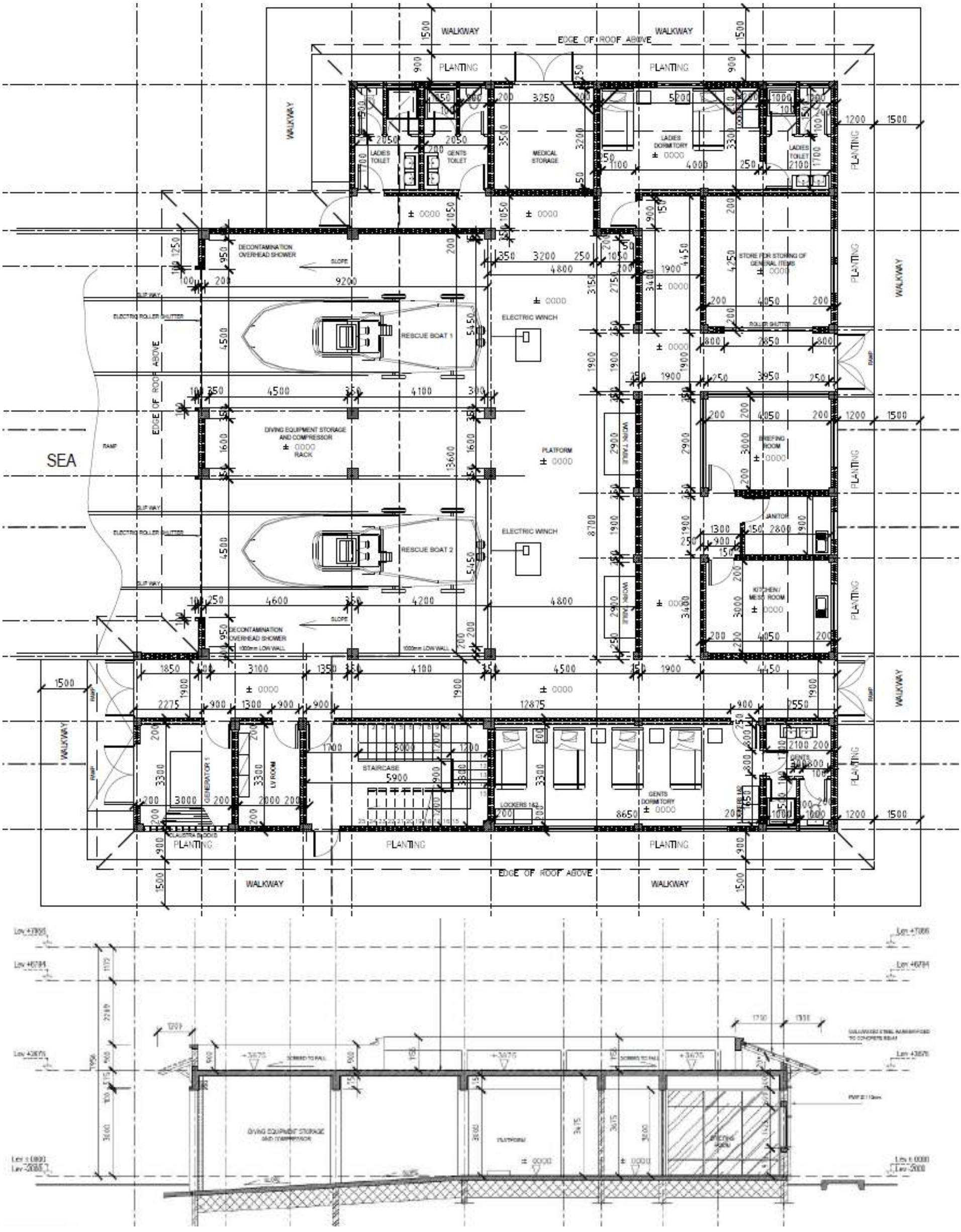


Figure 19: Sea Rescue Facility – GF plan and Section A-A (updated 2022)

5.3.7 Ancillary Facilities within the Scope of Phase 1 Airport Expansion

Refer to Figure 13 as updated for siting of the ancillary facilities.

5.3.7.1 Fuel farm

To be compliant with larger aircraft operating on new (and longer) routes, a full re-fuelling service is required. Fuel is currently delivered to the island's main port and is transferred to the airport by road tanker. The nature of the roads on the island means that only small capacity tankers can be used. The required on-site storage capacity of an extended fuel farm cannot be determined at this stage as it will depend not only on the weekly demand but also the frequency and volume of the bulk deliveries. The impact of an increase in the road haulage of fuel across the island will be assessed as part of the finalization of the ESIA .

5.3.7.2 Power Centre

A new Power Centre consisting of a GF only, 272m2 building is scheduled and will encompass amongst others the following rooms: metering, LV, Transformer and HV, CCR, control, workshop, store, kitchen, mess, toilets, together with a generator room with Nos 2 stand by generators.

5.3.7.3 Quarantine Building

A quarantine consisting of GF only 454m2 building is scheduled and will encompass amongst others the following rooms: consultation, nursing, donning, treatment, quarantine (high Risk), quarantine (low Risk), waiting, sanity facilities, etc. The waste management will be determined and assessed as part of the final ESIA.

5.3.7.4 Meteorological Building

A new meteorological facility of G+1 208m2 building is scheduled and will encompass amongst others the following offices, dormitories, observation room at First Floor, sanity facilities, etc

5.3.7.5 Solid Waste Management Facility / Incinerator

An incinerator is projected. From information gathered at concept stage, it is oil fired and capable of handling a range of general waste, hazardous waste, animal carcasses and medical waste.

It will have the lowest emissions possible by controlling the rate of combustion in a three chambers process and by capturing particulate matter in a settling chamber resulting in industry leading low emissions.

The capacity is:

General waste: 50 kg/h Medical waste: 33 kg/h	Animal carcass: 30 kg/h Plastic: 28 kg/h.

The impacts associated with the incinerator will be assessed as part of the finalization of the ESIA once more details are known.

5.3.7.6 New perimeter road

The new perimeter road will reuse the existing track which leads to the mouth of the Anse Quitor river. It is planned to widen it and make it passable for all types of vehicles.

The impacts associated with the perimeter road will be assessed as part of the finalization of the ESIA once more details are known.

5.3.7.7 Other facilities

The following additional facilities are planned:

- New security checkpoint
- New passenger car park

Limitation:

- There is no technical data available on the ancillary facilities to enable an assessment of the potential impact(s) of the facilities on the environment.
- Potential impacts associated with the construction and operations of these facilities will be assessed as part of the finalization of the ESIA

5.3.8 Ancillary Facilities within the Scope of Phase 2 Airport Expansion

Refer to Figure 13 as updated for siting of the ancillary facilities.

Strategic land has already been earmarked and reserved for the future development under phase 2 expansion:

Facilities to be located adjacent (north) of to the existing runway

- New cargo terminal building
- New cargo apron
- Refrigerator cold storage
- Cargo, helicopter base development

Facilities to be located west of existing passenger terminal

- New aircraft maintenance stand
- New aircraft maintenance hangar
- New employee car park

Limitation:

- There is no technical data available on the ancillary facilities to enable an assessment of the potential impact(s) of the facilities on the environment.
- Phase 2 expansion is excluded from the scope of the present ESIA. Hence, potential impacts associated with the phase 2 of the airport expansion will not be assessed as part of the finalization of the ESIA

5.3.9 Water tower

New water storage will need to be provided near the fire station to safeguard water supplies during emergency situations. The water will be supplied from the integrated water system proposed and detailed in section 5.3.10. The capacity of the new water storage tanks will need to cater for the enhanced service requirements and it will be determined in the detailed design phase. For fighting purposes, the water tower will need to have a minimum volume of 30 m3 as per firefighting guideline.

5.3.10 Stormwater drainage and domestic wastewater management facilities

The project includes an appropriate **stormwater drainage network** ensuring that stormwater is adequately captured and disposed of in an environmentally safe manner. The possibility of reuse of stormwater in an effective manner has been considered in an "integrated" water management scheme.

The project includes a **new sewer network with an associated wastewater treatment plant** to cater for the new control tower and Rescue and Fire Fighting Station, together with the existing passenger terminal building.

5.3.10.1 Main Concept Design considerations

The general principle proposed is presented in the figures hereinafter, based on the following concept design considerations:

Stormwater drainage and management

Collection, pre-treatment and disposal or reuse.
Use of the stormwater drainage facilities to confine the effluents generated by chronic pollution and any eventual firefighting on the runway and preserve the environment, in particular the 2 caverns (Caverne Petit Lac and Grotte Fougère) near Anse Quitor, but also potentially Caverne Bouteille in the same zone where drinking water is being produced by desalination.
Use the opportunity of gravity stormwater drainage for stormwater harvesting to reuse it after treatment for the water supply requirements of the airport.
Assess on the one hand the water needs for the airport, and on the other hand assess the volume of wastewater to be produced and the volume of stormwater to be collected in order to determine the zones of the airport that can be drained effectively towards the buffer storage pond and the Water Treatment Plant for reuse. This is to relax as far as possible the constraints induced by the topographical characteristics of the new runway which tends to slope down towards Anse Quitor.
The stormwater harvesting on the impermeable zones (namely taxiways, aprons, roads) will come in addition to the rainwater harvesting from the roofs of the passenger terminal building for reuse.
The stormwater drainage network needs to be non-infiltrating to convey the first runoff flow with the highest pollutant loadings to the buffer storage through an oil separator / primary sedimentation equipment.
The stormwater management including a buffering storage and / or works facilitating infiltration and reducing soil erosion enables to address climate change adaptation for disaster risk reduction. In fact, reduction of peak flows, run off and soil erosion lead to reduced sedimentation of water bodies including lagoons, thus protecting biodiversity, corals and white sandy beaches.
However, according to the recommendations of Gregory MIDDLETON in his email dated 10th April 2019 to Aurele Anquetil ANDRE, "The stormwater drainage system must be properly constructed to carry water far away from the runway, as excessive infiltration of concentrated runoff from infrastructure has been identified as a major cause of sinkhole collapse in the young limestones of Florida. Water and sewer systems in karst areas are prone to failure caused by small leaks that create minor subsidence, which then leads to major pipe failure".
The buffer storage pond for reuse, which is envisaged in open air, is to be emptied within a small lapse of time so as to be made available for the next eventual rain event. A visual monitoring is to be carried out for maintenance purposes.
A sea outfall is to be implemented for discharging at sea the excess water that cannot be reused. The sea outfall for excess stormwater is to be implemented tentatively in the zone of

the existing boat house and new sea rescue facility, in common with the sea outfall of the Waste Water Treatment Plant.
The water to be reused is to be conveyed by pumping towards the Water Treatment Plant (WTP 1 on the General Principle diagram figure 20, consisting tentatively of a sand filtration, activated carbon and ozonation) before being stored in an industrial water storage tank after proper treatment and adequate treated water quality monitoring.
An industrial water storage is envisaged with a capacity of 400 m^3 to reuse treated waste water or treated stormwater. This capacity can be backed up if required by rainwater harvesting from roofs of buildings.

Domestic wastewater management

Having a new Waste Water Treatment Plant on site gives the opportunity to implement an "Integrated" Water Management associating both stormwater and sewage water as sources of raw water for the common uses of the airport, after an adequate treatment.
The considered sewage water has to be strictly domestic wastewater. Any non-domestic wastewater shall be evacuated specifically by pumping via a dedicated carrier. In fact, domestic wastewater is generally free of pollutants like heavy metals and therefore can be treated using biological techniques with regard to toxicity towards bio-organisms.
The Wastewater Treatment Plant shall be of modular type to cater for future extensions if required and of "package plant" type, including UV disinfection and water quality monitoring at the outlet. A dedicated inlet lift pumping station shall be implemented at the inlet of the Water Treatment Plant.
The sludge produced shall be reused in agriculture and therefore shall require a minimum level of dryness.
A sea outfall is to be implemented for discharging at sea the excess treated water that cannot be reused, even if the objective is zero discharge as far as wastewater is concerned.
This sea outfall is to be implemented tentatively in the zone of the existing boat house and new sea rescue facility, in common with the sea outfall of the buffer storage tank described above.
The gravity sewer networks to be implemented to convey the domestic wastewater to the Water Treatment Plant shall be of uPVC type, with intermediate lift pumping stations if required.
The pumping networks shall be of HDPE type.
The treated wastewater will be stored in a dedicated 400 m^3 water tank; note that this figure may be reviewed at detailed design stage.

Water supply

- The Integrated Water Management gives the opportunity to have enough raw water for reuse after an adequate treatment and water quality monitoring.
- The treated water from the outlet of the water treatment plant will be reused for drinking water purposes provided the level of treatment can be made compliant with the drinking water standards and correctly monitored at the outlet of the treatment. Only the fraction dedicated to drinking water purposes has to be disinfected thoroughly. The treatment will be ensured by a specific Reverse Osmosis treatment stage (WTP 2 on the General Principle diagram Figure 20).
- The water to be reused is to be conveyed by pumping from the Water Treatment Plant outlet towards the corresponding storage tank after adequate water quality monitoring.
- it is proposed that this storage tank be the existing storage capacity of 400 m^3 since it is already connected to the distribution network and to the drinking water supply from the public network, to be maintained as back-up. The existing rainwater harvesting will be disconnected from the storage tank and connected to a new storage of 400 m^3 to be implemented and dedicated to rainwater storage. In fact, at the moment, the drinking water from the public network is connected to the same storage tank used for rainwater

harvesting from the roofs of the passenger terminal building. The drinking water is thus contaminated on the bacteriological point of view. It is therefore proposed to have a storage dedicated to drinking water uses at the airport.

- The specific storage tank for drinking water purposes shall be equipped with a disinfection facility using controlled chlorination towards the passenger terminal building.

Determination of the storage capacity for treated water to be potentially reused

The storage capacity determined for rainwater, industrial water and drinking water is based on a compromise considering namely:
a water demand of around 21 m^3/d
a storage of 1 month considering a period of no rain for around 21 days
the existing storage capacity of 400 m^3 taking into account an existing volume reserved for fire fighting (volume considered of 120 m^3).
A dedicated separate storage tank for rainwater harvesting, industrial water and drinking water for distribution, is proposed with a capacity of 400 m^3 each.

- In fact, the new capacity envisaged is arbitrarily fixed for the moment to 400 m^3 like the existing water storage on site

Determination of treatment capacity for reuse

- WTP to produce industrial water = around 21 m^3/d (estimated water demand)
- Rainwater to produce drinking water (WTP 2) = around 21 m^3/d (estimated water demand)
- Stormwater to produce industrial water (WTP 1) = up to 100 m^3/d (estimated stormwater collected during the month of least rainfall forecast: October)

Estimate of the total footprint for the whole water treatment plant

- Approximate total surface area (including land area, building footprint, road access, industrial water buffer storage) = 850 m^2
- Approximate height of buildings = 5 m

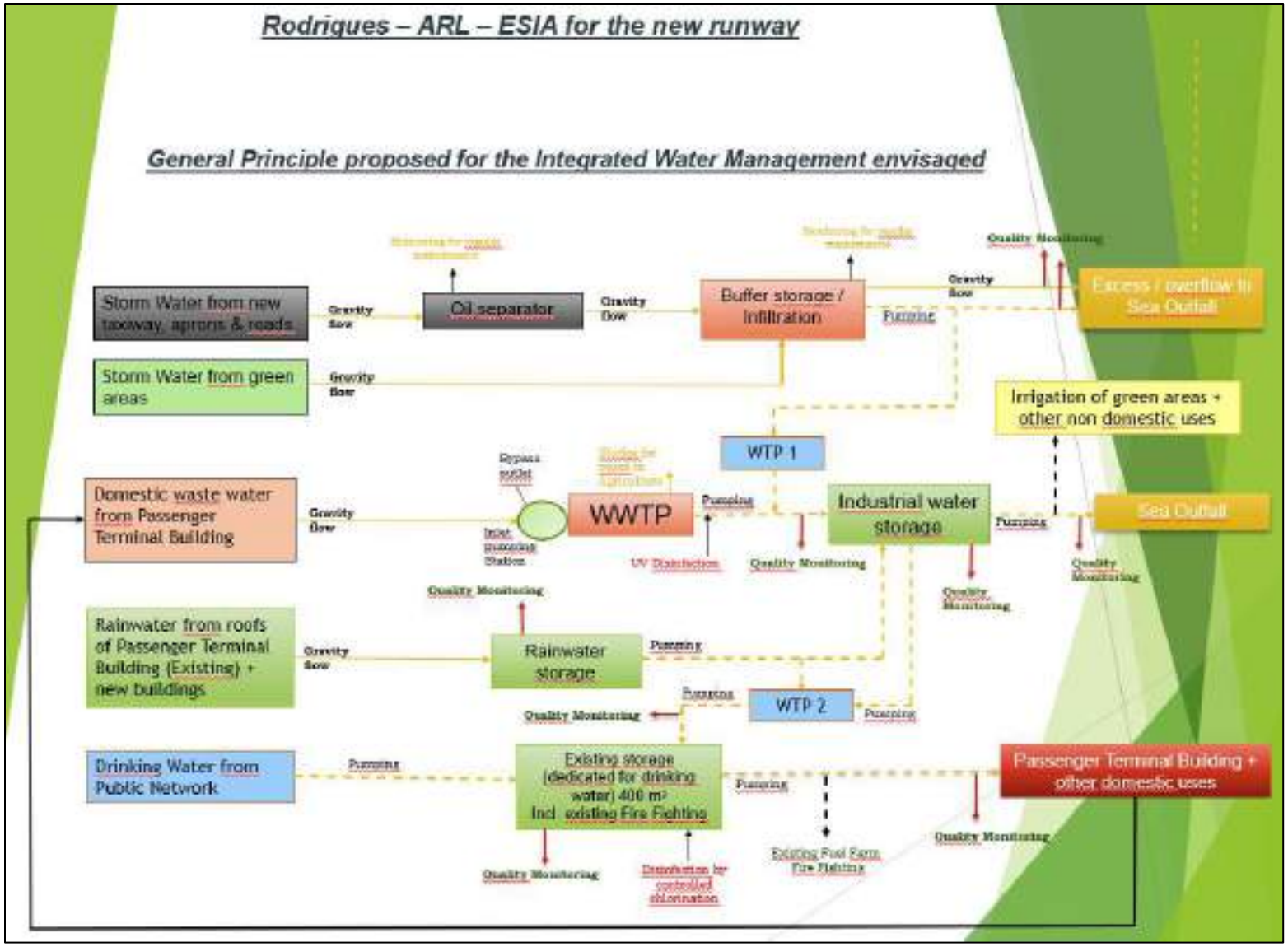


Figure 20: General principle proposed for the integrated water management envisaged

Figure 21: Tentative location of the buffer storage envisaged for the stormwater management

The location of the buffer storage envisaged, as indicated in the figure above, has been chosen in order to benefit from the existing topography in this specific zone and be able to reach the permeable soil layer for partial / natural infiltration of the pre-treated stormwater. The implementation in this zone also makes it less risky in terms of bird attraction with regard to safety restrictions of aviation.

Moreover, the location of the new Wastewater Treatment Plant (in the Preliminary Design) (location 26 in Figure 21 above) and the location of the existing water facilities for reuse in the passenger terminal building (zone between locations 1 and 5 in Figure 21 above), make it easier to handle the water transfer among the corresponding water facilities and for easy access for maintenance purposes as well.

5.3.10.2 Main Concept Design numerical assumptions and applicable standards

The main assumptions made at this prior stage are namely:

Air passenger volume projected / year :	100 000
Air passenger volume projected / day :	274
Number of employees projected :	170
Ratio L / employee per day :*	75
Ratio L / passenger from terminal per day :*	30
* source : INFRATA June 2014	
Ratio L / passenger from planes per day	2

The flow of wastewater produced at this prior stage is thus estimated to:

	Number	Ratio L/d	Volume (m3/d)
Passengers	274	30	8.2
Employees	170	75	12.8
Passengers from planes	274	2	0.5
Total			**21.5**

According to EPA Guidelines, the design assumptions are the following:

Parameters	*Units*	*Design*
Hydraulic flows		
Average flows	*m3/d*	21.5
Peak flows	*m3/h*	5.8
Pollution Flows		
BOD5	*kg/d*	5.4
COD	*kg/d*	8.6
Total Suspended Solids (TSS)	*kg/d*	6.5
NK	*kg/d*	2.2
Pt	*kg/d*	0.4
Bacteriological proprieties		
Faecal coliforms	*U/100mL*	1.00E+05
Physico-chemical proprieties		
Wastewater temperature	*°C*	20
pH range		7 to 8
Minimum hardness		5
Minimum K Acid buffer capacity	*mmol/L*	8

The standards proposed to be complied with are the following, regarding both wastewater treatment and treated wastewater discharge at sea. Drinking water standards, for reuse as such, if applicable, are given hereinafter.

A comparison of the 3 most common international standards is the following for a discharge at sea:

	Local standards	European standards				US standards	
	EPA and National WW guidelines	British Standards		French standards DERU 1991 + 07/12/2015 regulation			
BOD_5	20 mg/L	25 mg/L	70-90%	25 mg/L (>2000pe)	80%	45 mg/L (daily max)	
TSS	30 mg/L	-	-	35 mg/L (>2000pe)	90%	45 mg/L (daily max)	
COD	50 mg/L	125 mg/L	75%	125 mg/L (>2000pe)	75%	-	
NH_4 (Ammonium Nitrogen)	10 mg/L	-	-	-	-	-	
NO_3 (nitrates as N)	15 mg/L	-	-	-	-	-	
Total Nitrogen		< 15 mg/L (10 000 – 100 000 pe)	70%	< 15 mg/L (10 000 – 100 000 pe)	70%	10 mg/L	
Ptotal	10 mg/L (orthophosphate)	2 mg/L (10 000 – 100 000 pe)	80%	2 mg/L (10 000 – 100 000 pe)	80%	-	
E.coli	1 org/100mL	-	-	-	-	-	
Faecal coliforms	100 org/100mL	-	-	-	-	-	

It is proposed that the following performance standards be considered **for a discharge at sea** i.e. local standard as per comparative standards shown above (local, Europoean and American) :

	Concentration	Minimum percentage of reduction
BOD_5	20 mg/L	70-90%
TSS	30 mg/L	90%
COD	50 mg/L	75%
NH_4 (Ammonium Nitrogen)	10 mg/L	-
NO_3 (nitrates as N)	15 mg/L	-
Total Nitrogen	< 15 mg/L	70%
Ptotal	2 mg/L	80%
E.coli	1 org/100mL	-
Faecal coliforms	100 org/100mL	-

In the Final ESIA, the discharge limits will also include reference to the WBG EHS discharge limits, namely the following table extracted from the General EHS Guidelines: Environmental Wastewater and Ambient Water Quality.

Table 1.3.1 Indicative Values for Treated Sanitary Sewage Discharges[a]

Pollutants	Units	Guideline Value
pH	pH	6 – 9
BOD	mg/l	30
COD	mg/l	125
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Oil and grease	mg/l	10
Total suspended solids	mg/l	50
Total coliform bacteria	MPN[b] / 100 ml	400[b]

Notes
[a] Not applicable to centralized, municipal wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation.
[b] MPN = Most Probable Number

However, for reuse, we propose the following standards according to local (Mauritian) wastewater regulations:

Parameter	Unit	Land/ Underground	Surface water courses	REUSE in irrigtion
Total coliforms	MPN per 100 ml	-	400	-
Faecal coliforms	MPN per 100 ml	-	-	1000
E. Coli	MPN per 100 ml	<1000	<200	-
Free Chlorine	mg/l	-	0.5	-
Total Suspended Solids (TSS)	mg/l	45	35	45
Total Dissolved Solids	mg/l	-	-	2000
Sodium Adsorption Ratio (SAR)	-	-	-	<6
Reactive Phosphorus	mg/l	10	1	-
Color	-	Not objectionable	Not objectionable	Not objectionable
Temperature	degree C	40	40	-
pH	-	5 - 9	5 - 9	5 - 9
Chemical Oxygen Demand (COD)	mg/l	120	120	120
Biochemical Oxygen Demand (BOD5)	mg/l	40	40	40
Chloride	mg/l	750	750	250
Sulphate	mg/l	750	750	500
Sulphide	mg/l	0.002	0.002	-
Ammoniacal Nitrogen	mg/l	1	1	-
Nitrate as N	mg/l	10	10	20
Total Kjeldahl Nitrogen (TKN)	mg/l	25	25	-
Nitrite as N	mg/l	1	1	-
Aluminium	mg/l	5	5	5
Arsenic	mg/l	0.1	0.1	0.1
Beryllium	mg/l	0.1	0.1	0.1
Boron	mg/l	0.75	0.75	0.75
Cadmium	mg/l	0.01	0.01	0.01
Cobalt	mg/l	0.05	0.05	0.05
Copper	mg/l	0.5	0.5	0.2
Chromate chromium	mg/l	-	-	0.1
Fluorine	mg/l	-	-	1
Iron	mg/l	2	2	-
Lead	mg/l	0.05	0.05	2
Lithium	mg/l	2.5	2.5	2.5
Manganese	mg/l	0.2	0.2	0.2
Mercury	mg/l	0.005	0.005	0.02
Molybdenum	mg/l	0.01	0.01	0.01
Nickel	mg/l	0.1	0.1	0.2
Selenium	mg/l	0.02	0.02	0.02
Sodium	mg/l	200	200	-
Total Chromium	mg/l	0.05	0.05	-
Vanadium	mg/l	0.1	0.1	0.1
Zinc	mg/l	2	2	2
Oil & Grease	mg/l	10	10	10
Total Pesticides	mg/l	0.025	0.025	0.025
Total organic halides	mg/l	1	1	-
Cyanide (as CN -) or Free cyanide	mg/l	0.1	0.1	-
Phenols	mg/l	0.5	0.5	-
Detergents (as LAS*) * Linear Alkylate Sulphonate	mg/l	15	15	-
Detergents	mg/l	-	-	5
Intestinal nematodes	Arithmetic mean no. of eggs per litre	-	-	<1

For drinking water uses, the following local (Mauritian) standards are commonly used. However, the Treated Water shall be monitored in compliance with the EC Drinking Water

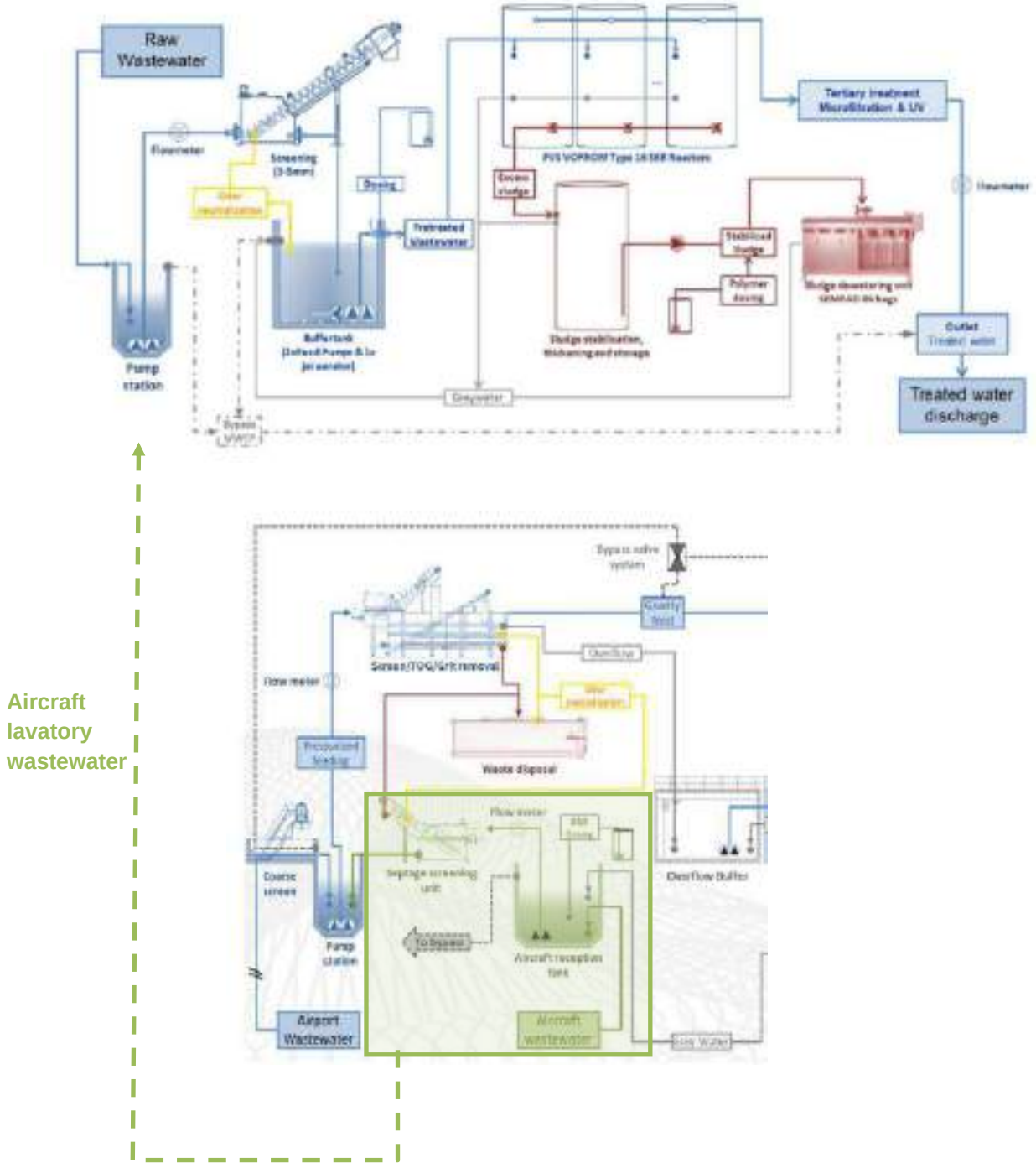
Directive 98/83/EC and the Drinking Water Standards (GN n°55 of 1996 below), whichever is stricter.

Parameter	*Standards*
Microbial	
E. *coli*	must not be detectable in any 100ml sample
Coliform Organisms	0 in 95% of samples examined throughout the year. In the case of quantities of water needed for distribution throughout the year, when not less than 50 samples are examined for each period of 30 days, 3 in an occasional sample , but not in consecutive samples
Physico-chemical	
pH	6.5-8.5
Total dissolved solids	1000 mg/l
Turbidity	5 NTU
Organoleptic	
Colour	20 Pt-Co
Taste and Odour	not objectionable
Trace metals	
Aluminium	0.2 mg/l
Arsenic	0.01 mg/l
Cadmium	0.003 mg/l
Copper	1 mg/l
Lead	0.01mg/l
Mercury	0.001 mg/l
Total chromium	0.05 mg/l
Zinc	3.0 mg/l
Nickel	0.02 mg/l
Anions	
Chloride	250mg/l
Fluoride	1.5 mg/l
Sulphate	250 mg/l
Nitrate	50 mg/l (as NO_3)
Nitrite	3 mg/l (as NO_2)
Pesticides	
Aldrin and dieldrin	0.03 microgram/l
DDT	2 microgram/l
Lindane	2 microgram/l
HCB	1 microgram/l
Methoxychlor	20 microgram/l
Heptachlor and Heptachlor oxide	0.03 microgram/l

5.3.10.3 Main Concept Design working principle (Wastewater Treatment for discharge or reuse)

The figure below illustrates the general working principle envisaged and proposed for the Waste Water Treatment Plant.

Figure 22: General principle proposed for the water treatment plant



5.3.10.3.1 Pre-treatment of the wastewater from the Aircraft infrastructures

The wastewater from the aircrafts will first enter a receiving tank with a storage capacity of 2 days. This receiving tank will be equipped with special aerators and a dosing station which will add specific reagents in order to render the aircraft wastewater treatable.

A pair of clog free pumps will enable to feed the pre-treatment unit.

A flowmeter will count the flow of aircraft wastewater sent to the pre-treatment unit.

A special pre-treatment unit, developed and engineered in order to handle septic and highly concentrated wastewater from aircrafts will press and remove the suspended solids and sediment in order to obtain a wastewater quality adapted to the domestic wastewater flows coming from the airport infrastructures.

The pre-treated aircraft wastewater will be added to the general inlet pump station of the WWTP.

5.3.10.3.2 Pre-treatment of the domestic wastewater from the Airport infrastructures

The water will be lifted up by the pump station and the incoming flows counted with a flowmeter.

In addition, the pump station will be equipped with an overflow/bypass system. But this is to be used in a very exceptional situation.

The lifting station will send the wastewater to a screening unit in order to remove a maximum of suspended solids.

The waste removed by this primary step will be stored in dedicated waste disposal containers.

The primary treatment unit and the waste containers will be treated by an activated carbon for odour removal in order to avoid the spreading of unwanted gases.

In addition, the primary treatment will be equipped with an overflow sending the wastewaters to a buffer tank and a by-pass system in order to be able to by-pass the biological treatment for maintenance purposes.

After pre-treatment, the wastewater will be sent by gravity to a buffer tank.

5.3.10.3.3 Buffering of the screened wastewater

The wastewater will enter a buffer tank. This receiving tank will be equipped with jet mixing aerator and a dosing station which will add specific reagents depending on the quality of the wastewater.

A pair of clog free pumps will enable to feed the pre-treatment unit.

A flowmeter will count the flow sent to the SBR Cells.

The buffer tank will be designed in order to handle the overflows and return of greywaters.

5.3.10.3.4 Biological treatment with treatment modules.

After buffering, the waste water will be sent to the biological reactors. There will be unit reactor cells and 1 stabilisation cell with a modular scalability. This means that each cell can be activated, put on hold or completely off-line from the process.

Therefore, the plant will be capable of adapting the treatment in regard to the influent loads giving the possibility to start with smaller amounts of wastewater and grow in regard to the airport growth itself.

The process is designed here in order to handle 15 to 20 m³/d of wastewater per reactor cell. It includes carbon, nitrogen and phosphorus treatment.

The biological system is also paired with the buffer tank, designed to handle all overflows from the reactors.

The excess sludge will be sent to an aerated stabilization sludge storage.

The treated water will be sent by gravity to a tertiary disinfection unit before sea outfall pumping via a specific pumping station.

5.3.10.3.5 Sludge treatment: stabilization, thickening, storage and dehydration

The generated excess sludge coming from the biological reactors will be treated within a dedicated sludge stabilization tank. This reactor will have following properties:

- Aerated storage of the sludge in order to avoid fermentation and odours
- Thickening of the sludge up to five times higher than in the biological SBR reactors
- Storage of the sludge in a liquid form

The stabilized sludge will be pumped out and sent to a sludge dehydration unit with capacity of 70% dry content. In order to reach this high dryness, the unit used will be the filtration bag technology. The sludge will enter the unit, the bags will hold up the sludge and the water will pass through the bags. Once the bags are full, they will be stored outside in order to dry out up to 70% of dryness.

The filtration bag technology is the best known on the market in order to reach high dryness capabilities and is suitable for installations handling up to 200 m³/d of domestic wastewater. An illustration is given below.

Figure 23: Example of the filtration bag technology proposed for the sludge treatment on site

5.3.10.3.6 Tertiary treatment of treated water

The treated effluents from the biological reactors will be polished with a microfilter unit in order to remove the last suspended particulate matter. This prior step is important in order to provide high efficiency for the bacterial removal.

After microfiltration the effluents will pass through a UV disinfection system in order to destroy bacteria, eggs and viruses.

Once the water is disinfected, it can be released to the sea according to the local regulations or reused as proposed either as industrial water or, if really necessary, to produce drinking water through the specific Reverse Osmosis treatment units.

The industrial water storage envisaged is of 400 m^3.

5.3.10.4 Main Concept Design working principle (Rainwater/Stormwater Treatment for reuse or discharge)

The stormwater to be treated and reused will be collected from the zones illustrated below, which exclude the new runway due to topographical constraints.

In accordance with the General Principle diagram (Figure 20), rainwater harvested from the roofs of buildings will be treated for reuse in priority to produce drinking water for the airport. This rainwater will be supported by the stormwater collected in the buffer storage pond for the drinking water production.

For the drinking water production, it is envisaged the implementation of 2 reverse osmosis units after an adequate pre-treatment consisting of at least a drum filtration and a sand filtration.

The drinking water produced will be stored in the existing storage of 400 m^3 already connected to the water distribution facilities of the passenger terminal building.

The stormwater collected in the buffer storage pond will top up the rainwater harvested, if necessary, for drinking water production. Otherwise, it will be used for industrial water production. The excess will be discharged at sea.

The rainwater storage envisaged is of 400 m^3 (refer to the General Principle diagram - Figure 20).

Figure 24 below shows the catchment areas according to the topography.

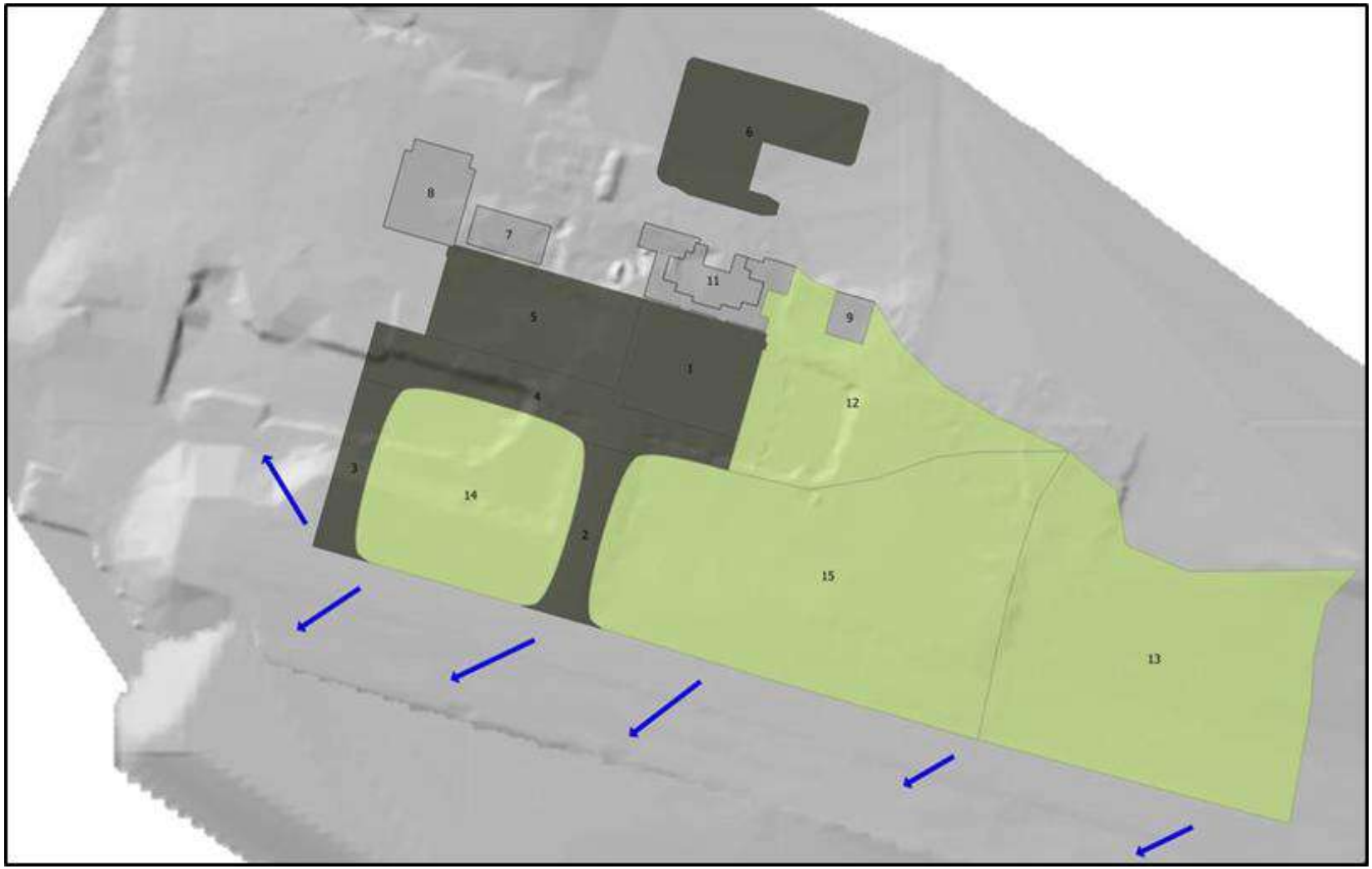


Figure 24: Zones for rainwater/stormwater collection for treatment and reuse

5.3.10.5 Main Concept Design assumptions and characteristics for the stormwater drainage management on the new runway towards Anse Quitor

The drainage system defined in the impact study replaces those proposed in the preliminary design in order to better take into account the issues associated with potential impacts on the natural environment and the reuse water network.

The design of the stormwater drainage system covers both quantitative (flows and volumes of water flowing on site and discharged to the natural environment) and qualitative (quality of water discharged to the natural environment) aspects.

On the quantitative side, the main issue is to protect the facilities against flooding. Since runoff is ultimately discharged into the ocean, and in the absence of issues vulnerable to downstream flooding, reducing the volumes of discharged water is not that essential. However, a particular attention is paid to the choice of final outlets in order to limit the concentration of the volumes of discharged water and to keep them away from sensitive sites, particularly the identified caves.

The main issue is therefore based on the quality of the discharged water, which is likely to have a strong impact on the end receiving environment (the lagoon). The aim is to treat chronic or accidental sources of pollution and to limit the supply of materials resulting from the erosion of drained catchment areas.

The stormwater drainage system is to be divided into two distinct sub-networks due to the general topography of the project:

the first one, to the South, is to manage stormwater from the new runway and its surroundings, with gravity outflows to the lagoon south of the runway and Anse Quitor,
the second one, to the North, is to manage rainwater from buildings, stormwater from car parks, taxiways and their surroundings, with a natural outlet to the west, towards the existing boat house. This drainage system will feed the water re-use process as indicated in the above scheme.

5.3.10.5.1 Stormwater drainage of the airport installation, to the North of the new runway

To the North of the future runway, stormwater from the airport facilities (including collecting roofs, roads, parkings, taxiways and part of the existing runway and the natural watersheds overhanging) is collected to a retention basin to buffer peak flows and supply the stormwater reuse network.

The outlet of the roads, parkings and taxiways stormwater network will be equipped with an oil separator designed to collect and treat upt to 20% of the flow generated by a 2-year return period rainfall. The outlet of this network is also equipped with a first storage works associated with a valve to isolate the flow from the natural environment in the event of a pollution (leakage of polluting liquids, water from fire fighting, etc.).

As no risk of flooding associated with rainwater discharge has been identified, the main objective of the buffer tank is to reduce pollution and sedimentation to the lagoon, thus protecting biodiversity, corals and white sandy beaches.

The buffer tank is therefore to be sized to contain a 2-year return period rainfall with a leakage rate of 10L/s/ha of drainage area. If the soil allows it, infiltration will be preferred. A sea outfall

is to be implemented for discharging at sea the excess water that cannot be reused. The sea outfall for excess stormwater is to be implemented tentatively in the zone of the existing boat house and new sea rescue facility, in common with the sea outfall of the Waste Water Treatment Plant.

However, the sizing of the collect system and of the buffer tank will have to take into account the evolution of rainfalls associated with the climate change. A higher intensity of the 2-year event obtained by the current rain data of Rodrigues will be considered in the detail design phase depending on the climate change prediction in the region.

5.3.10.5.2 Stormwater drainage of the **new runway** and associated taxiways

The stormwater drainage of the **new runway** and associated taxiways is to be designed to collect the first flows of runoff loaded with potential pollutants in a watertight network, connected with oil separators and sedimentation works. The outlet of this network is also to be equipped with a storage capacity associated with a valve to isolate the flow from the natural environment in the event of a pollution (leakage of polluting liquids, water from firefighting, etc.). All these structures will be designed to collect and treat up to 20% of the flow generated by a 2-year return period rainfall.

Over and above these first flows, the water is to be evacuated away from the runway to avoid any risk of flooding.

To the North of the runway, a large ditch will collect its flows. It will also collect runoff from the excavated hillside created by the project that could flow to the runway in the absence of such existing works (cut-off drain). The ditch will be vegetated, wide and shallow, in order to reduce flow velocities and spread water; this will allow to:

- facilitate the natural infiltration of water if the soil allows it,
- reduce transfer times to the natural outlet,
- reduce the risk of erosion and the transfer of materials to the lagoon.

This ditch will be divided into several linear sections to create different evacuation points to the ocean, to the South of the runway, via structures passing under the runway. All these works will be sized at least for a 50 year return period rain event.

The sizing of the leak-tight collectors could be increased over 20% of the 2-year event rainfall if necessary in the detailed design phase in order to limit the use of the infiltration system which can be subject to failures and sinkhole collapse if used too frequently. Indeed, water and sewer systems in karst areas are prone to failure caused by small leaks that create minor subsidence, which then leads to major drainage system failure.

Moreover, as for the stormwater drainage of the airport installation, the sizing of the collect system and of the buffer tank will have to take into account the evolution of rainfall associated with the climate change. A higher intensity of the synthetical rainfall events obtained by the current rain data of Rodrigues will be considered in the detail design phase depending on the climate change prediction in the region.

On the southern part of the runway, flows will be in free runoff over the grassed shoulders and will flow to the ocean.

The project has been designed to evacuate the stormwater avoiding the sensitive points of caves, and favours multiple discharge points to the ocean to avoid concentration effects in the

receiving environment. In addition, the first runoff is collected in leak-tight collectors and treated before discharge. However, we do not know the sensitivity of the receiving environments and do not have the means to quantify the impacts.

These principles are presented on the illustrating figures hereinafter.

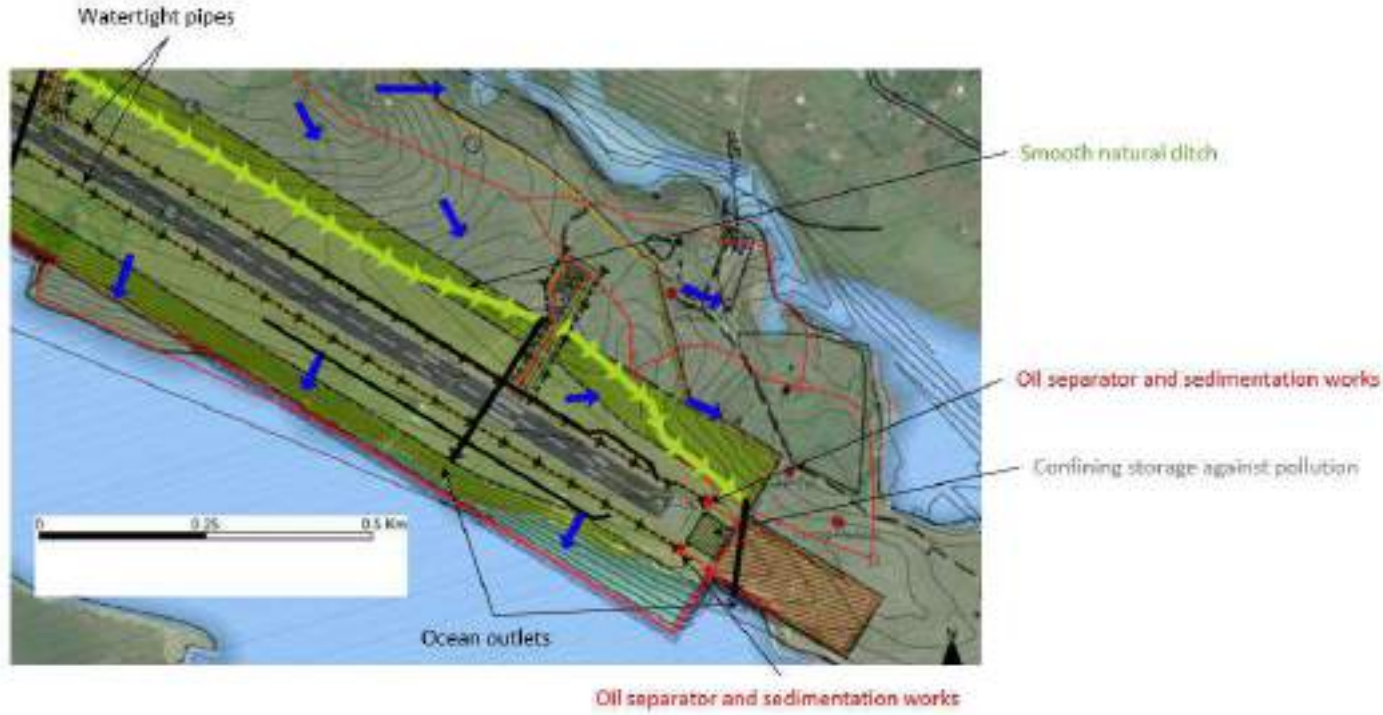
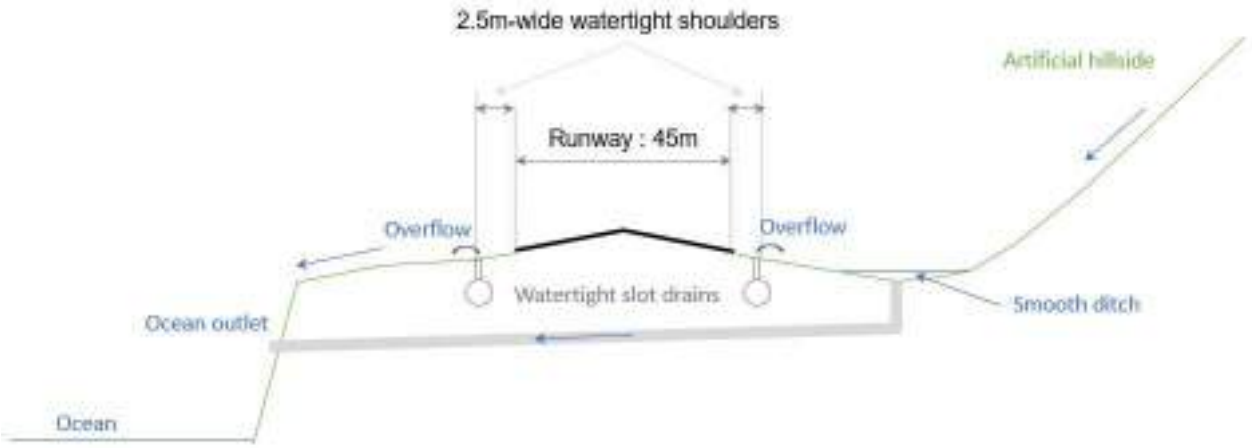


Figure 25: Schematic diagram of the stormwater network



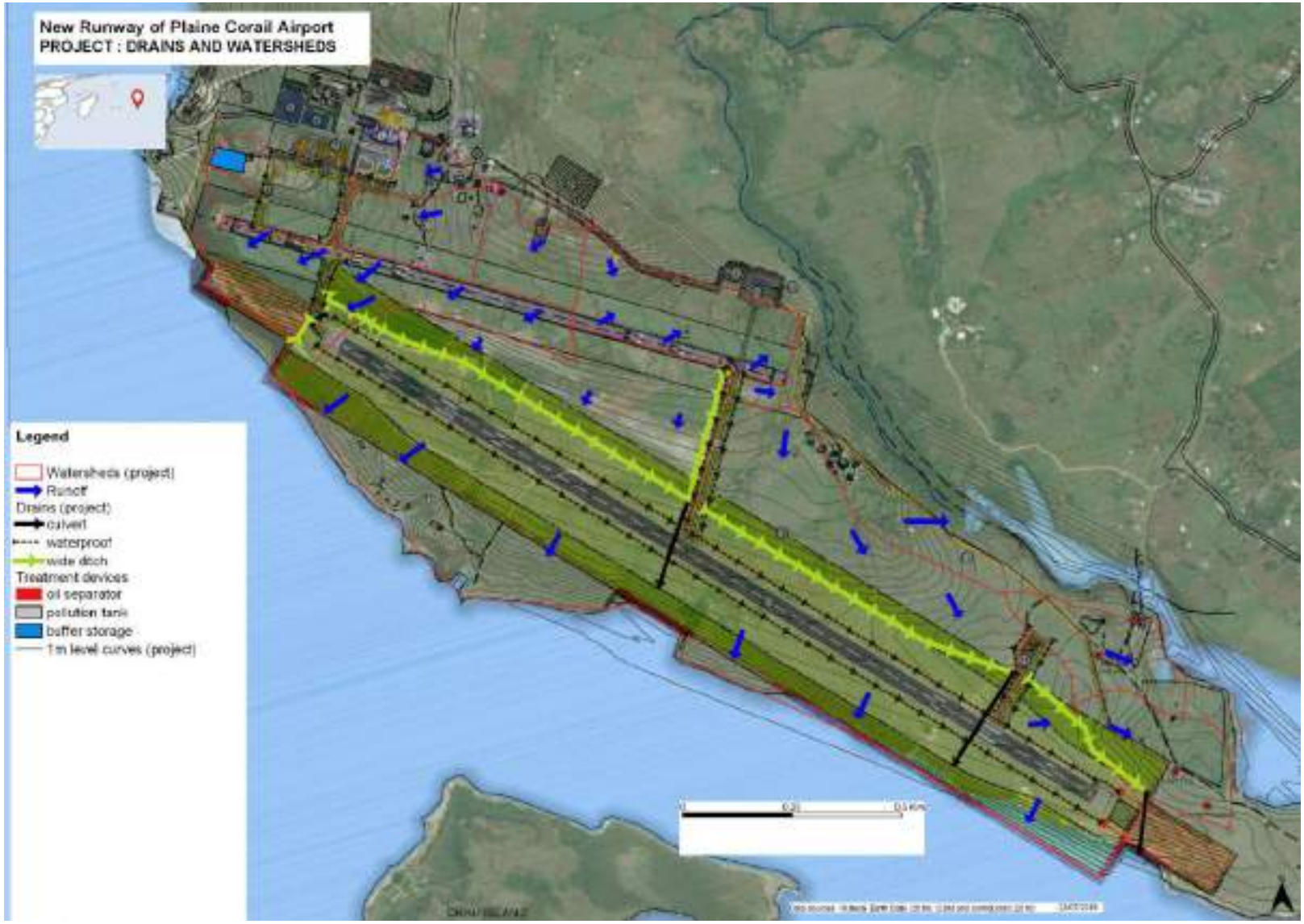


Figure 26: Projected watershed and stormwater network

5.4 Cost and investment

The project's preliminary cost estimated as per Design of 2019 is **MUR 3,923,013,815.00:**

Description	Amount (MUR)
Preliminary and general itms (20%)	**622,700,604**
Airport Aairside Infrastructure and Facilities	**2,764,082,809**
Including Earthwork	
Pavement	
Drainage	
Markings and AGL, Floodlighting, Control Systems	
Permeter, Service Roads, Gate Post and Fencing	
Lanscaping works	
Building works	**152,340,840**
Including Meteo	
Boat haouse and facilities	
Fire station	
Quarantine,	
Power center	
Cold storage building	
Incinerator	
Control Tower building	
Civil and utility works	**57,531,602**
Including new access road	
Car Park	
Power supply system	
Water supply system	
Sewer system	
Air Navigation Facilities	**129,867,770**
DayWorks	**9,680,000**
Contingency sum (5%)	**186,810,190**
TOTAL	**3,923,013,815**

The financial update will be undertaken in the light of the information provided by the client and Main Consultant.

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5.5 Projected traffic

5.5.1 Passengers traffic

The feasibility report prepared by Ecorys in 2011 contained forecasts for future passenger traffic over the period 2011-2031. These forecasts were based on a range of economic considerations and tourist segments and thus annual growth rates vary during the forecast period as different segments of the market are forecast to develop at varying rates.

Considering a new 2,100 m long runway and international routes to be developed, it was forecast that the passenger arrivals (and hence departures) would grow from approximately 61,000 (consisting of approximately 54,000 by air and 6,600 by sea) in 2010, to 137,500 in 2031, an annualised compound growth rate of 3.95%.

However, passenger arrivals by air over the period 2010 - 2017 are shown below, and it can be seen that these have increased faster than expected.

Table 22: Statistic passenger arrivals

Year	2010	2011	2012	2013	2014	2015	2016	2017
Passenger arrivals	54,017	59,456	62,114	63,543	66,196	80,463	91,004	96,812
Annual growth		10.07%	4.47%	2.30%	4.18%	21.55%	15.00%	8,69%

Among the 96,000 passengers arriving per year, there are currently 78,000 tourists, and thus 18,000 Rodriguese passengers.

It is unlikely that air passenger traffic will continue to increase indefinitely but rather that it will be constrained by the size of the population, available resources and the capacity of the island's infrastructure, improved as necessary, to support tourist activities.

This point was encapsulated in the 2009 Sustainable Integrated Development Plan for Rodrigues (SIDPR) Report where, in section 16.4, it was noted that "*the exact number (of tourists) that Rodrigues could welcome would ultimately become a policy trade off (balancing economic and social sustainability against environmental sustainability)*".

The objective of RRA is to host 100,000 tourists per year in 2025. It is expected that the Rodriguese passengers will see a very small increase by this time.

It is therefore considered that for the purpose of airport planning, the number of arriving air passengers forecast by Ecorys for 2031, 137,500, should be maintained with the growth rate between the actual passenger arrivals in 2017 and the forecast numbers for 2031 adjusted to achieve this. The consequent adjusted annual compound growth rate is 2.54%.

The resultant forecast passenger arrivals are shown below and are compliant with the RRA tourism objectives.

Table 23: Forecast of passenger arrivals

Year	Actual Passenger Arrivals	Forecasted Arriving Passengers
2010	54017	
2011	59456	
2012	62114	
2013	63543	
2014	66196	
2015	80463	
2016	92530	
2017	96812	
2018		99271
2019		101793
2020		104378
2021		107029
2022		109748
2023		112535
2024		115394
2025		**118325**
2026		121330
2027		124412
2028		127572
2029		130812
2030		134135
2031		137542

5.5.2 Air traffic

The Preliminary Design Terms of Reference required the facilities to be designed to cater to A320 neo/A321 neo and B737-800 aircraft. Air Mauritius currently operates the A319-100 variant of the A320 aircraft and is planning to operate either the A320neo or the A321neo in the near future, whilst the B737-800 is, or is expected to be, operated by other airlines in the region.

Based on the assumption that 80% of all departures will be carried out by A321 neo and 20% by B737-800 aircraft and that the growth rate in aircraft departures will mirror that in passenger departures, i.e. 2.54%, the number of aircraft departures to be catered to at the pavement design horizons are set out below:

Table 24: Forecast aircraft departures

Design year	Cumulative total of forecasted aircraft departures		
	A321 neo	B737-800	Total Departures
Inauguration + 15	9,352	2,683	12,035
Inauguration + 20	13,337	3,827	17,163
Inauguration + 30	22,975	6,592	29,568

Airline flight schedules are typically based on two seasons per year, April – October and November – March, with additional flights to cater to expected peaks. The monthly passenger movements, as a percentage of the annual total, derived from analysis of the actual arrivals/departures for 2010-2016 is shown below:

Table 25: Average percentage of annual passenger departures per Month

Month	Average percentage of annual passenger departures
January	9.48 %
February	5.05 %
March	6.09 %
April	9.06 %
May	6.86 %
June	5.31 %
July	8.91 %
August	9.07 %
September	5.78 %
October	8.20 %
November	10.46 %
December	15.73 %

As can be seen there are significant variations in the monthly departures within the typical airline schedule periods, ex. December departures being three times those of February.

5.5.3 Cargo

An A321 aircraft can take about 4 tons of cargo on board.

Cargo projected traffic is not available yet.

For the time being, it is planned to use the transport capacity of passenger aircraft and not to charter aircraft specifically for air freight.

Table 26: Forecast Aircraft Departures for 2021 – passenger traffic

Aircraft Type				A321 neo			B737-800			Forecast Weekly Flights for Mixed Fleet*
Month	Average Percent of Annual Departures	Monthly Pax Departures	Average Weekly Departures	Weekly Flights Required (90%)	Forecast Weekly Flights	Forecast Monthly Flights	Weekly Flights Required (90%)	Forecast Weekly Flights	Forecast Monthly Flights	
January	9.40%	10,059	2271	13.64	14	62	15.77	16	71	14
February	5.05%	5,409	1352	8.12	8	32	9.39	9	36	8
March	6.08%	6,508	1469	8.83	9	40	10.20	10	44	9
April	9.07%	9,711	2266	13.61	14	60	15.74	16	69	14
May	6.84%	7,322	1653	9.93	10	44	11.48	12	53	10
June	5.28%	5,656	1320	7.93	8	34	9.16	9	39	8
July	8.98%	9,608	2169	13.03	13	58	15.07	15	66	13
August	9.11%	9,748	2201	13.22	13	58	15.29	15	66	13
September	5.82%	6,232	1454	8.73	9	39	10.10	11	47	9
October	8.12%	8,693	1963	11.79	12	53	13.63	14	62	12
November	10.58%	11,323	2642	15.87	16	69	18.35	18	77	16
December	15.66%	16,761	3785	22.73	23	102	26.28	26	115	24

„* Mixed Fleet is 80% A321 neo + 20% B737-800

5.6 Construction Activities

As the project is only at the Preliminary Design stage, the construction phase has not been described yet. Only some principles are known.

Precise methods, phases and organizations will be described in the Detailed Design, following the recommendations of the Environmental and Social Management Plan provided as a last chapter of this ESIA.

5.6.1 Earthworks and construction above voids

The existing voids located in the runway and project footprint need to be filled prior to proceeding to the earthwork and infrastructures construction.

Voids of less than 1 meter wide could be compacted instead of filled with concrete, in order to avoid risks of polluting the karstic system with liquid concrete spills.

The Sainte-Marie Hill could be demolished using dynamite except if environmental issues are raised against the method.

Earthmoving methods and their relevance to the different locations on the site are described in Chapter 7.2.1.3.1 (Earthworks in the new proposed runway area).

The earthworks and their predicted impacts and associated measures are described in the following sections of Chapter 7.2.1.3, and then in Chapter 7.3.1.3.

5.6.2 Demolitions

Buildings must be demolished for project purposes. These are the buildings located within the project footprint:

- Dwellings,
- Agricultural buildings,
- Fisheries buildings.
- Different demolition techniques could be used:

Manual demolition using picks, weights and pneumatic hammers. This method is accompanied by significant nuisances, however, since the site is far from inhabited areas and demolitions concern specific buildings, this method could be acceptable for part of the demolitions.

Demolition with mechanical mini engines. Made from excavators equipped with a bucket or a rock breaker, this technique is suitable for low-rise buildings, type R + 1. The vibrations generated are potentially higher.

5.6.3 Marine works

The current design requires approximately 2.7 ha of land to be reclaimed. The current reclamation approach considered the construction of a marine rock revetment wall. The details of the marine works are yet to be finalized.

5.6.4 Works main facilities

5.6.4.1 Worker's installation

As about 400 workers will be needed for the works and a part of them will come from Mauritius or other countries, a **workers' camp** will be erected for the workers.

The location of the site establishment and workers' camp is not known to date. The impact assessment of such facilities will be discussed with the Consultant responsible for drafting the Terms of Reference for the Tender for construction.

5.6.4.2 Work site supply

The work site will be supplied by sea, arriving in Port Mathurin and then by road from there to the airport. Because of the shallowness of the lagoon's seabed, direct supply by sea is not an option.

The road used will be the coastal one, which directly arrives on the projected runway site and Sainte-Marie Hill. The section of this road crossing Anse Quitor and arriving to Saint-Marie will have to be resized and strengthened to make the circulation of trucks possible.

Electricity supply will be provided by the same electrical centre supplying the airport.

Water supply, estimated to be around 40 m^3 per day, might not be possible from the public reservoir if the works' needs are too important. Therefore, the Terms of Reference for the contractor will include the provision of a desalination plant and minimum measures that will need to be complied with will be stipulated in the final ESIA and ESMP.

The following assumptions are made regarding the anticipated temporary desalination plant that is required during the construction phase:

The water desalination plant will be a pre-fabricated and pre-tested reverse osmosis unit designed to produce 20 m^3/day. To date, assumptions have been made on the water characteristics which will be confirmed at the end of the detailed design. The desalination plant may be constituted of:

- A prefiltration system equipped with:
  - a pump
  - a sand filter to remove particles up to 80 µm.
  - a microfiltration system to remove particles up to 5 µm
  - an anti-fouling dosing to prevent co-precipitation on the membrane surfaces
- A reverse osmosis system equipped with an energy recovery system with pressure exchanger that does not require any electric energy, working at an efficiency of about 95 percent and practically maintenance free.

A 35 percent recovery rate is expected.

Special attention will be put on the brine discharge and disposal. One recommendation in the Terms of Reference for the provision of the desalination plant could be a zero liquid discharge of the brine, which will potentially allow for the production of salt on site. As such brine could be treated through an evapo-concentrator-condenser-crystallizer instead of being diluted and rejected in the natural environment.

This is fully in line with the integrated management plan that aims at optimizing the different water uses.

The potential impacts associated with the desalination plant and potential mitigation and management measures will be further assessed as part of the final ESIA and ESMP

5.6.4.3 Works plants and buildings

It is assumed that the construction works will require an in-situ asphalt plant and a concrete batching plant rather than transporting the material from an off-site plant.

However, no information is available to date and hence the assessment will be done once the design is more advanced and tender requirement are worked out.

Likewise, it is assumed that basic workshops will be required for the maintenance of equipment.

The siting/parking of plants and equipment will have to be validated upon receipt of the contractor's site establishment layout plan.

The final ESIA and ESMP will include the relevant management requirements to assess and mitigate anticipated impacts associated with the infrastructure required for construction purposes.

5.6.4.4 Construction waste and solid waste management

Construction waste such as cement, blocks, etc is usually used as backfilling material for construction, if found suitable.

Other construction waste such as metal scrap, plastic, glass, paper, wood, etc sill be sorted and carted away/treated in line with available solid waste management in Rodrigues.

Export of waste to Mauritius for recycling may be considered.

5.7 Ancillary facilities

5.7.1 Ground service equipment

The currently operating ATR72s power-in & power-out from the stand and have their own in-built passenger steps. Luggage is man-handled from ground level. The requirement for GSE is limited therefore to ground generation. Refuelling tankers are rarely used as most of the current flights carry sufficient fuel for the return trip.

To comply with larger aircraft starting up operations, aircraft tugs / access steps / fuel bowsers / baggage conveyors and hoists are then required. All this GSE will require garaging and servicing, normally provided by a dedicated GSE building.

This increased activity is planned to be housed in the new airport's buildings and facilities, and no specific construction is planned.

5.7.2 Security

The current low level of operations and little numbers of staff and visitors on the site result in a self-secure operation in the sense that most individuals are recognised or categorised. There is a CCTV security system installed and the perimeter fence is regularly checked with repair / replacement undertaken immediately. The proposed increase in activity at the airport will

increase the risk of a security breach and so an extension of the current CCTV coverage and an increase in security patrols is recommended.

6 Environmental and social baseline conditions

6.1 Scoping and methodology

6.1.1 Scoping

The ESIA has been carried out in accordance with the Mauritius Environmental Protection Act 2002 and with the requirements of the World Bank Environmental and social Framework .

The purpose of the ESIA is to identify the environmental issues which could have been directly or indirectly impacted by the project. In order to highlight the main themes to be studied, some experts have been consulted. This methodology allows the study to focus on the effective potential impacts of such an airport project and helps to determinate the level of the investigations to carry out on the different subjects.

The following tasks have been undertaken:

- Desk review of available data,
- Site investigations,
- Consultations with interested parties,
- Consultations with specialists.

The project is an existing airport extension, thus the project area already is an airport site. The environment is open, very sparsely populated, and essentially used for extensive agriculture and fishing. There are no forests nor swamps in the area.

The specific issues related to the type of project are air quality and noise, terrestrial flora and fauna, including birds, topography and landscape, and displaced populations.

The island and coastal context of the project also requires a specific focus on the natural and hydro-sedimentary marine environment and meteorological conditions.

Finally, the original geological and hydrogeological context linked to the presence of a karst sedimentary formation above a volcanic basement means that particular attention must also be paid to the risks associated with ground movements and groundwater resources.

In addition, the following subjects were the subject of campaigns to recognize the existing system:

- Terrestrial natural environment (field investigation carried out in April 2019)
- Marine natural environment (field investigation to be carried out in May-June 2019)
- Hydro-sedimentary context (field investigation to be carried out in May-June 2019)
- Hydrology and water management (field surveys to be carried out in May 2019)
- Socio-economic context (field survey carried out in April 2019)

As the geotechnical context has been recently investigated, no complementary field investigations were carried out.

6.1.2 Baseline issues assessment methodology (receptor sensitivity)

The first step is a presentation of the general state of the island of Rodrigues. This global presentation aims to define the current state (baseline) of the island, before the potential implementation of the project. It is therefore a description that takes into account several themes (physical context elements, natural context elements...).

The final objective of this exercise is to highlight all the "receptors" which could be affected, directly or indirectly, by the implementation of the project.

For each of these receptors, sensitivity was assessed according to the importance of the issue and its vulnerability.

In the context of this social impact assessment, and in order to adapt as precisely as possible to the local context of Rodrigues Island, the sensitivity of the receptor was judged in particular on the basis of the results of consultation meetings with local stakeholders, taking into account the importance given to them by local communities and authorities.

Thus, at the end of each section of the initial state, the issues are listed and their sensitivity is assessed and rated using the following methodology: 1 "low", 2 "medium", 3 "high" or 4 "major". To make reading easier, a gradient of blue is associated with each score to make the report more readable.

The higher the importance of the issue, the more intense the shade of blue.

Table 27: Receptor sensitivity

Receptor sensitivity	Low	Medium	High	Major

6.2 Area of Influence

Several areas of influence (AoI) have been defined to establish the baseline of the project's site. Each component of the environment is contextualized at the scale of the Island or the Indian Ocean according to the themes, then examined at the scale of a "large area of influence" and finally, if necessary, at the scale of a "restricted area of influence".

The "large area" includes the airport and its remote surroundings, which are known to be influenced by the direct and indirect impacts of the airport. The "restricted area" is the project footprint's direct surroundings, which are considered potentially directly impacted by the project.

The project's footprint is included in the restricted area.

Specific areas of influence had to be defined for some of the baseline components:

the areas of influence for the terrestrial and marine natural environment are designed to adapt to the targeted species and ecosystems,
the socio-economic area of influence is designed to adapt to the boundaries of the villages and areas used by the affected inhabitants or for the resettlement of displaced populations.
At the beginning of each section, the area of influence applied is specified.

Figure 27: Area of influence (to be updated at final ESIA stage)

6.3 Physical environment

6.3.1 Area of influence

The area of influence for physical context is mapped in Figure 27. The terms large and restricted area of influences discussed previously are used.

6.3.2 Geographical overview

Rodrigues, like Mauritius or La Réunion, is an island of volcanic origin belonging to the Mascarene Islands. Located in the South Western Indian Ocean near the southern end of the Mascarene Ridge, it is 18 km long, 6.5 km wide and covers a surface area of 108 km².

Rodrigues' capital city is Port Mathurin, located at the opposite corner of the island from Plaine Corail, in the northeast.

Rodrigues Island strikes E-W. Although of modest elevation (the highest peak, Mount Limon, rises to 398 metres), the island has a general mountainous topography. This mountain separates alluvial plains to the north and south. The island is organized around a central ridge in a west-southwest direction, from which steep ravines radiate. The valley bottoms usually remain dry and are only affected by torrential flows during heavy cyclonic rains.

However, the southwestern part of the island is dominated by a karst plain of coral sandstone over an area of about 10 km².

The island is surrounded by a large coral reef, located between 50 m and 8 km from the coastline. This immense lagoon is generally shallow. It is dotted with several islets which emerge from it.

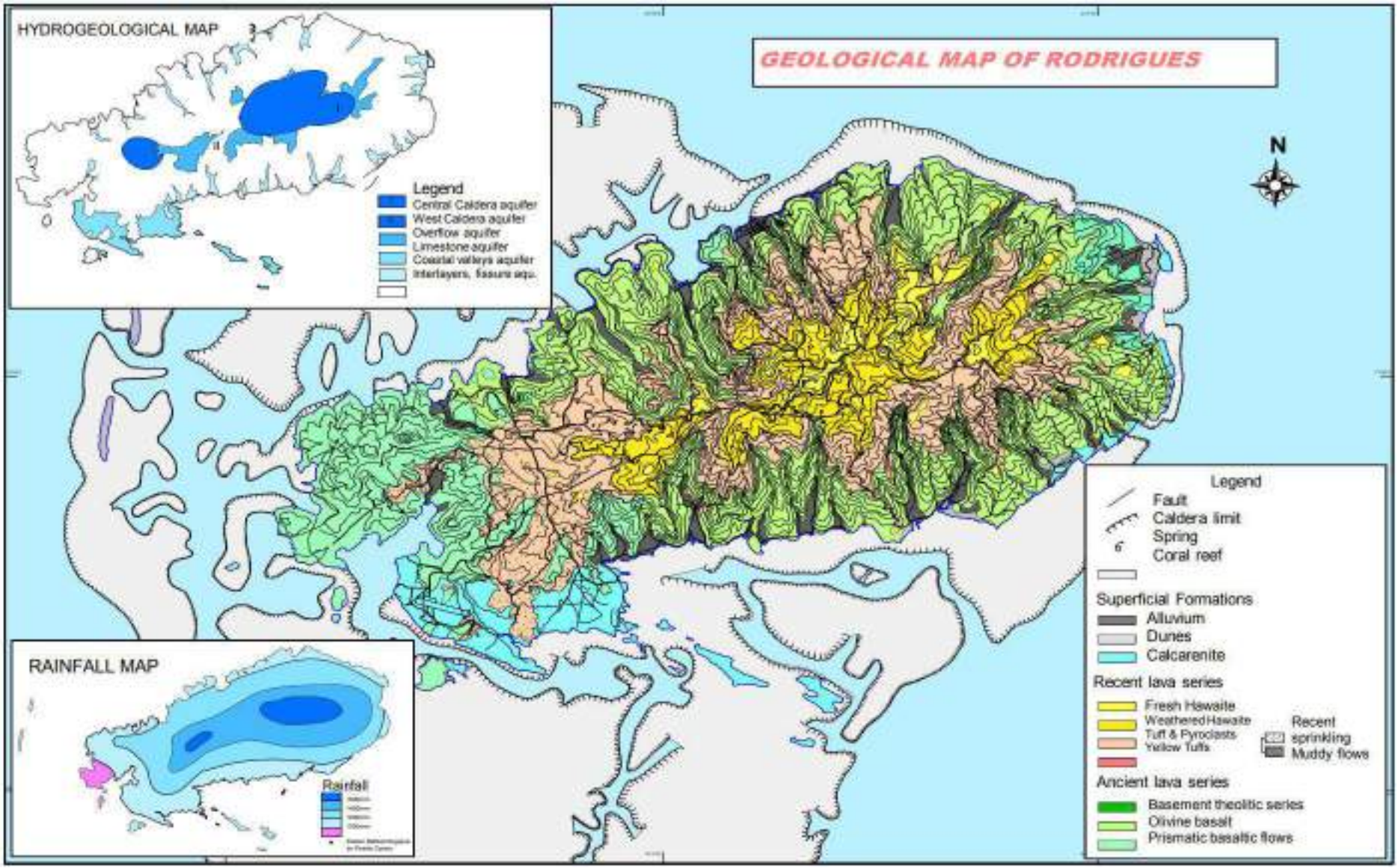


Figure 28: Geographical overview of Rodrigues Island

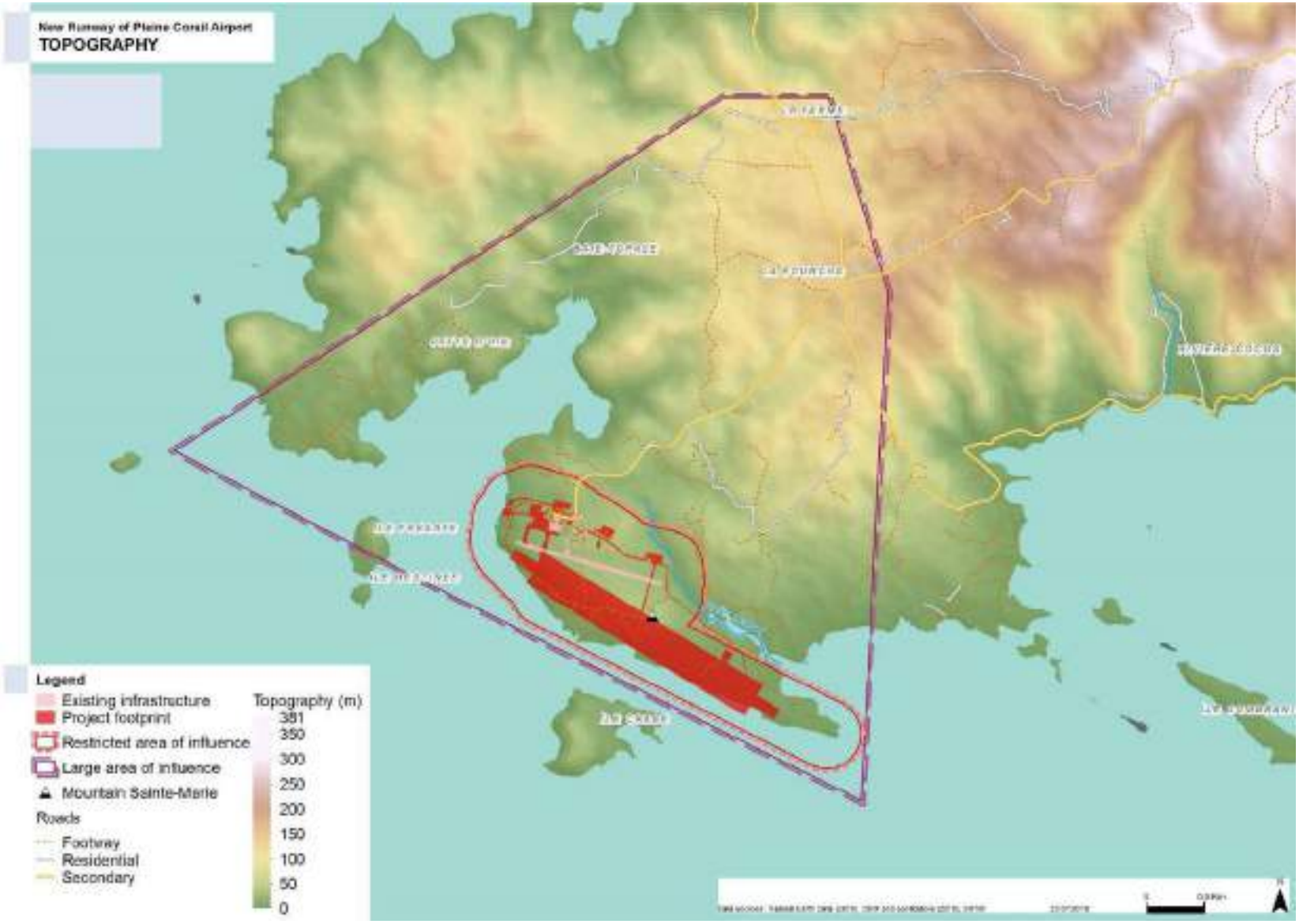


Figure 29: Topography of the area of influence

6.3.3 Climate and marine and terrestrial meteorological conditions

The purpose of this chapter is to present, in a traditional way, the particular climatic and meteorological conditions of the Island of Rodrigues linked to its geographical location. However, its purpose is also to present precisely the wind, current, swell, waves, and water level conditions, as well as the situation in terms of extreme events.

Indeed, since the project involves significant earthworks and a modification of the shoreline, it is important to be able to analyse its impacts on marine currents and sedimentation, as it may have impacts on the marine life of the reef and the balance of erosion phenomena.

This baseline is an input for the hydro-sedimentological modelling planned for impact analysis.

It is also important to analyse the risks associated with the arrival of large aircrafts on this island, which is sometimes subject to extreme weather conditions.

A numerical coupled wave–current–sediment transport model (horizontal two-dimensional approach, 2DH) is built and exploited in order to simulate flows, waves, sediment transport, winds and their mutual interaction with the reef; simulations are performed during its current state, considered as the baseline conditions.

6.3.3.1 Numerical hydrodynamic modelling

6.3.3.1.1 Hydrofynamic software

Delft3D suite is used to model hydrodynamics. Delft3D suite is a fully integrated computer software suite for a multi-disciplinary approach and 3D computations for coastal, river and estuarine areas. It can carry out simulations of flows, sediment transports, waves, water quality, morphological developments and ecology. It has been designed for experts and non-experts alike. The Delft3D suite is composed of several modules, grouped around a mutual interface, while being capable to interact with one another. Following molules are used in this study:

- Delft3D-FLOW: multi-dimensional (2D or 3D) hydrodynamic (and transport) simulation program which calculates non-steady flow and transport phenomena that result from tidal and meteorological forcing;
- Delft3D-WAVE: wave module of Delft3D computes wave propagation, wave generation by wind, non-linear wave-wave interactions and dissipation, for a given bottom topography, wind field, water level and current field in waters of deep, intermediate and finite depth.
- Delft3D-MORPHOOLOGY: sediment transport and morphology module supports both bedload and suspended load transport of non-cohesive sediments and suspended load of cohesive sediments due to waves and currents;
- D-Water Quality: this module simulates the far- and mid-field water and sediment quality due to a variety of transport and water quality processes.

6.3.3.1.2 Data input

The oceanographic data used in the DELFT-3D model is summarized as follows:

- The large-scale model bathymetry data would be forced from the General Bathymetric Chart of the Oceans (GEBCO) with 0.5° resolution, approximately 430m. Closer to Rodrigues, the GEBCO bathymetry would be supplemented by a thinner data set, approximately 200m, close to the coast and inside the lagoon furnished by the RRA.

- The LEGOS4 produced a global finite element solutions (FES) tidal atlases computed from the tidal hydrodynamic equations and data assimilation. Harmonic constants, amplitude and phase, are extracted in the surroundings of the island
- An analysis was performed by MeteOcean to characterize the meteo-oceanic conditions in the vicinity of Rodrigues. Waves, winds, water height, salinity and temperature statistics are available at a deep water point (2989m from the MSL) located at -63°12'E 20°S, in the South of the island.

6.3.3.1.3 Simulations carried out

In order to point out the impact of the structure, two types of simulation are carried out:

The reference simulation. This is the current situation with no extension of the runway onto the ocean.
The construction phase simulation. The runway is under construction hence the modified topography; turbid flumes are propagated during the construction work.

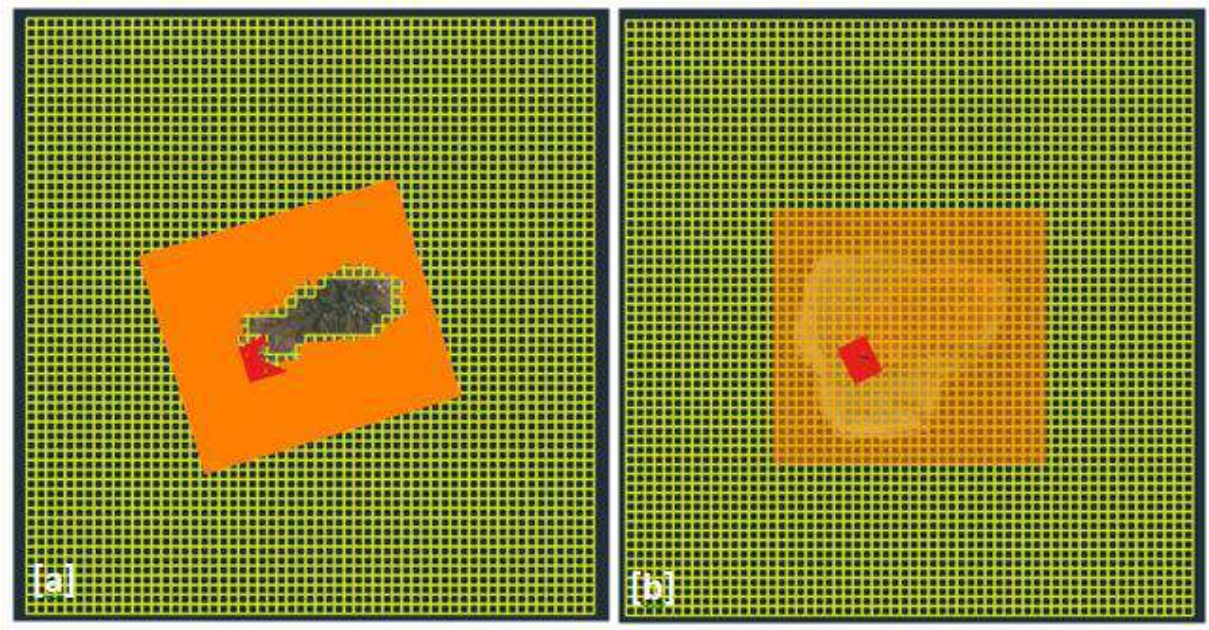


Figure 30: Flow [a] and Wave [b] computational grids

The computational domain of the model is about 42 km wide and 45km long centered on the coral reef fringing Rodrigues. The flow model consists of a 3 levels nested grid of 1000m, 50m and 10m resolution and the wave model is composed of another 3 levels nested grid of 1000m, 250m and 50m resolution.

6.3.3.2 General geographical and climatic considerations

Rodrigues, one of the three Mascarene Islands (the two others are Mauritius and La Réunion), lies near the edge of the southern tropical belt and is free from the influence of large land masses or continents. The climatological regime of the island, characterized as mild tropical maritime, is determined by the alternation of the two seasons: winter from May to October and summer from November to April.

Summer is the rainier and warmer season, during which tropical cyclones occur. February is the wettest month. Winter is cooler and relatively drier. October is the driest month.

[4] Laboratoire d'Etude en Géophysique et Océanographie spatiales

The average annual rainfall over Rodrigues is 1348 mm, which is equivalent to about 150 Mm^3/year for the whole island.

The rainfall increases from 800 mm on the coast to more than 1,600 mm on the summits.

The most frequent natural disasters faced by Rodrigues are cyclones and high intensity rainfall over short periods of time which lead to flash floods or water accumulation.

6.3.3.3 Winds

6.3.3.3.1 Wind pattern in the vicinity of the Mascarene Islands

The wave pattern on the coast of Rodrigues is influenced year-round by two types of persistent winds: south-easterly trade winds and Austral westerly ones; which is caused by the geographical location of the island being near to the Inter Tropical Convergence Zone (ITCZ). There are seasonal variations. The summer season experiences weaker trade winds when the subtropical anticyclones become less intense and migrate towards the pole. In winter, when strong anticyclones pass to the South and close to the Mascarene Islands, trades are stronger and more persistent as they are migrating equatorward and then moving eastwards along the southern high latitudes.

6.3.3.3.2 Wind statistics around Rodrigues

The following distribution rose chart shows the joint probability distribution of wind (magnitude and direction).

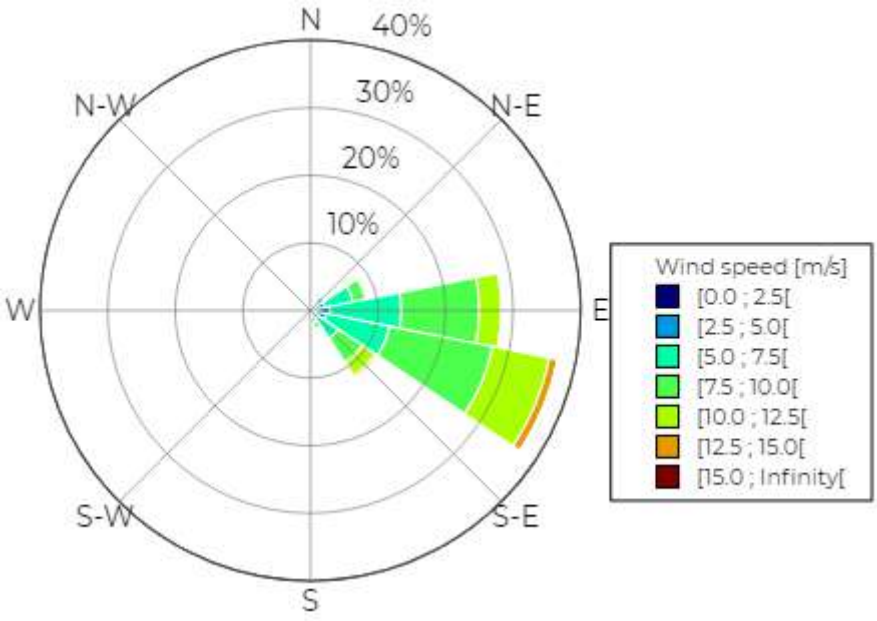


Figure 31: Wind distribution rose (coming from direction) at 10m at point (-63°12'E 20°S)

Most of the wind is coming from the East and South-Southeast directional sector with a mean velocity of 7.68 m/s. During extreme events, such as cyclones, wind gusts can reach a speed of up to 44.03m/s.

Plaine Corail's south side is sheltered from the dominant winds by its coast.

6.3.3.4 Current

6.3.3.4.1 Deep water offshore current

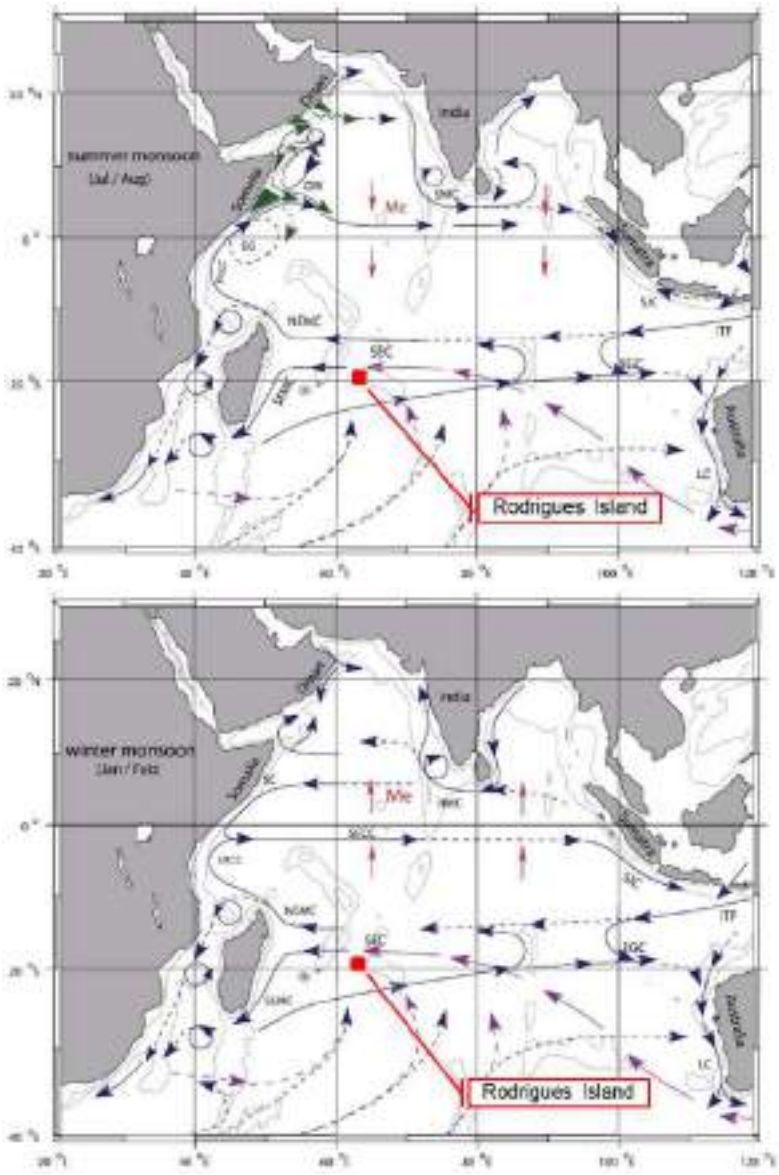


Figure 32: Schematic representations of identified current branches during summer and winter monsoons

The anticyclone winds influence the coastal hydrodynamics and offshore current systems of the island. The strong prevailing South Easterly trade winds increase the current magnitude of the South Equatorial Current (SEC) flowing from West to East throughout the duration of the year and fluctuate between 10 and 20°S in the Indian Ocean (see Figure 32). The speeds of the current increase as it passes through the channels situated within the Mascarene Plateau resulting in the formation of strong gyres on the leeward side. It splits when it reaches Madagascar: one part goes to the North to feed the current in the Mozambique Channel and the East Africa current as the other part flows southwards along the Madagascan coast.

6.3.3.4.2 Current near Rodrigues in deep water

The following distribution rose chart shows the joint probability distribution of the surface current (magnitude and direction).

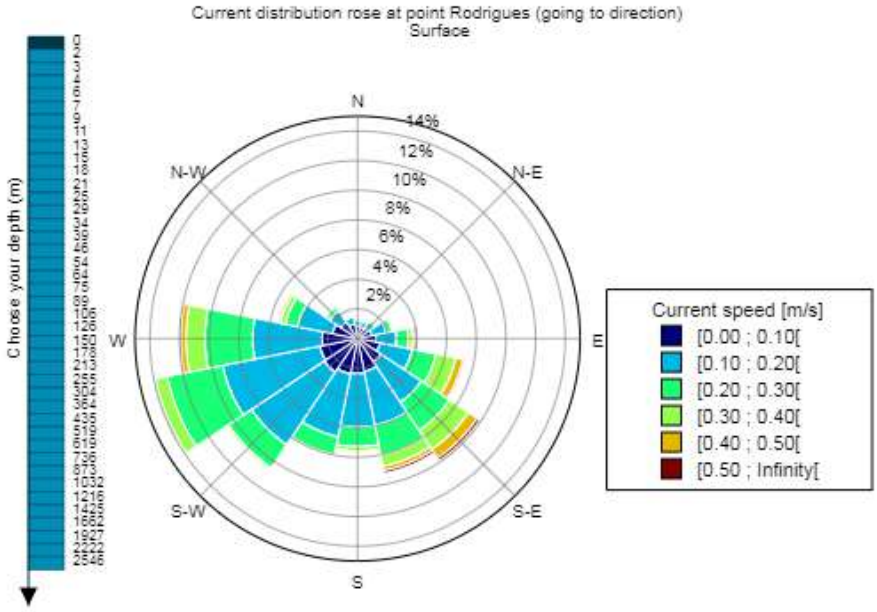


Figure 33: Annual current distribution rose (going to direction) in surface

The mean magnitude of current is 0.17 m/s and varies from 0 to 1.02 m/s. Currents of less than 0.3m/s are the most likely (89% frequency). Most of the magnitude is inferior to 0.3 m/s, 89%. The directional spreading is significant. Directions vary with a predominance of South West – North East currents.

6.3.3.4.3 Current inside the lagoon

The hydrodynamics of the reef lagoon are complex as it is exposed to a broad range of physical events such as tides, waves, winds, river discharge, rainfall, and evaporation.

Density-driven currents have been observed between the lagoon and ocean. Circulation patterns in a lagoon are mainly driven by spatiotemporal variations of hydrodynamic parameters: waves, winds and tides. Bathymetry pass dimensions and lagoonal width to length to depth ratios, as well as the reef structure (size, roughness), also have to be considered.

Tidal cycles have a direct effect on the lagoon water: the lagoon fills during the flow and empties during the ebb, inducing so called “tidal ellipses” (periodically rotating currents). This basic scheme can be significantly complicated by the presence of complex lagoon bathymetry with multiple openings and passages towards the open ocean and neighbouring lagoons. Around Rodrigues, at least three lagoonal passes can be identified in the fringing reef, none of them in front of Plaine Corail.

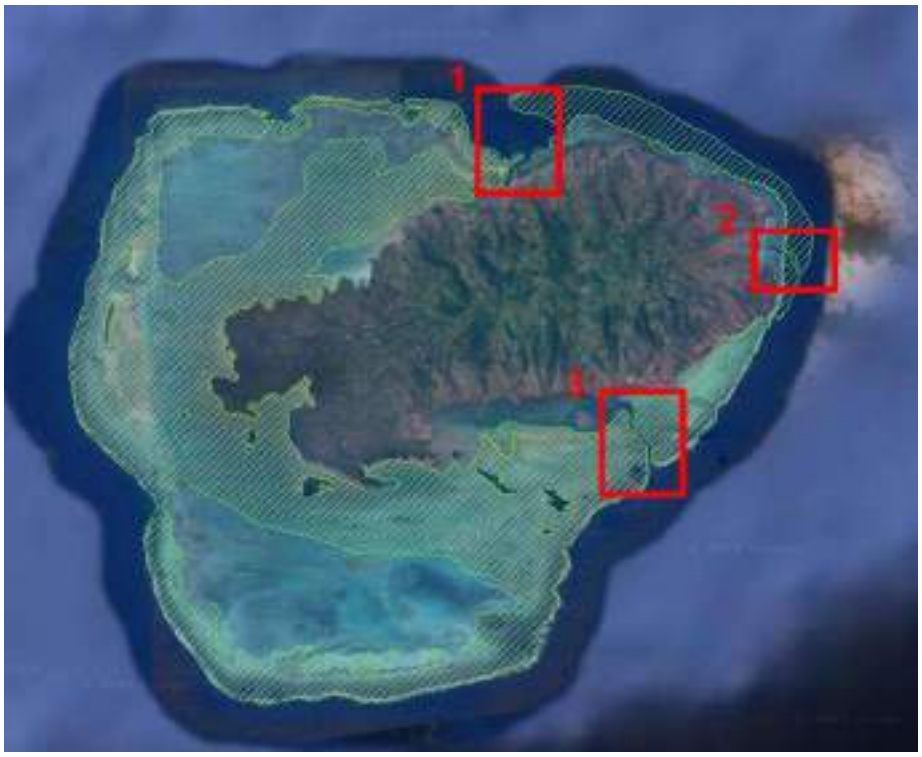


Figure 34: Passes and fringing reef enclosing Rodrigues

The flushing of the lagoon takes place in the pass n°3 causing high magnitude flow, up to 1.0 m/s, oriented to outside the coral reef. Bathymetry varies from 20 cm depth to 26.40 m and connects Anse Grand Var to the Ocean.

Another passe is located in the western part of the reef and participates, to a smaller extent, to the flushing of the lagoon.

Current magnitudes are under the influence of tidal cycles. The gravitational effects of the moon and the sun affect the Earth's tides on a monthly basis and are expressed under two configurations:

When the sun, moon, and Earth are in alignment, the solar tide has an additive effect on the lunar tide, enhancing the tidal signal and generating extra-high high tides and very low low tides – known as spring tides.
When the sun and moon are at a right angle to each other, the solar tide partially cancels out the lunar tide and produces moderate tides – known as neap tides.
During each lunar month, two sets of spring tides and two sets of neap tides occur.
Spring currents exhibit the strongest velocities (see table below).

6.3.3.4.4 Current between Topaze Bay and Anse Quitor

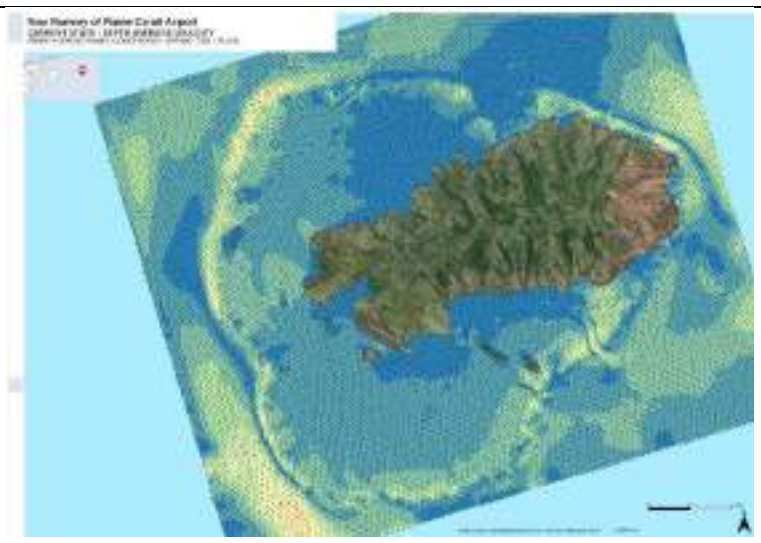
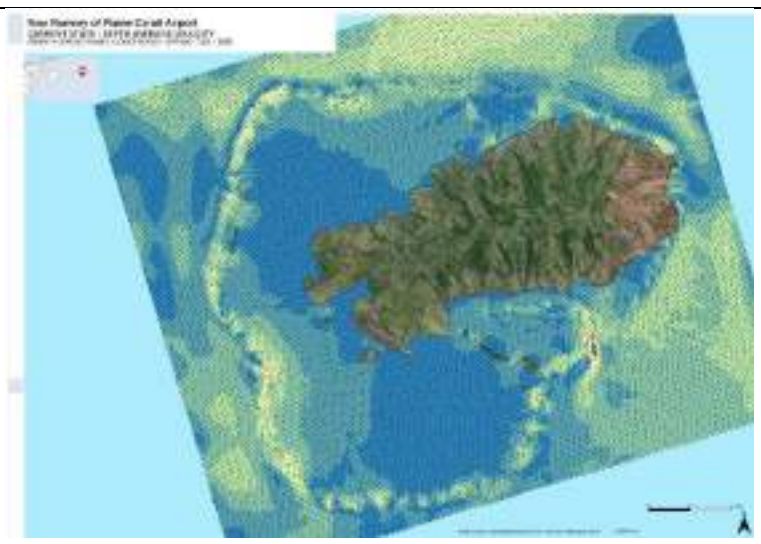
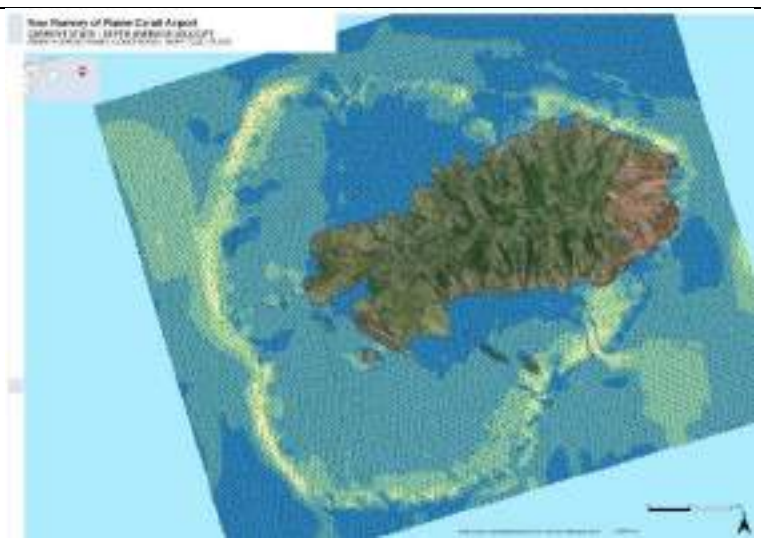
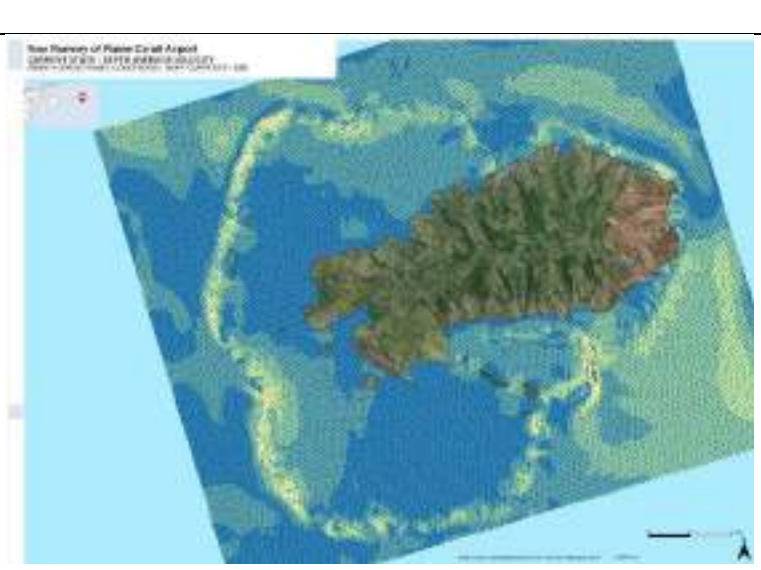
The channels between Crab Island and Plaine Corail, Fregate Island and Destinee Island, Fregate Island and the mainland are a bottle-neck for current: the magnitude increases in this area.

Alongside the runway, currents are flowing from South-East to North-West throughout the duration of the year and fluctuate from almost no magnitude to 0.5 m/s with ebb and flow tide currents. They are tide generated, the wave height inside the laggon being very small. During light wind and strong tide coefficient the current can briefly reverse.

Topaze Bay is away from the main Northwestern current and relatively current free.

Northwesten currents split when they reach Crab Island, its western front constitutes a calm sheltered area.

Table 28: Circulation pattern in the lagoon and at Plaine Corail

	RODRIGUES	PLAINE CORAIL
Spring tide – FLOW **Legend** Project runway,taxiway Existing apron, taxiway, runway Terminal Velocity < 0.1m/s 0.1 - 0.2m/s 0.2 - 0.3m/s 0.3 - 0.4m/s 0.4 - 0.5m/s 0.5 - 0.6m/s 0.6 - 0.7m/s 0.7 - 0.8m/s 0.8 - 0.9m/s 0.9 - 1.0m/s 1.0 - 1.2m/s > 1.5 m/s		
Spring tide - EBB **Legend** Project runway,taxiway Existing apron, taxiway, runway Terminal Velocity < 0.1m/s 0.1 - 0.2m/s 0.2 - 0.3m/s 0.3 - 0.4m/s 0.4 - 0.5m/s 0.5 - 0.6m/s 0.6 - 0.7m/s 0.7 - 0.8m/s 0.8 - 0.9m/s 0.9 - 1.0m/s 1.0 - 1.2m/s > 1.5 m/s		
Neap tide - FLOW **Legend** Project runway,taxiway Existing apron, taxiway, runway Terminal Velocity < 0.1m/s 0.1 - 0.2m/s 0.2 - 0.3m/s 0.3 - 0.4m/s 0.4 - 0.5m/s 0.5 - 0.6m/s 0.6 - 0.7m/s 0.7 - 0.8m/s 0.8 - 0.9m/s 0.9 - 1.0m/s 1.0 - 1.2m/s > 1.5 m/s		
Neap tide - EBB **Legend** Project runway,taxiway Existing apron, taxiway, runway Terminal Velocity < 0.1m/s 0.1 - 0.2m/s 0.2 - 0.3m/s 0.3 - 0.4m/s 0.4 - 0.5m/s 0.5 - 0.6m/s 0.6 - 0.7m/s 0.7 - 0.8m/s 0.8 - 0.9m/s 0.9 - 1.0m/s 1.0 - 1.2m/s > 1.5 m/s		

6.3.3.5 Waves

6.3.3.5.1 General information

Deep sea waves affecting Rodrigues's shores can be generated by the following three meteorological phenomena:

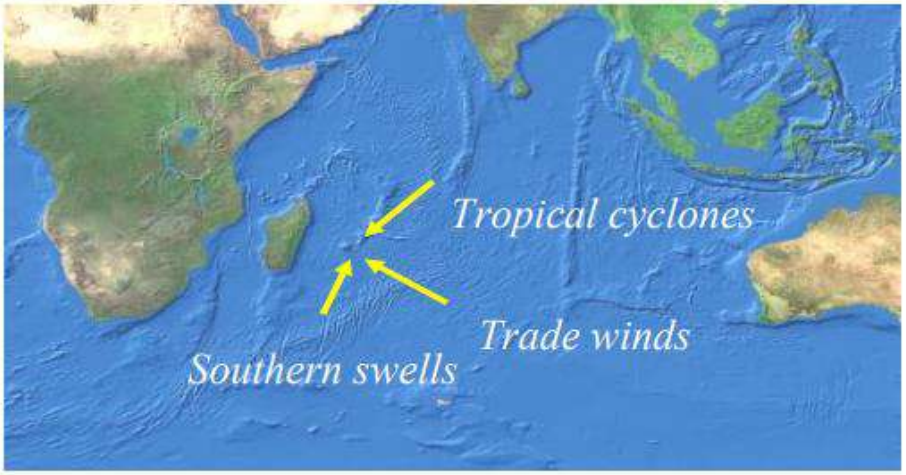


Figure 35: Type of Wave Generation Mechanisms in Mauritius and Rodrigues

Local Generated Waves: waves generated by the south-eastern trade winds in the vicinity of Rodrigues, generally from the East to the South-east direction;
Southern Hemisphere Swells: waves generated by distant storms, as extra-tropical cyclones, that can propagate thousands of kilometres across the ocean with little loss of energy. The swells typically approach Rodrigues from the southwest;
Tropical Cyclones: waves due to tropical cyclones generated in the South Western part of the Indian Ocean. Tropical cyclones can have very high wind speeds and the waves generated can be extremely large. Their characteristics vary for each cyclone (wind speed and track). In general these waves approach the country predominantly from East to North. Also, the high wind speeds and low central depression of a tropical cyclone can induce large surges in coastal regions.
The following distribution rose chart shows the joint probability distribution of waves (magnitude and direction).

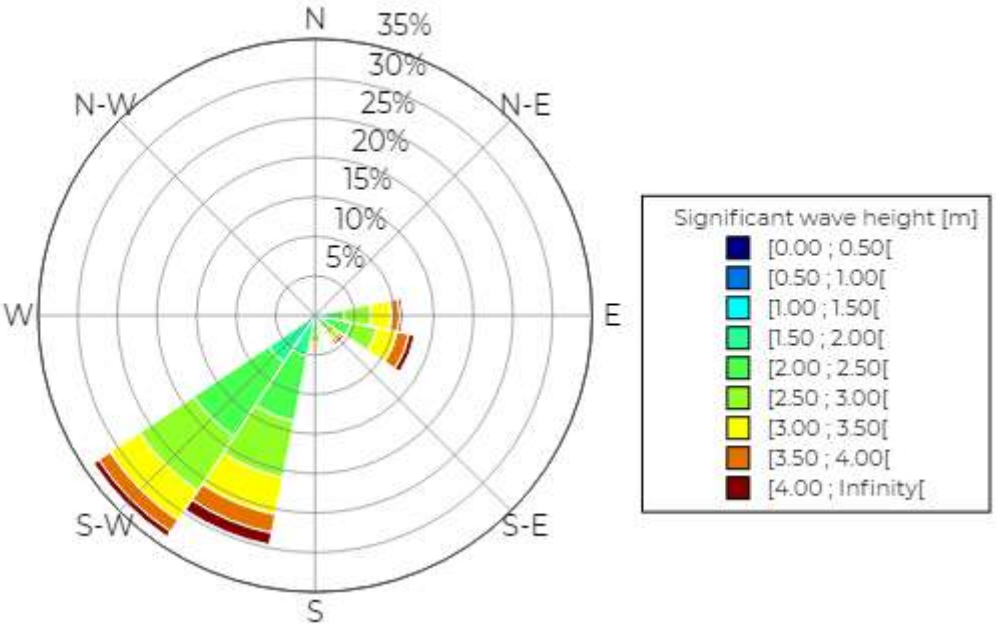


Figure 36: Annual wave distribution rose (peak direction) coming from direction at point (-63°12'E, 20°S)

Statistics computed during the period 10/01/1979 to 31/01/2019 show that the mean significant wave height is 2.66m and varies from 1.02 m to 12.95m. Most of them are coming from two directions:

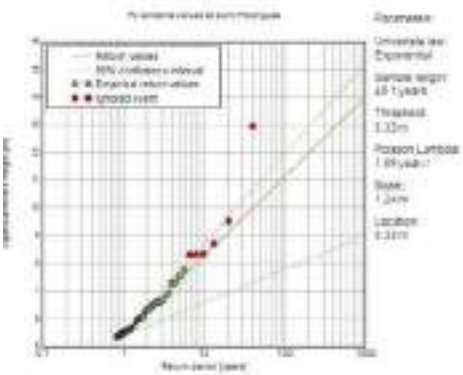
- 63.3% from the SW and SSW: these are the Southern swells;
- 25% from the E and ESE: these are waves generated by trade winds.

Wave spectral peak periods range between 6 and 22s, and the majority is included between 9 and 15.75s.

- Hydrodynamic mean annual conditions present the following wave characteristics:
- Trade winds (from East): Hs = 2.75m, Tp = 9.25s, Direction = 105°

Southern swells (from SW): Hs = 2.25m,Tp = 14.5s, Direction = 215°

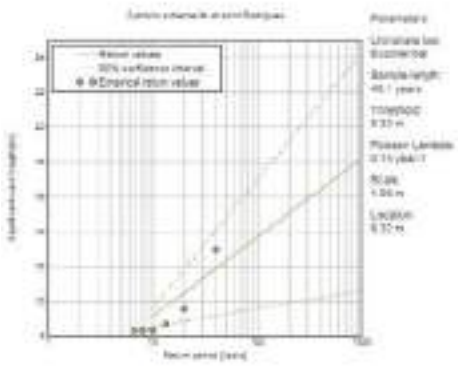
Extreme values are based on an Extreme Values Analysis, which uses probabilistic laws to predict extreme events over large return periods that usually exceed the duration of the data. Wave height extreme values in Rodrigues, for regular and for cyclonic waves, are the following:



Hs extreme values at point Rodrigues

Return period [years]	Hs [m]	Hs lower [m]	Hs upper [m]
1	5.39	5.37	5.41
5	7.39	6.21	7.69
10	8.26	6.57	8.69
50	10.26	7.43	10.96
100	11.12	7.79	11.92
500	13.12	8.61	14.23
1000	13.99	9.01	15.22

Figure 37: Hs extreme values at point (-63°12'E, 20°S)



Cyclonic extreme Hs at point Rodrigues

Return period [years]	Hs [m]	Hs lower [m]	Hs upper [m]
10	9.12	8.54	9.59
50	12.30	9.25	14.76
100	13.67	9.51	17.01
500	16.85	10.31	22.11
1000	18.22	10.64	24.34

Figure 38: Cyclonic extreme Hs values at point (-63°12'E, 20°S)

6.3.3.5.2 Inside the lagoon

The coral reef fringing Rodrigues serves as a natural barrier that protects adjacent shorelines from offshore coastal hazards such as storms surges and waves. As waves propagate towards Rodrigues, an important amount of energy is dissipated on the reef when the abrupt change of bathymetry causes a first depth limited wave breaking.

Waves breaking on the fringing reef create a radiation stress gradient that drives wave-induced current and wave set-up. Depending on the incident wave characteristics, the strongest generated current remains in the surrounding of the reef boundaries. The wave-induced velocity is less than 0.1m/s in the further area. In particular, Plaine Corail is well protected from extreme waves due to the reef, which is up to 8.3 km wide in this region, and Crab Island, which is located south of the area and can protect it from southwestern dominant waves.

The main physical processes during the wave propagation into the lagoon toward the shore include refraction, reflection and shoaling on the outside reef slope, bathymetric breaking occurring generally before the reef top, harmonic transfers toward infragravity (IG) waves, dissipation by friction, and interaction with co- or counter-currents. The relative importance of each process is controlled by the offshore wave features, the bathymetry, the mean water level and slope, and the reef roughness.

6.3.3.5.3 Between Topaze Bay and Anse Quitor

As most of the swell has broken on the reef or has been transformed during the propagation trough the lagoon, the most significant waves reaching the area of interest are wind waves. i.e waves generated and influenced by the local wind field.

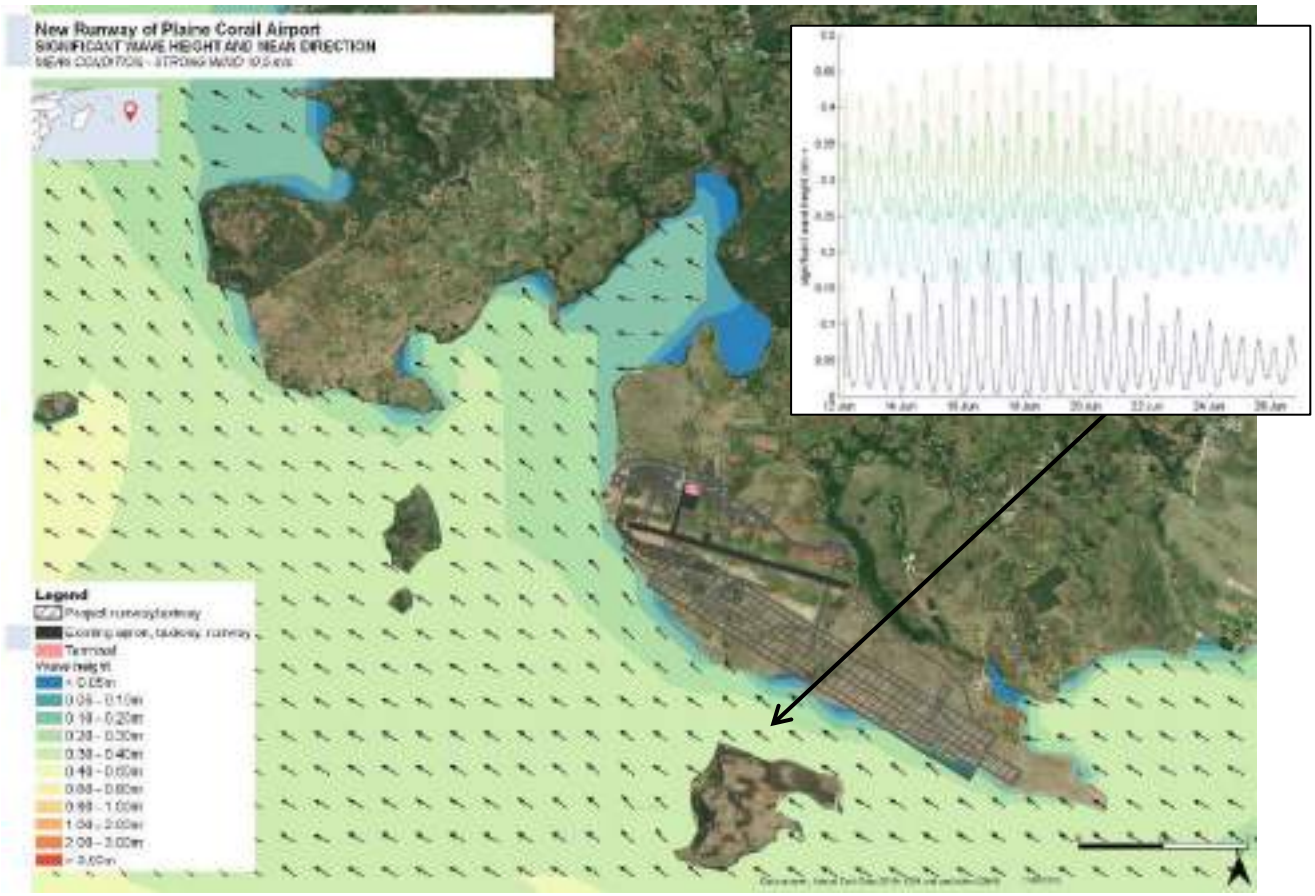


Figure 39: Significant height and mean direction under mean hydrodynamic conditions and wave significant height for nul (dark blue), light (blue), mean (green) and strong (yellow) wind

The comparison of nul, light, means and strong wind shows the impact of wind onto wave height: the stronger the wind is, the higher is the wave.

In the canal between Crab Island and the runway, significant height reaches 45 cm when eastern wind blows with 10.5 m/s velocity (highest 10%) and 20 cm without wind.

6.3.3.6 Water level

6.3.3.6.1 General information

Tides are generated by the effect on the Earth's oceans of gravitational forces between the Earth, the Moon and the Sun, of centrifugal forces due to the Earth's rotation, and of centrifugal forces due to the Earth's solar orbit.

The tides with the largest range are called spring tides, and occur at a new moon and at a full moon. The tides with the smallest range are called neap tides, and occur at intermediate phases of the Moon, at seven and a quarter days after the new or full moon, in the first and last quarters.

6.3.3.6.2 Port Mathurin tide gauge

A tide gauge has been located at Port Mathurin since 1987.

Table 29: Characteristics of Rodrigues' tide gauge

Station Name	Port Mathurin, Rodrigues (Indian Ocean)
Gloss Station Number	19 (Operational since 1987)
Latitude	19°41'S
Longitude	63°25'E
Local Time	GMT + 4 hours
Type	Leupold and Steven's float/Stilling well
New Gauge	Real Time Satellite transmission
Authority Responsible	Mauritius Meteorological Services
Benchmarks	A bolt at the edge of the wharf of the tide gauge. Zero of tide staff tied to benchmark which is a point on beam adjacent to tide gauge station.
Auxiliary Benchmarks:	(a) Brass tube fixed on a wall in the marine services area about 200m from tide gauge. (b) One benchmark located near entrance of the Port
Tide predictions	Performed by the University of Hawaii
Data sent to	Permanent Service for Mean Sea Level (PSMSL), Hawaii
Other data available in vicinity	Sea Level Pressure, rainfall, winds

The maximum tidal range is approximately 1.90 m, and since the average water depth in the lagoon is less than 2 m, some areas are exposed during spring tides. Rodrigues' tides can be classified as meso-tidal due a tidal range inferior to 2 m.

The tide signal can be decomposed as elementary harmonic constants; the main ones are the following:

Table 30: Port Mathurin, Inner Harbour, Admiralty Tide Tables harmonic amplitudes and phases (2002 analyses)

Symbol	Constituent Name	Amplitude (cm)	Phase (°)
M2	Principal Lunar Semidiurnal	40.1	256.1
S2	Principal Solar Semidiurnal	25.55	282.0
K1	Luni-solar declinational diurnal	5.55	95.3

It is broadly representative of natural open-ocean as a consequence of the islands' limited continental shelf width.

The statistics of the sea level height are collected from the University of Hawaii Sea Level Center, computed from the period 09/11/1986 to 31/12/2018 and referred to as the zero point assigned to the tide gauge. The empirical probability distribution of total surface height at Port Mathurin is the following:

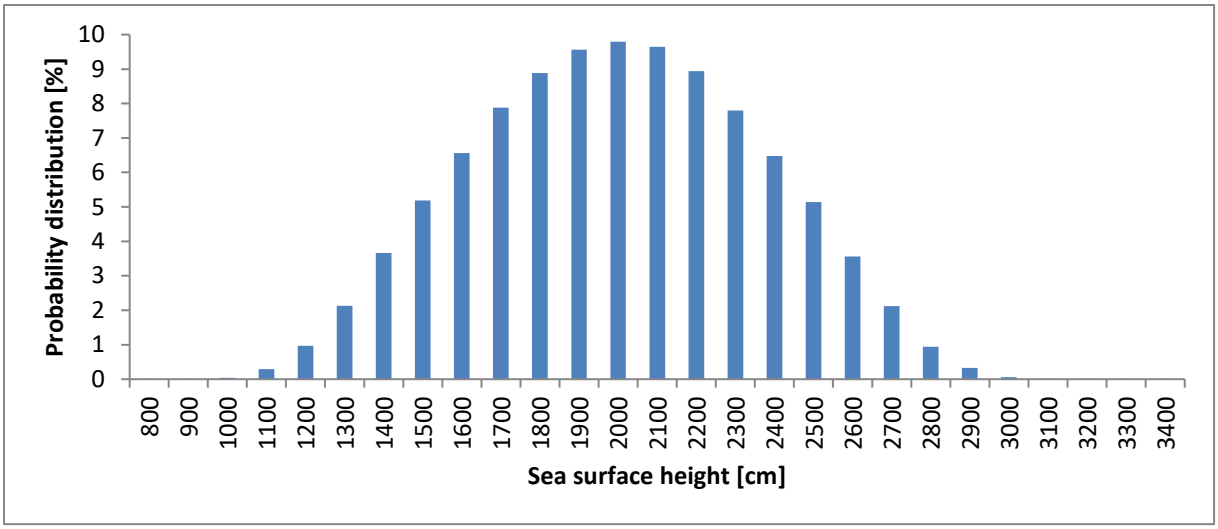


Figure 40: Empirical probability distribution of total sea surface height at Port Mathurin

Rodrigues is one of the islands being impacted by global climate change. From 1986 to 2003, sea level has decreased at a rate of -0.32 mm/year whereas between 2003 and 2009 an accelerated rise at a rate of 1.2 to 3 mm/year was observed.

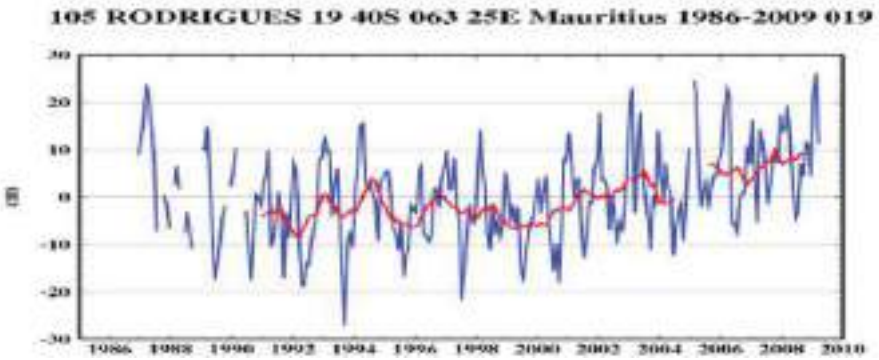


Figure 41: Sea level trend at Port Mathurin, Rodrigues [1986-2009]

According to the Acclimate study, sea level has already risen by 6.7 cm in Rodrigues between 1950 and 2001 representing an average +1.34 mm per year. Therefore, surveys showed occurrences of severe bleaching leading to the mortality of up to 75% of corals in some sites. The North and West of the island are particularly vulnerable.

6.3.3.6.3 Inside the lagoon

Of the processes linked to extreme sea levels in reef lagoon environments, wave setup has been found to be the largest component of extreme water levels for other island case studies with fringing reef morphology (e.g. Hoeke et al. 2015). Set-up at coasts has been regarded approximately as 10 to 20% of deep water wave height (e.g. WMO 1998; Holden 2008), with reefs potentially forcing higher set-up values, of up to a third of incident wave height (Munk and Sargent 1948; Hoeke et al. 2013).

The impacts of the reef on the still water level will be included in the model amongst others on the elevation caused by extreme wave breaking. Indeed, when waves are strong, water enters the lagoon faster than it can be flushed through reef passes. The sea level difference generates an elevation of the lagoon level and amplifies ebb tidal current.

Two different lagoon natural flushing processes are possible in lagoons exposed to wave and ocean tides. Their relative importance depends on the bathymetry of the lagoon and the local hydrodynamic climate. After studying the local bathymetry of the lagoon, it would be possible to determine the flushing process of Rodrigues.

The sea surface height alongside Plaine Corail could be impacted by this elevation and therefore is different from Port Mathurin's.

6.3.3.7 Tropical cyclones

As it is located in the cyclone belt, Rodrigues can be affected by hurricanes from the east from November to April. On average, ten named tropical depressions are tracked in the South-West Indian Ocean and of these, three reach tropical cyclone intensity.

These winds blow clockwise around the centre and generate very high waves. The cyclones often re-curve to the South and East prior to reaching the island of Rodrigues and the cyclone intensity typically diminishes with latitude.

Tropical disturbances are ranked according to their maximum of average sustained wind speed and which tropical cyclone basin they belong to. The Meteo France's Reunion Tropical Centre monitors the cyclonic activity of the South-West Indian Ocean, the basin where Rodrigues is located, and uses the following terminology to classify them:

Table 31: Tropical cyclone naming in the SW Indian Ocean (Mauritius Meteorological Service and Meteo France)

Tropical Disturbance Classification	Maximum of average 10-minute sustained wind speed		Beaufort Scale
	kt	km/h	
Very Intense Tropical Cyclone	> 115	> 212	Force 12 and +
Intense Tropical Cyclone	90 – 115	166 – 212	
Tropical Cyclone	64 – 89	118 – 165	
Severe Tropical Storm	48 – 63	89 – 165	Force 10 – 11
Moderate Tropical Storm	34 – 47	63 – 88	Force 8 – 9
Tropical Depression	28 - 33	51 – 62	Force 7
Tropical Disturbance	< 28	< 50	Force 0 – 6

Since the early 60's, 74 tropical disturbances have occurred in the vicinity of Rodrigues (refer table 32) which represent in average of 1.3 events per year. Most of them are qualified as Tropical Storm or Severe Tropical Storm. They usually present the same characteristics: they form in the eastern part of the Indian Ocean and migrate to the southwest following a parabolic trajectory. In the past few years, Hansella (1996), Kalunde (2003), Amara (2014), Bansi (2015) and Gelena (2019) were the most damaging cyclones. Cyclone Kalunde brought 3.4 million euros in damage to Rodrigues Island.

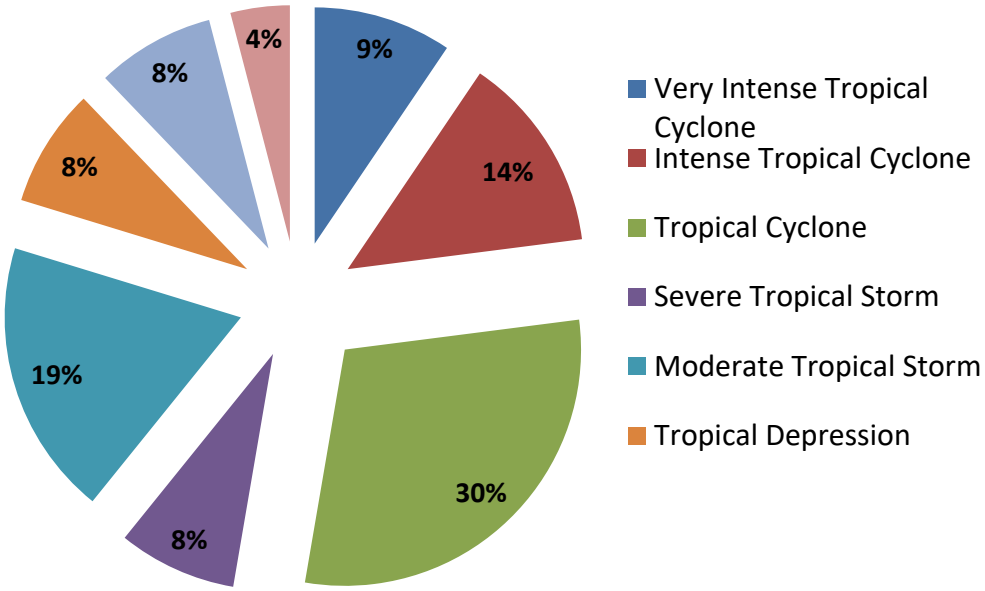


Figure 42: Distribution of Cyclone Types since 1962

The Cyclone Warning System of Mauritius and Rodrigues issues warnings to the population before a cyclonic disturbance is likely to affect its coast. Warning is ranked in 4 classes according to the remaining time before a 120 km/h gust hits:

- Class I: Issued 36 to 48 hours before Rodrigues is likely to be affected by gusts reaching 120 km/h;
- Class II: Issued so as to allow, as far as practicable, 12 hours of daylight before the occurrence of gusts of 120 km/h;
- Class III: Issued so as to allow, as far as practicable, 6 hours of daylight before the occurrence of gusts of 120 km/h;
- Class IV: Issued when gusts of 120 km/h have been recorded in some places and are expected to continue.

6.3.3.8 Tsunami

Minor floods were experienced as a result of the 26 December 2004 tsunami. So far there is no record of any significant tsunami that has affected Rodrigues but there is a possibility that a tsunami generated from either the Sumatra or the Makran source could affect the coasts of Rodrigues. The Tsunami Warning System of Mauritius considers a lead-time of 5-7 hours for a tsunami wave from Sumatra to reach its coast.

Table 32: Tropical disturbance events in the vicinity of Rodrigues Island [1962 - 2019]

Cyclone Season	Approaching date (UTC)	TC Name	Type	Intensity (kts) at nearest distance from Rodrigues Airport	Maximum intensity (kts) of the TC	Minimum sea level pressure (mb)	Code JTWC (Join Typhoon Warning Center)	Nearest distance form Rodrigues Airport	Wind speed at Plaine Corail (kts)	Direction in the vicinity of Rodrigues	Data Source	Cyclone Warning System (Mauritius Meteorological Services)
1962	06/04/1962	MAUD	Tropical Cyclone	64	-	-	-	-	_	Parabolic NE to SW	IBTrACS-NOAA	-
1963	19/02/1963	GRACE	Severe Tropical Storm	62	-	-	-	-	_	Parabolic NE to SW	IBTrACS-NOAA	-
1964	11/12/1963	AMANDA	Severe Tropical Storm	63	-	-	-	-	_	Parabolic NE to SW	IBTrACS-NOAA	-
1965	08/01/1965	FREDA	Tropical Cyclone	65	-	-	-	-	_	Parabolic NE to SW	IBTrACS-NOAA	-
1967	12/02/1967	HUGUETTE	Moderate Tropical Storm	35	-	-	-	-	-	NNW to SSE then E	IBTrACS-NOAA	-
1968	23/12/1967	CARMEN	Tropical Cyclone	70	-	-	-	-	-	N to S	IBTrACS-NOAA	-
1968	21/01/1968	HENRIETTE	Tropical Cyclone	80	-	-	-	-	_	NNE to SSW	IBTrACS-NOAA	-
1968	29/03/1968 00:00	MONIQUE	Tropical Cyclone	64	-	-	-	-	_	Parabolic NE to SW	Cycloneoi.com (NOAA, UNISYS, C.PEGOUD)	-
1970	19/02/1970 12:00	JANE	Very Intense Tropical Cyclone	140	-	900	-	305 km N		Parabolic NE to SW	FIRINGA/ - SA	-
1970	30/03/1970 00:00	LOUISE	Tropical Cyclone	80	-	910	-	210 km N	_	Atypical track	Cycloneoi.com (NOAA, UNISYS, C.PEGOUD)	-
1971	12/11/1970 00:00	CLAUDINE	Tropical Cyclone	70	-	970	-	160 km North	_	E to W	Cycloneoi.com (NOAA, UNISYS, C.PEGOUD)	-
1971	27/01/1971 00:00	GINETTE	Tropical Cyclone	81	-	938	-	55 km SE	_	-	Cycloneoi.com (NOAA, UNISYS, C.PEGOUD)	-
1971	26/02/1971 00:00	LISE/YVONNE	Tropical Cyclone	80	-	-	-	80 km	_	E to W then S	Cycloneoi.com (NOAA, UNISYS, C.PEGOUD)	-
1972	05/01/1972 00:00	BELLE	Moderate Tropical Storm	46	-	-	-	-	_	-	Cycloneoi.com (NOAA, UNISYS, C.PEGOUD)	-
1972	20/02/1972 00:00	FABIENNE	Very Intense Tropical Cyclone	135	-	-	-	120km W	_	From E	Cycloneoi.com (NOAA, UNISYS, C.PEGOUD)	-
1977	08/02/1977 09:00	GILDA	Moderate Tropical Storm	45	-	-	-	230 km	_	From E; Then N to S	FIRINGA	-
1977	24/02/1977 22:00	IO/JACK	-	-	-	-	-	300 km	_	-	FIRINGA/NOAA	-
1979	09/02/1979 00:00	CELINE	Very Intense Tropical Cyclone	116	-	-	-	-	_	-	FIRINGA/NOAA	-
1979	14/02/1979 11:00	ESTELLE	-	-	-	988	-	200 km W	_	Atypical track	FIRINGA/NOAA	-
1980	03/02/1980 16:00	JACINTHE	Tropical Cyclone	65	-	-	-	160 km NW	_	-	FIRINGA/NOAA	-
1982	31/01/1981 03:32	HEYLETTE	-	-	-	-	-	100 km N	_	-	FIRINGIA	-
1982	16/01/1982 12:00	DAMIA	Tropical Cyclone	80	120	-	TC 08S 1982	Over Rodrigues	_	-	JTWC	-
1984	22/01/1984 18:00	EDOARA	Tropical Depression	30	35	-	TC 15S 1984	40 km S	_	-	JTWC	-

1984	16/02/1984 06:00	HAJA	Tropical Depression	30	45	-	TC 20S 1984	155km S	_	-	JTWC	-
1985	02/12/1984 06:00	BOBALAHY	Tropical Disturbance	20	55	-	TC 02S 1985	130 km SE	_	From NE to SW	JTWC	-
1985	26/01/1985 00:00	DITRA	Tropical Cyclone	65	70	-	TC 16S 185	< 10km S	_	N the S	JTWC	-
1985	10/04/1985 12:00	HELISAONINA	Intense Tropical Cyclone	100	110	-	TC 33S 1985	110 km N	_	Loop. From N to W.	JTWC	-
1986	14/01/1986 06:00	COSTA	Tropical Cyclone	70	70	-	TC 06S 1986	130 km NE	-	NW to SE	JTWC	-
1987	06/02/1987 03:00	BEMAVAZA	Moderate Tropical Storm	35	-	-	-	-	-	-	FIRINGA	-
1989	05/04/1989 12:00	KRISSY	Tropical Cyclone	65	105	-	TC21S 1989	120km NW	-	NE to SW	JTWC	-
1989	22/03/1989 12:00	JINABO	Tropical Disturbance	25	65	-	TC19S 1989	190 km N		E to W and S	JTWC	-
1990	06/03/1990 00:00	EDISOANA	Intense Tropical Cyclone	95	100	-	TC18S 1990	210 km W	-	N to S	JTWC	-
1991	31/01/1991 06:00	BELLA	Intense Tropical Cyclone	100	130	-	TC08S 1991	25 km W	-	E to W and then to S	JTWC	Warning class IV (max)
1992	10/02/1992 00:00	CELESTA	Tropical Disturbance	25	45	-	TC 15S 1992	75 km N	-	NNW to SE	JTWC	-
1992	01/03/1992 00:00	GERDA	Tropical Depression	30	35	-	TC 24S 1192	150km NNW	-	-	JTWC	-
1994	15/02/1994 12:00	IVY	Severe Tropical Storm	50	100	-	TC 16S 1994	100 km W	-	NE to S	JTWC	-
1994	12/04/1994 12:00	ODILLE	Intense Tropical Cyclone	95	105	-	TC 26S 1994	150 km SW	-	NNW to SSE	JTWC	-
1995	30/11/1994 06:00	ALBERTINE	Tropical Cyclone	70	115	-	TC 02S 1995	105 km NW	-	NNE to SSW	JTWC	-
1995	27/01/1995 00:00	DORINA	Moderate Tropical Storm	45	100	-	TC08S 1995	150 km SE	-	ENE to WSW	JTWC	-
1995	09/02/1995 00:00	GAIL	Tropical Cyclone	70	75	-	TC 10S 1995	35 km NNW	-	NE to SW	JTWC	-
1996	24/02/1996 12:00	EDWIDGE	Tropical Depression	30	95	-	TC 16S 1996	15 km SW	-	SE to NW	JTWC	-
1996	29/02/1996 18:00	FLOSSY	Intense Tropical Cyclone	100	115	-	TC 17S 1996	100km NNW	-	NE to SW	JTWC	-
1996	06/04/1996 06:00	HANSELLA	Intense Tropical Cyclone	95	95	-	TC 24S 1996	30km NE	90	N to S	JTWC	Warning class IV (max)
1996	08/04/1996 18:00	HANSELLA	Severe Tropical Storm	60	95	-	TC 24S 1996	70km SW	-	E to W	JTWC	Warning class IV (max)
1997	21/02/1997 18:00	KARLETTE	Tropical Cyclone	65	65	-	TC 25S 1997	50 km S	-	NE to SW	JTWC	-
1999	03/02/1999 06:00	CHIKITA	Moderate Tropical Storm	35	40	-	TC 17S 1999	50 NE	-	ESE to WNW	JTWC	-
1999	08/03/1999 18:00	DAVINA	Intense Tropical Cyclone	100	110	-	TC 25S 1999	150 km N	-	NE to SW	JTWC	-
1999	07/04/1999 06:00	EVRINA /FREDERIC	Tropical Depression	30	140	-	TC 31 S 1999	30 km N	-	E to W	JTWC	-
2001	15/01/2001 18:00	BINDU	Moderate Tropical Storm	45	100	-	TC05S 2001	130 km SE	-	NE to SW	JTWC	-
2001	07/04/2001 00:00	EVARISTE	Severe Tropical Storm	55	75	-	TC 18S 2001	180 km W	-	NNW to SSE	JTWC	-
2002	20/01/2002 18:00	DI NA	Very Intense Tropical Cyclone	130	130	910	TC 10S 2002	180km NNW	-	ENE to WSW	JTWC	Warning class III

2003	12/03/2003 18:00	KALUNDE	Intense Tropical Cyclone	90	140	954	TC 23S 2003	60km SE	114	N to S	JTWC	Warning class IV
2005	02/02/2005 06:00	GERARD	Tropical Disturbance	15	60	1006	TC 14S 2005	30 km SE	-	NE to SW	JTWC	None
2005	10/04/2005 12:00	JULIET/ADELINE	Very Intense Tropical Cyclone	120	125	992	TC 26S 2005	130 km SE	-	NE to SSW	JTWC	Warning class III
2006	29/12/2005 00:00	-	Tropical Disturbance	25	35	1002	TC 04S 2006	200km NW	-	NE to SW	JTWC	-
2007	10/02/2007 18:00	ENOK	Moderate Tropical Storm	40	55	993	TC13S 2007	Over Rodrigues	-	NNW to SSE	JTWC	Warning class IV (max)
2007	15/02/2007 12:00	FAVIO	Moderate Tropical Storm	40	120	994	TC14S 2007	150 km NW	-	NE to SSW	JTWC	-
2007	06/02/2007 12:00	DORA	Severe Tropical Storm	50	115	985	TC10S 2007	130 km SE	-	NNE to SW	JTWC	Warning class II
2008	17/12/2007 06:00	CELINA	Moderate Tropical Storm	35	40	996	TC06S 2008	150 km WNW	-	NNE to SSW	JTWC	None
2008	19/02/2008 18:00	HONDO	Tropical Disturbance	25	130	1004	TC16S 2008	60 km N	-	E to NW	JTWC	None
2010	20/02/2010 18:00	GELANE	Tropical Cyclone	65	125	974	TC 16S 2010	180km W	-	N to S	JTWC	Warning class II
2011	19/03/2011 21:00	CHERONO	Moderate Tropical Storm	35	45	998	TC18S 2011	30 km S	-	E to SW	JTWC	Warning class I
2012	20/01/2012 18:00	ETHEL	Tropical Cyclone	70	70	970	TC07S 2012	90 km E	-	N to S	JTWC	Warning class IV
2012	21/02/2012 12:00	HILWA	Moderate Tropical Storm	40	40	993	TC13S 2012	75km ESE	-	NE to S	JTWC	None
2013	15/04/2013 12:00	IMELDA	Tropical Cyclone	70	85	970	TC21S 2013	110 km W	-	NE to SW then E	JTWC	Warning class IV
2014	21/12/2013 00:00	AMARA	Very Intense Tropical Cyclone	125	130	929	TC03S 2014	80 km E	73	Parabolic NE to SW	JTWC	Warning class IV (14h)
2015	09/01/2015 06:00	BANSI	Very Intense Tropical Cyclone	120	140	933	TC05S 2015	110 km NE	67	NE to SW	JTWC	Warning class IV (12h10)
2016	13/12/2015 00:00	BOHALE	Moderate Tropical Storm	35	35	996	TC 05S 2016	440 km E	-	NE to S	JTWC	
2017	12/03/2017 00:00	FERNANDO/ELEVEEN	Tropical Depression	30	45	1000	TC 11S 2017	100 km S	-	NE to WSW	JTWC	None
2018	13/01/2018 22:00	BERGUITTA	Moderate Tropical Storm	40	95	940	-	155 km N	-	E to W then SW	FIRINGA/MeteoFrance	Warning class III
2019	23/12/2018 07:00	CILIDA	Tropical Cyclone	85	95	945	-	310 km SW	-	NW to SE	FIRINGA/MeteoFrance	Warning class I
2019	06/02/2019 23:00	FUNI	Tropical Cyclone	85	100	940	-	220 km ENE	-	NNW to SSE	FIRINGA/MeteoFrance	Warning class II
2019	09/02/2019 23:00	GELENA	Intense Tropical Cyclone	95	100	942	-	50 kmSW	82	WNW to ESE	FIRINGA/MeteoFrance	Warning class IV (27 hours)
2019	26/03/2019 01:00	JOANINHA	Intense Tropical Cyclone	100	100	939	-	80 km NNE	96 (gusts > 54 kts during 33 hours)	-	FIRINGA/MeteoFrance	Warning class IV

Table 33: Sea level at Port Mathurin for the major cyclones impacting Rodrigues

Approaching date (UTC)	Name	Relative Sea Level [m]	Sea Level measured at Port Mathurin [cm]	Wind Speed at Plaine Corail
1/2/1991 6:00	BELLA	-0.37	1700	-
6/4/1996 6:00	HANSELLA	-0.10	1880	166 km/h (90kts)
8/4/1996 16:00	HANSELLA	-0.37	1549	-
12/3/2003 18:00	KALUNDE	0.21	2181	212 km/h (114kts)
15/4/2013 12:00	IMELDA	0.51	2428	-
21/12/2013 0:00	AMARA	0.51	2735	135 km/h (73kts)
9/1/2015 6:00	BANSI	-0.39	1878	124 km/h (67 kts)
13/1/2018 22:00	BERGUITTA	0.12	2373	-
23/12/2018 07:00	CILIDA	0.44	2629	-
06/02/2019 23:00	FUNANI	0.65	3150	-
09/02/2019 23:00	GELENA	1.04	3520	-
26/03/2019 01:00	JOANINHA	0.7	3030	178 km/h (gusts > 100 km/h during 33hours) (96 kts) (54kts)

6.3.4 Climate Change Projections

6.3.4.1 Sea Level Rise

Sea level have started to rise under the impact of climate change. This increase is estimated by the IPCC for different parts of the world. For the South Indian Ocean, the estimates are as follows compared to the period 1995-2014 according to 2 scenarios:

Period	Sea level rises	
	Scenario SSP2-4.5 *(middle-of-the-road development)*	Scenario SSP5-8.5 *(Fossil-fuelled development)*
Near term (2021-2040)	+0,1m	+0,1m
Medium Term (2041-2060)	+0,2m	+0,3m
Long Term (2081-2100)	+0,6m	+0,7m

6.3.4.2 Tropical Cyclones

IPCC projections show medium confidence in evolution of tropical cyclones according to document: Climate Change 2021: The Physical Science Basis.

Projections for Madagascar (no projections for Indian Ocean) show medium confidence of decrease in frequency and increase in intensity. Cyclones will potentially be less numerous with more intense winds and rainfall. Lower minimum pressure and stronger winds may generate more significant surges. According to IPCC, "*The increase in global TC* [Tropical Storm] *maximum surface wind speeds is about 5% for a 2°C global warming across a number of high-resolution multi-decadal studies (Knutson et al., 2020)*" and "*A projected increase in global average TC* [Tropical Storm] *rain rates of about 12% for a 2°C global warming* […] *(Knutson et al., 2020)".*

6.3.5 Terrestrial geology and geotechnics

The purpose of this section is to describe the geology of the Island and the geological and geotechnical characteristics of the area of influence. The sector of Plain Corail has an exceptional geology as it is characterized by a karst formation above a volcanic basement. In order to better scope relevant information regarding geological history, including karstic development, a brief summary of its regional geodynamics and main geological units is provided below. Then the geotechnical conditions are described.

The objective is to make it possible to assess the risks in constructing such an infrastructure above a geotechnically fragile structure: risks of infrastructure collapse and plane crash, but above all, environmental risks due to consolidation techniques during the work.

The impacts of the project earthwork on erosion and their consequences on the risks of ground movements around the infrastructure will also be assessed knowing the geological and geotechnical context.

6.3.5.1 Geodynamical and geological settings of Rodrigues Island

6.3.5.1.1 Geodynamics of Rodrigues

Rodrigues Island is located on the eastern part of a roughly E-W trending fracture zone (RFZ - Rodrigues Fracture Zone), east of the Mascarene Plateau, supporting the Mauritius and La Réunion islands. This Plateau is drifting in a NE direction (24 mm/y) (see figure below).

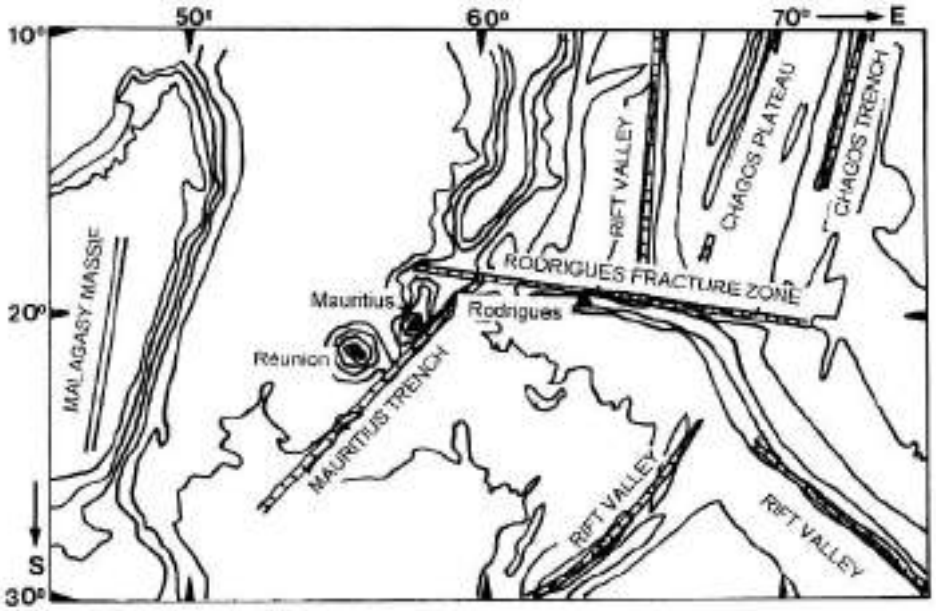


Figure 43: Geodynamic sketch map of the Mauritius-Rodrigues region

6.3.5.1.2 Hot Spot Volcanic Setting

The geological history of Rodrigues Island is marked by three separate volcanic activity periods. The first period led to the production of a basalt basement, followed by a non-activity period. The second period began with the formation of a central cone, made up of aerial and subaerial lava, slags and cinders. Then, hydrothermal activity took place on the centre of the cone, followed by an explosive episode. A volcanic plug of hawaiites and basalts filled the depression.

The restricted area of influence of Plaine Corail is composed of this basalt and hawaiite basement, weathered through time.

6.3.5.1.3 Geology of Plaine Corail

Plaine Corail area is located on the southwestern side of Rodrigues Island (see figure below).

Local topography ranges from 5 m to 39 m above mean sea level (AMSL). The natural terrain slopes gently downwards from the present-day airport's south boundary towards the coastline, from north to south. The highest point near Plaine Corail is the Mount Sainte Marie, where ancient lava outcrops occur.

The Southern part of Rodrigues Island (La Fourche, Petite Butte, and Plaine Corail sites) is characterized by the following geological categories:

calcarenites composed of corals and sands deposits (formations A – in yellow and A5 – in blue), some areas being affected by depressions in the calcarenites (formation A4 – in hatched light green) and which can potentially be affected by karstic evolution, including the formation of voids and caverns;
unweathered ***massive basalts***, partially covered by clayey soils (formations D2 and D4 - in salmon and orange);
thick ferralitic soils overlaying ***weathered basalts*** and volcanic ***ash*** (formations E1 to E4 - shaded in purple); and,
weathered basalts observed at ground surface (formation E5 - in light red), some being observed in the restricted area of influence (as for example Mount Sainte-Marie), North and South close to Plaine Corail Airport's (also known as Sir Gaetan Duval Airport's) footprint.
The airport footprint (hatched grey area) is supposed to be supported by calcarenite formations (A1), except a small part on the North Eastern part where weathered basalt formations (A5) are assumedly found at ground level (Mount Sainte Marie).

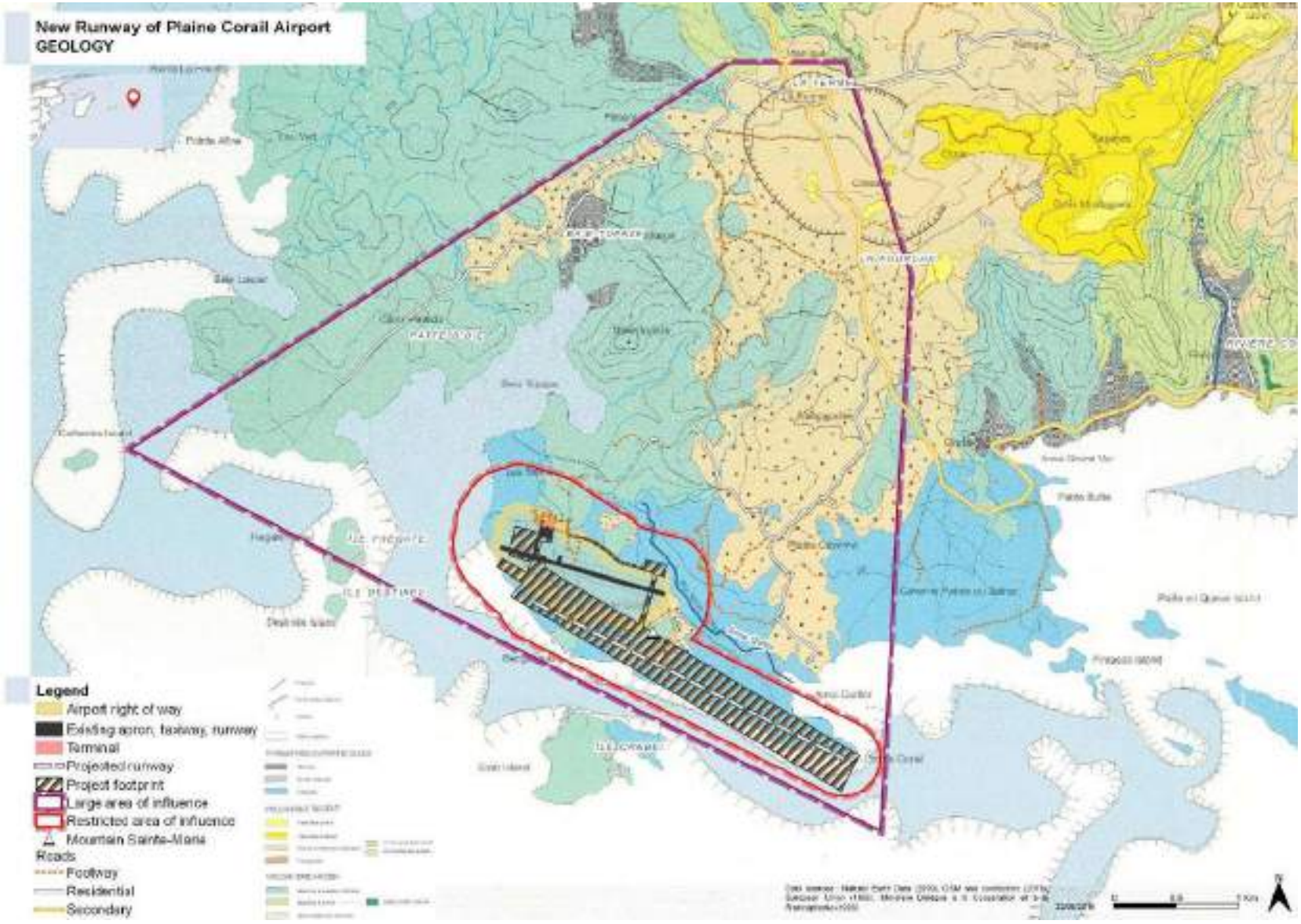


Figure 44: Geological map of Rodrigues

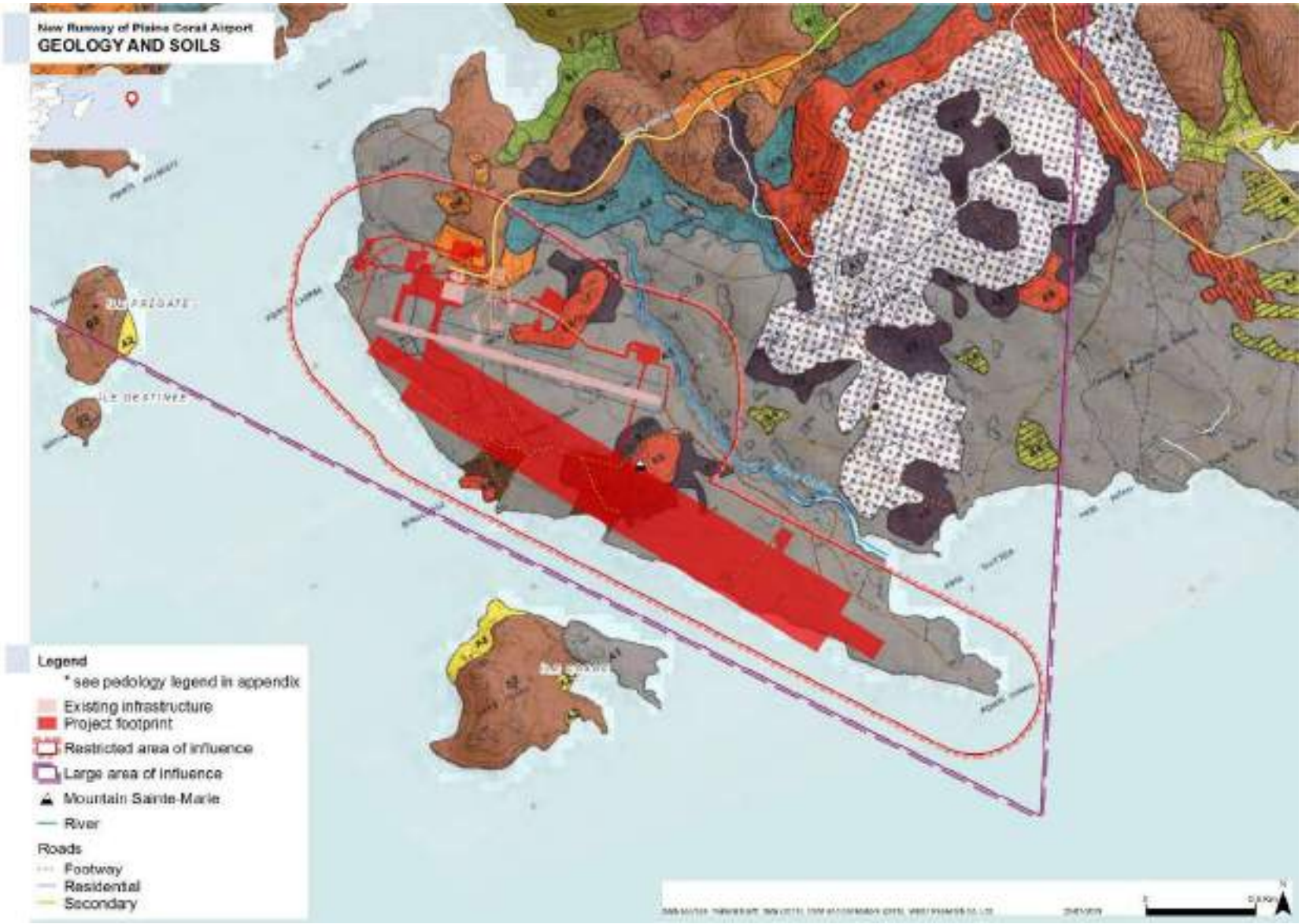


Figure 45: Geology and soils in the area of influence (legend next page)

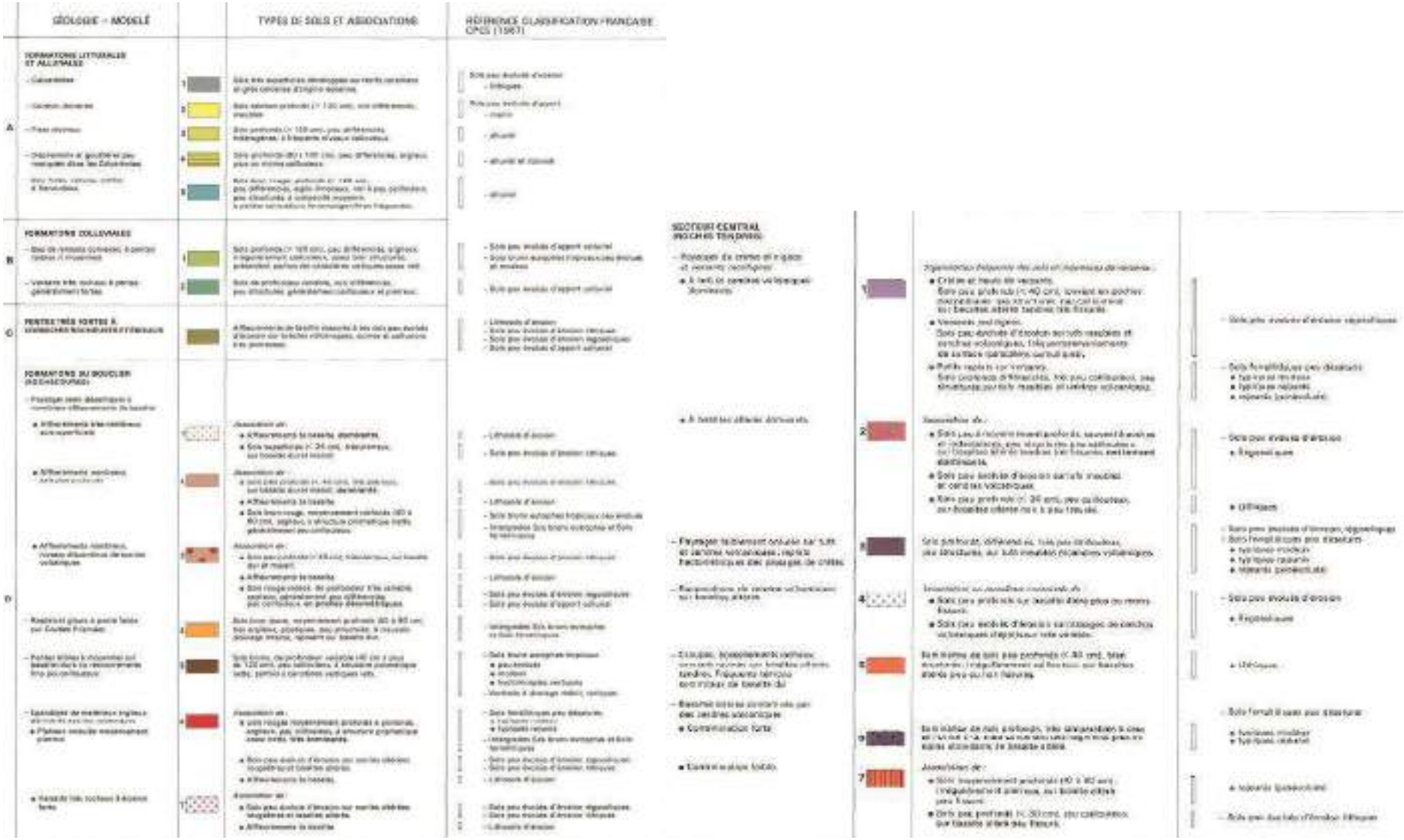


Figure 46: Legend of the geology and soils map of southern pat of Rodrigues Island, near Plaine Corail and in the area of influence

6.3.5.1.4 Geology of the restricted area of influence

6.3.5.1.4.1 Ground investigations carried out

Different ground investigations were led by GIBBS, in accordance with British Standard BS 5930 -2015, in the project runway area (dashed white line) and focused on characterization of the ground conditions (nature and mechanical properties of soils) and the determination of voids/caverns in relation to karstic phenomenon in the area.

These investigations were performed in three steps (Phase A, Phase B and Phase C) from January 2017 to September 2018. Phase A was led to identify the main suitable borrow areas, and to characterize the main geological strata of the entire area. Phase B and Phase C were led to obtain detailed geotechnical data in the vicinity of the projected runway area, south of the present-day Plaine Corail Airport runway.

64 No. rotary core boreholes were drilled during Phase B geotechnical campaign, from September to November 2017. Supplementary 47 No. rotary core boreholes were drilled during Phase C geotechnical campaign, from May to August 2018, completed with 9 No. additional trial pits located in the northwestern part of the Rodrigues Airport area, close to the northern part of the existing runway (refer to Figure 47).

Figure 47: All ground investigations from Phase B (2017) and Phase C (2018) geotechnical campaign of the restricted area of influence at Plaine Corail (Preliminary Design, 2017)

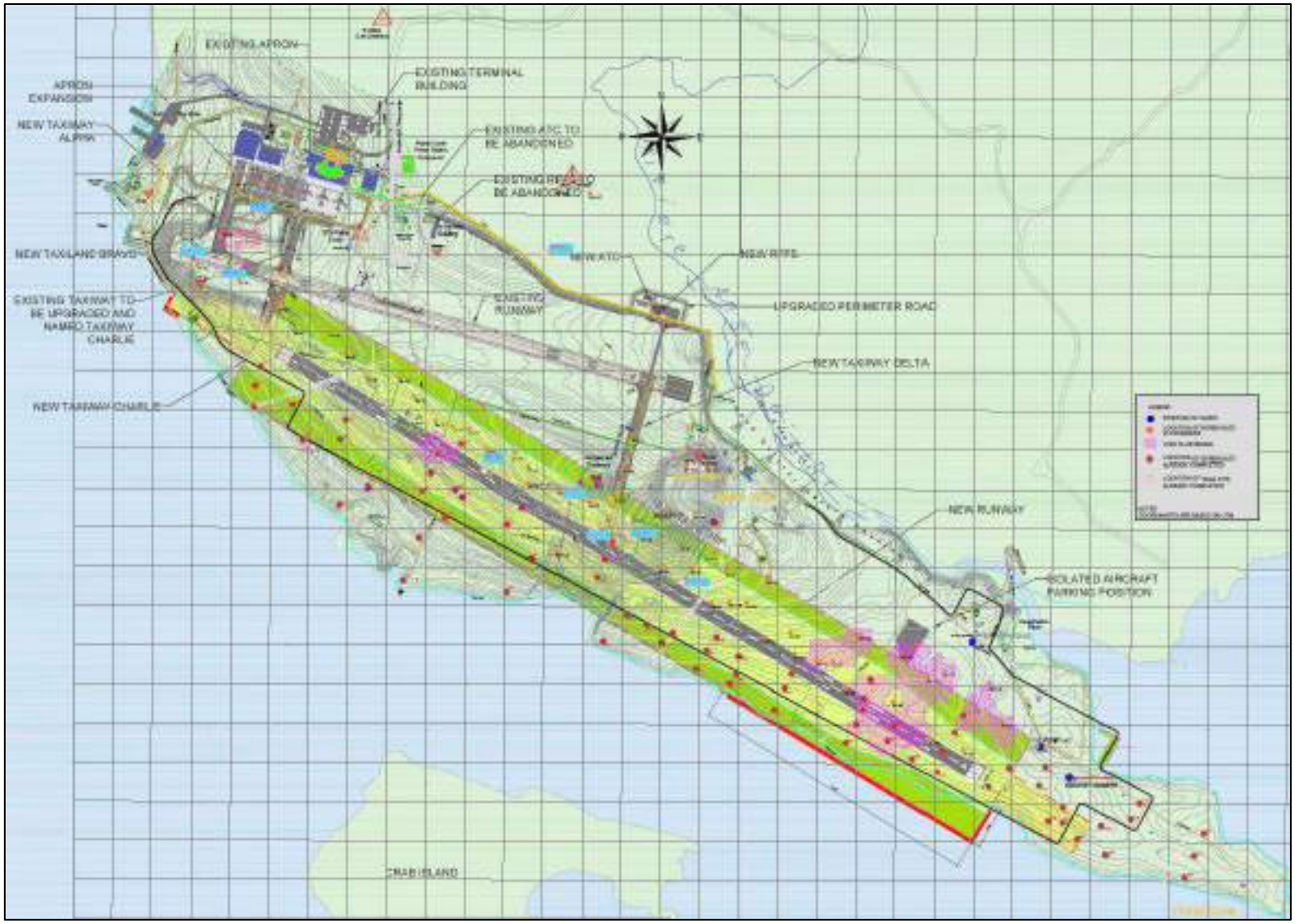


Figure 48: All ground investigations from Phase B (2017) and Phase C (2018) geotechnical campaign of the restricted area of influence at Plaine Corail (Preliminary Design, 2017)

6.3.5.1.4.2 Description of the geology of the restricted area

Based on the results of the in situ ground investigations, the general geological profile on site of the new project runway is the following:

Calcarenites – composed of alternating fine to coarse sands and grained corals, separated by clayey beds (average thickness of 5 m),
Basalts – composed, from top to bottom of Basalt serie, of highly to slightly weathered basalts, with high plasticity silty clays with intervals of gravels and cobbles (average thickness of 9.5m),
Breccias – composed of highly weathered breccia, often located beneath Calcarenite deposits up to depths of 10 m, with high plasticity silty clays and medium to fine gravels of weathered basalts (average thickness of 3 m).

No groundwater monitoring devices were installed from 2017 to 2018. In situ groundwater levels have been recorded in all rotary core boreholes from 2017 Phase B geotechnical campaign. No groundwater level has been recorded in the Phase C rotary core boreholes.

Ground penetrating radar (GPR) surveys were carried out over the area and revealed that 541 voids were determined this way, but more can be found deeper. Over the 541 voids determined with the following distribution:

- none are found between 0 and 5 m below the surface.
- 11% are found between 5 and 10 m
- 38 % between 10 and 15m,
- 30% between 15 and 20
- 21% beyond 20 m.

Most of voids are thus located between 10 and 20 m below the surface. The effect of karstic dissolution in the formation of the voids identified was not investigated considering the absence of ground water monitoring.

In addition, 38 drilling anomalies have been encountered in rotary core boreholes. These cavities have a 50 cm diameter spacing in average (see Figure 48).

Available laboratory test results collected from samples extracted from both Phase B and Phase C have been summarized in Table 34.

As a comment, one can observe that lab tests performed are mostly focused on soil-derived facies, whereas behavioural parameters of unweathered rocky facies are poor, especially for basalts.

Additional 3 geological long sections have been performed to highlight the geometry at depth of the encountered geological formations at ground surface.

These long sections are located in Figure 50 and focus on the northern, centre and southern parts of the new projected area (Figure 51, Figure 52).

All long sections show longitudinal variations of the thickness of the calcarenite unit, this unit being missing in the centre of the project, at Saint Marie mount area. Toward the northern and southern part of the mount Saint Marie, the thickness of the calcarenite increases, but is still limited in the northern part, due to Basalt rock basement present at lower depth.

Figure 53 shows the spatial distribution of each geological formation based on the borehole and trial pit ground investigations. It highlights that ground investigations confirm at depth the geological formations present at ground level. A color bar has been applied to all ground investigations to show the thickness of each geological unit.

Table 34: Summary of In situ and Laboratory Data of Calcarenites, Breccias and Basalts Formations

Parameters	**Geological Formation**			**Calcarenites**	**Breccias**	**Basalts**
Classification	***Bulk density (Mg/m³)***			1.9	2.3	-
	Porosity (%)			23.2	12.9	-
	Carbonate Content of SOIL, CO2 (%)			37.9	0.4	-
	Atterberg Tests	Plastic Limit (%)		-	40	30
		Liquid Limit (%)		-	78	53
		Plasticity Index (%)		-	38	23
Intrinsic parameters / Soil Strength	***Standard Penetration Test (SPT)***			30	23	22
	Shear box	***c' (kPa)***		81	107	5
		φ' (°)		27	31	42
	Undrained Shear Strength	Direct Shear Strength	***Su*** (kPa)	209	247	219
Compressibility and Consolidation	***Consolidation (Odeometer Test)***	Consolidation, m_v (m^2/MN)		1.68	1.38	0.37
		Consolidation, c_v (m2/y)		1.85E-02	4.62E-03	7.12E-03
		Void ratio, e_0 (-)		0.53	0.72	0.44
Compaction	***Compaction, maximum dry density - MDD (Mg/m3)***			1.82	1.39	1.65
	Compaction, maximum dry density - MDD (Mg/m3)			12.30	30.65	22.1
Bearing Capacity	***California Bearing Ratio (5.0mm plunger load) - CBR (%)***			31	7.8	6.3
Rock parameters	***Uniaxial Compressive strength (N/mm2)***			9.4	27.4	-
	Los Angeles Coefficient			65.5	-	-
	Slake Durability Index 2	Durability Class		Medium – High	-	-
		2nd cycle		89.8	-	-

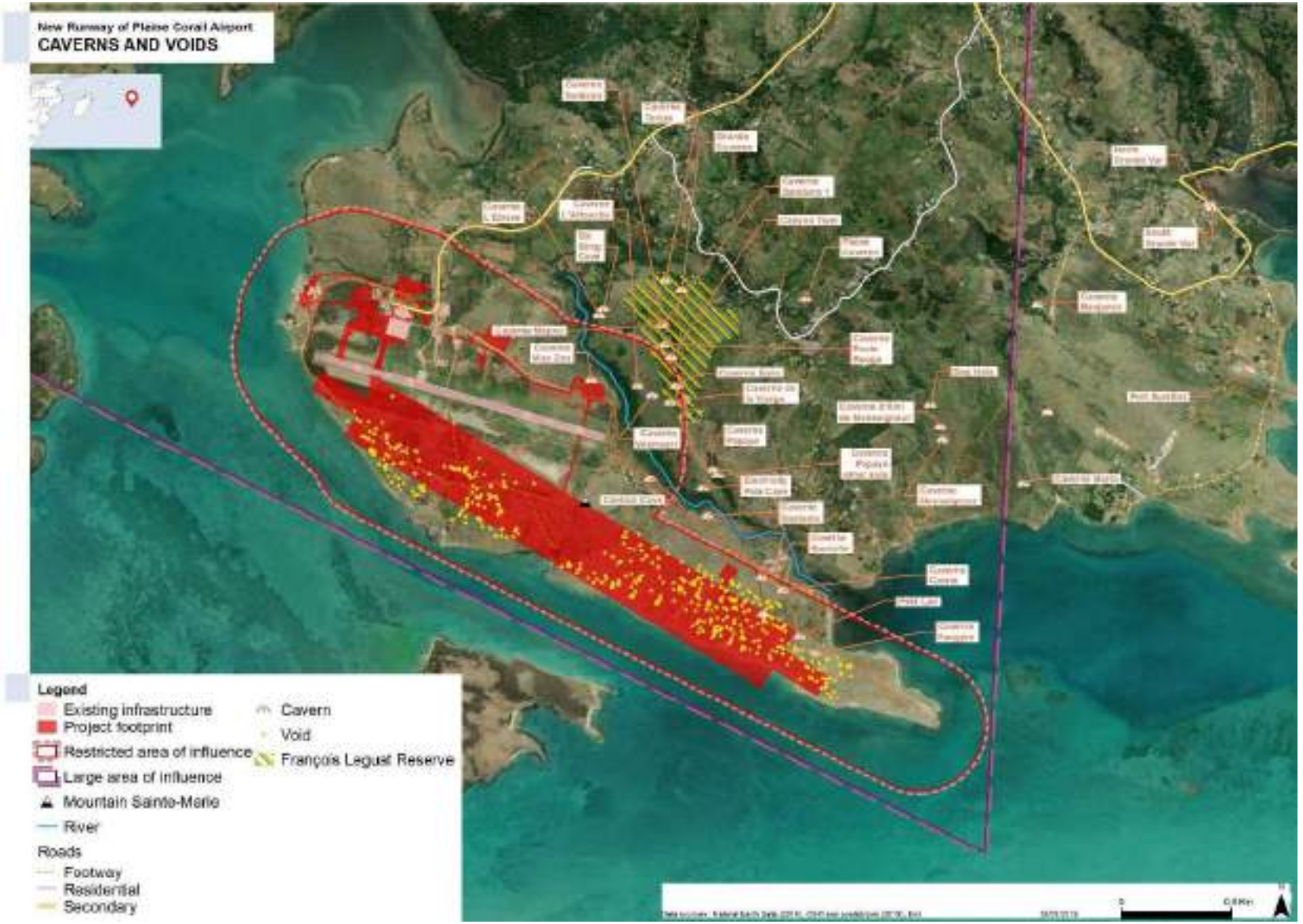


Figure 49: Voids and cavities identified in the restricted area of influence at Plaine Corail

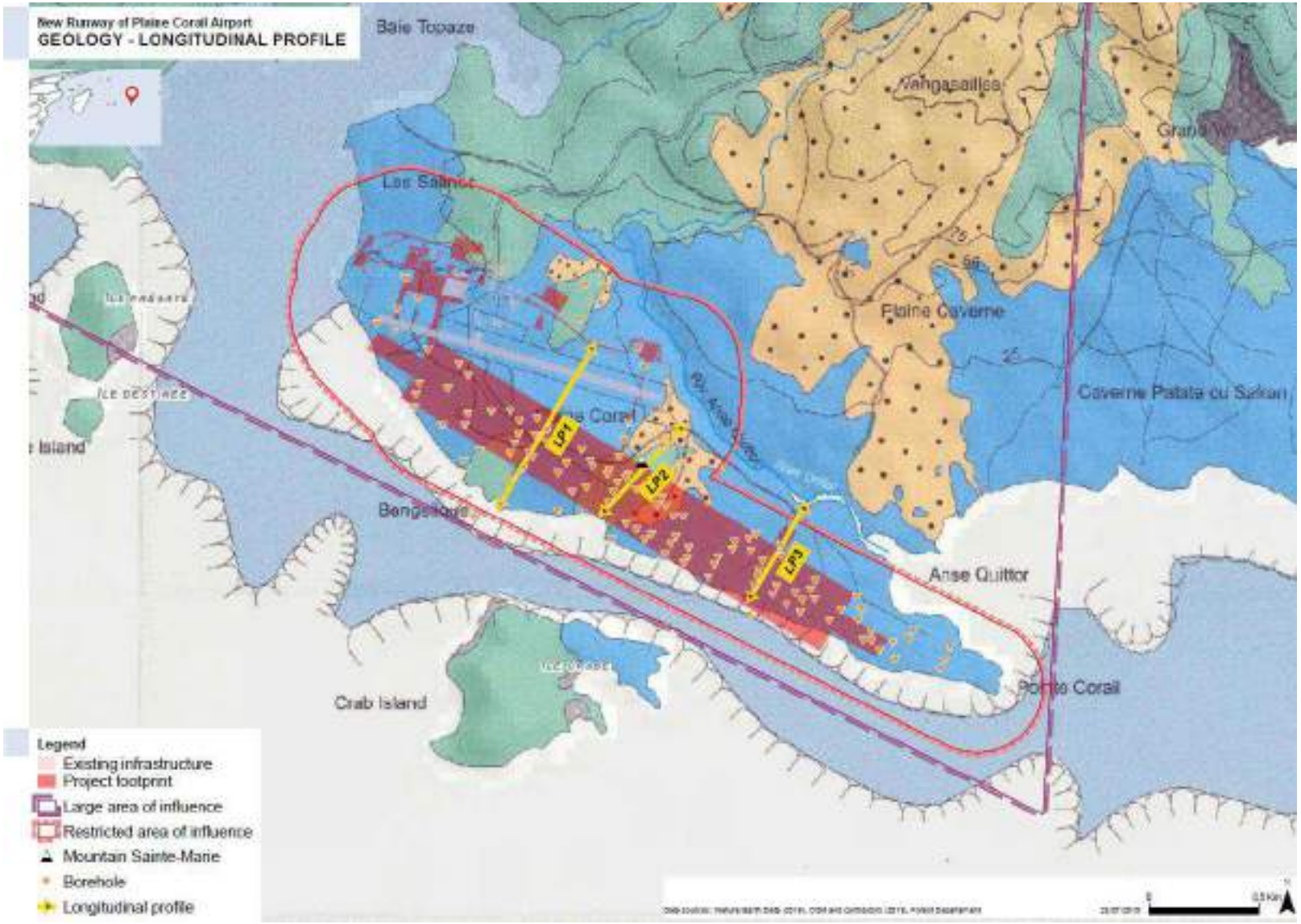


Figure 50: Geological long sections through the restricted area of influence at Plaine Corail

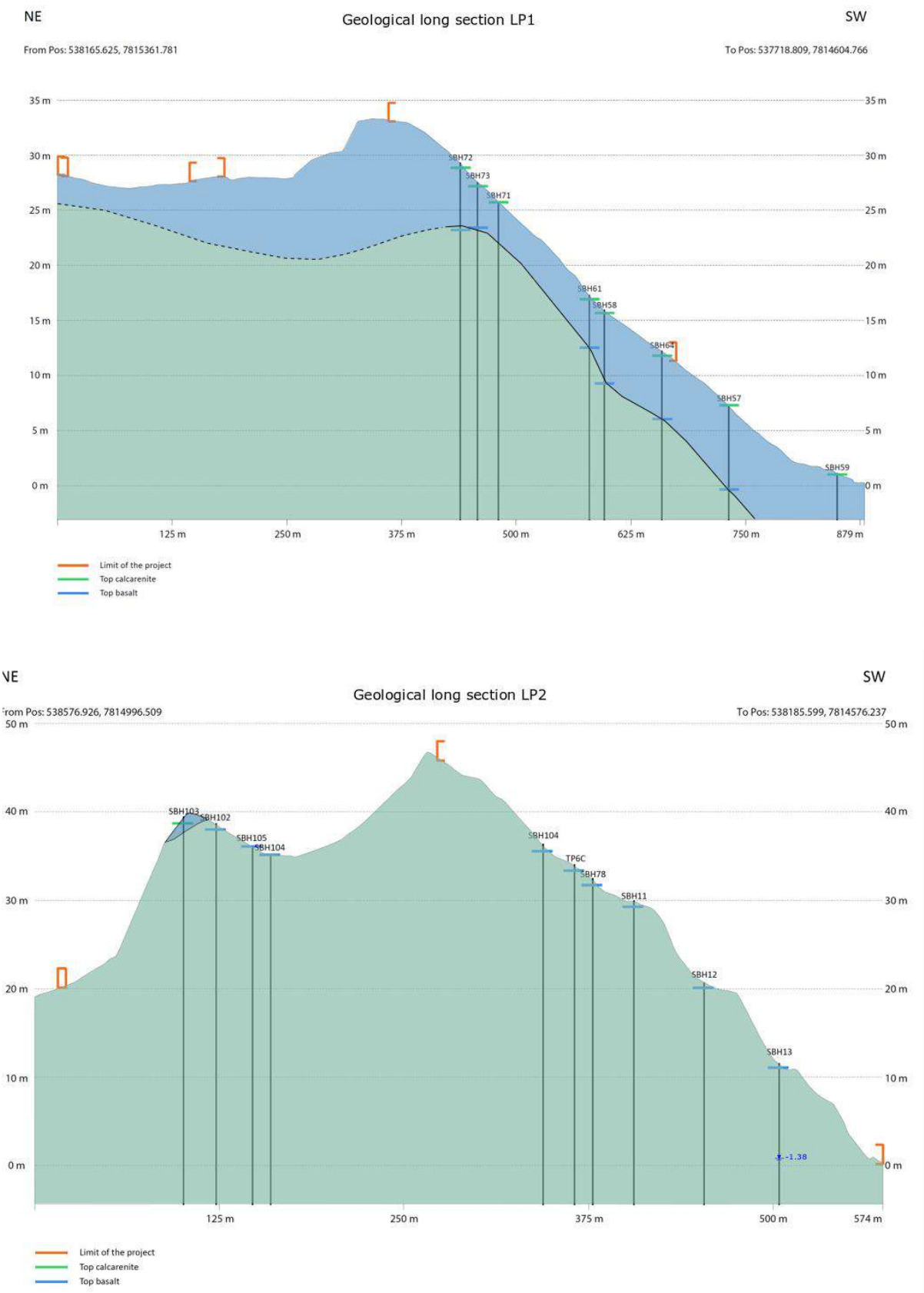


Figure 51: Geological long sections LP1 to LP2

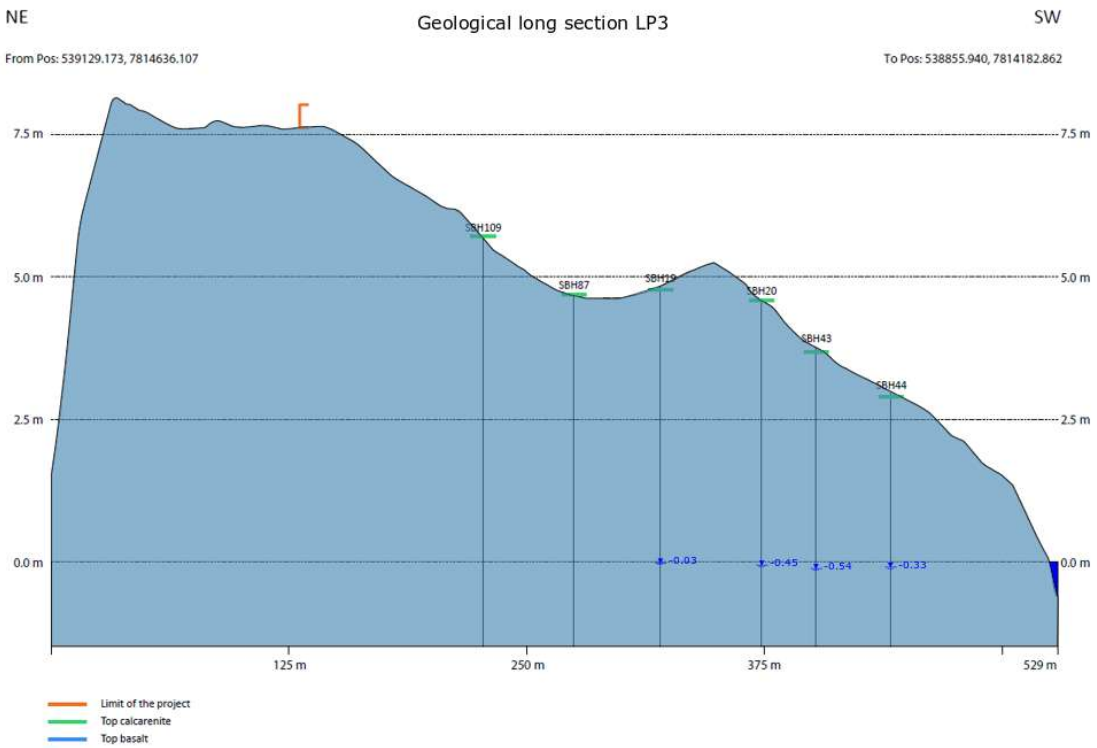


Figure 52: Geological long sections LP3

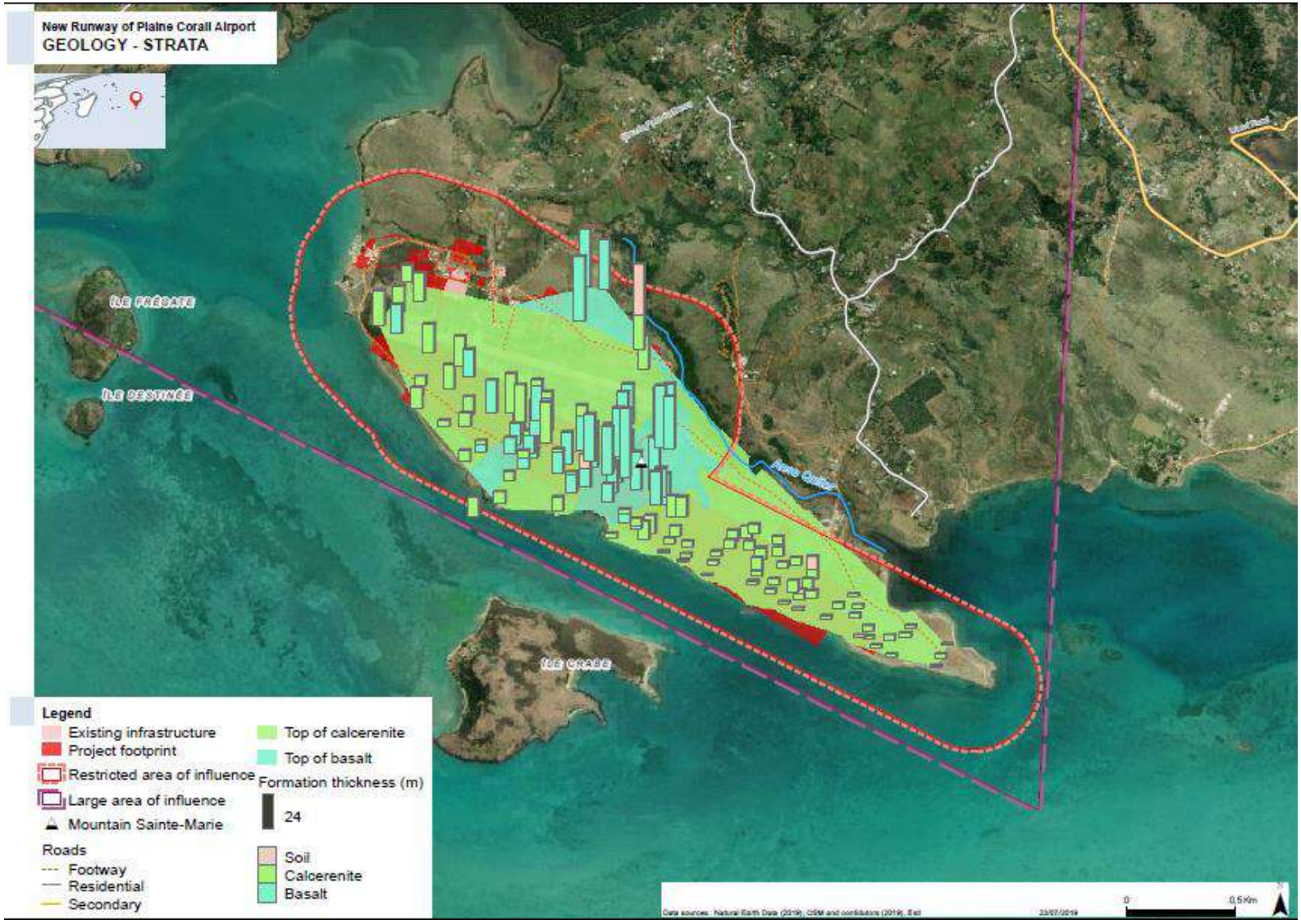


Figure 53: Spatial distribution and thickness of the main geological formations based on the geological formations encountered in boreholes ground investigations

6.3.5.1.5 Synthesis and uncertainties

It has to be stressed that no additional geophysical ground investigations were performed in the area of the present-day Plaine Corail Airport since Phase B ground investigations campaign.

Numerous voids identified from geophysical survey and borehole investigations have been located in the proposed runway area. The number of voids clearly shows that the Eolian Calcarenite Formation is a geological unit affected by karstic dissolution. But uncertainties remain with regard to relationships between geophysical/drilling anomalies attributed to karstic features and the known caverns located along the western flank of Anse Quitor. Additional geophysical surveys coupled with control boreholes shall therefore be carried out in this area by the consultant in charge of the detailed design, in order to clearly understand the 3D expression of the underground karstic features directly below the new runway footprint, and appreciate associated geotechnical hazards.

For more information on the karst formation in the restricted area of influence and the assessment of project impact on the groundwater, please refer to section 5.3.7.

6.3.5.2 Soils and erosion

Land uses may be grouped into Agriculture and Grazing Lands; Forestry and Forest Biodiversity; Management of Caves; Botanical Gardens; and Built up areas (SIDPR classification). Poor land management is considered a concern on the Island, which has resulted in soil erosion. Soil erosion is a result of several factors, including:

bad agricultural and grazing practices;
past deforestation;
poor building practices (especially the dispersed nature of settlements);
steep topography; and
high intensity rainfall.

The SIDPR reports a lack of an endorsed framework for land planning and land use. Soil erosion results in a number of knock effects, including land degradation that affects agricultural productivity and is therefore a major factor in food security and poverty. It also affects rivers and dams as well as the lagoons and coral reefs, contributing to environmental degradation of the aquatic and marine environment. The anticipated secondary effects of the development of a new runway, i.e. the development of the tourism industry and demand for new services and goods, may have important implications on land use in terms of land use planning (i.e. appropriate zoning of new developments) and in terms of encouraging unsustainable land use practices such as agriculture to provide goods to the tourist industry, if not managed appropriately.

6.3.6 Marine and shores geology and marine turbidity

This chapter is the marine counterpart to the previous one, and is meant to base the assessment of the risks of impacts related to earthwork and shoreline work during the construction and then the consequences of the topography and shoreline modification.

6.3.6.1 Description of Rodrigues and Plaine Corail shorelines and reef

The coastal zone is mostly surrounded by fringing coral reef enclosing a shallow lagoon area – 0.5 to 3m – with deeper channels (to 40m in front of Port South-East). A shallow channel also separates the location of the future airport runway from Crab Island. The width of lagoons varies from place to place; along the West coast the reef lies 4-8km from the shore (4,6km from the airport runway). The reef platform and shallow lagoon around the island are more than twice the island's area. The bottom of the lagoon is composed of silty sand, the amount of silt being dependent on the distance from (temporary) rivulets. In general, the vast lagoon between the coastline and the reef is shallow, with sandbanks appearing at low tide and some deeper channels. At spring low tides, the intertidal zone locally extends several hundred meters.

Rodrigues Island was formed some ten million years ago from a crater of a sea-mount and consisted of theolitic lavas which have been observed as far as the eastern coast of the island. Subsequently, other eruptions consisting of pyroclasts and lavas (prismatic, hawaiites, etc.) contributed to the geomorphological features of the island.

The coastline is about 67 km long and is composed of different shore types: rocky stretches (especially at the headlands) alternating with sandy beaches (mainly in the bays) and smaller stretches of rock boulders and pebble shores. Locally, small (undercut) cliff walls (2–3 m high) occur, composed of eroded fossil coral reefs. In front of (temporary) rivulets, silty-sandy areas develop. Plaine Corail's shore is mostly rocky.

Because of late volcanic eruptions that occurred 1.3 to 1.5 million years ago, most of the shoreline is made of rocks and only 9% of the coastline are sandy beaches. Most are pocket beaches or small crescentic ones. They range from 2 to 25 m wide, some being very narrow as a consequence of the receding shoreline.

Table 35: General characteristics of beaches in Rodrigues

Island	Coastline (km)	Sandy coastline (km)	Number of beaches	Beaches seriously eroded
Rodrigues	67	6 (9%)	8	3

The eastern side of the island experiences greater exposure to the open ocean and prevailing wind and wave regime.

The southwestern area of Rodrigues Island is composed of thick eolian calcarenite deposits which contain a rich variety of limestone caves (Caverne Patate) and many karst features.

Plaine Corail, located in the South West, is an extensive area of low and flat land made of limestone, made up of solidified wind-blown sand.

Crab Island, which is southwest of mainland Rodrigues, is 1.1 km long in the east-west axis and 0.8 km wide in the north-south axis and lies some 350 m offshore of Plaine Corail at its nearest point to the mainland. The greater part of Crab Island consists of basaltic rock formed by volcanic activity probably over 1.3 million years ago (Upton et al., 1967). The summit of the islet rises to 45.5m above sea level at the highest point. The land slopes down rather steeply beyond the plateau except towards the NE where the gradient is much gentler. The islet has a rather open and shallow bay to the SW, fringed at places with some remnants of calcarenitic rocks consisting of wind-blown coralline sand probably deposited during the Pleistocene and thereafter cemented together (Mc Dougall et al., 1965). A more extensive calcarenitic area occurs along the Southern coast of the peninsula. The islet has three beaches of coralline sand: one in the southwest, and two on the eastern side, the larger of which occurs in the northeast portion of Crab Island. There is no river or fresh water body on Crab Island that could generate turbidity.

6.3.6.2 Marine sediment transport

The western coastal area of Rodrigues' lagoon is characterized by significant medium sand and mud.

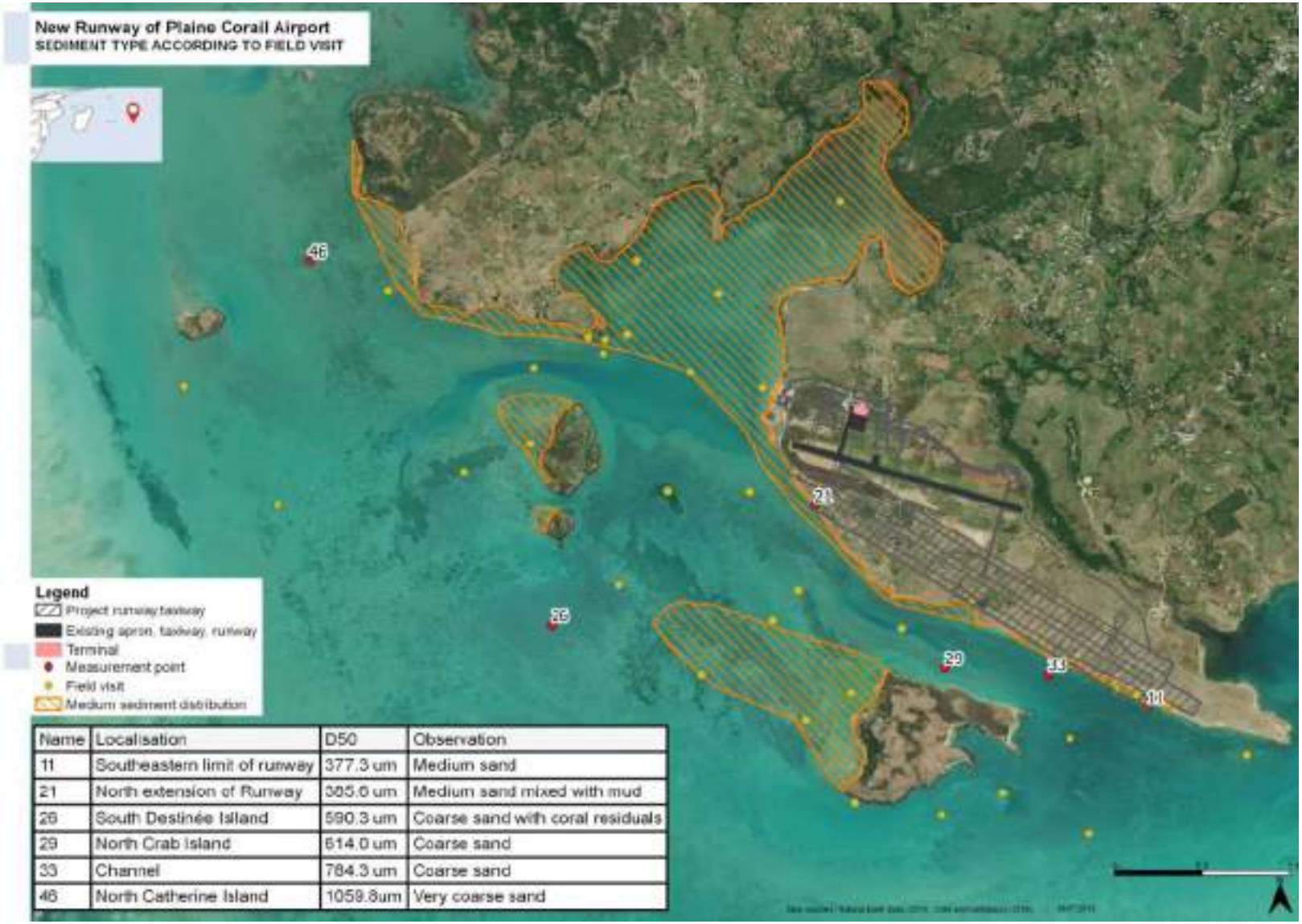
The grain size distribution of superficial distribution was conducted in July 2019. It shows sand is a more important component than silt and clays in the 6 samples collected and analysed (see figure below). These measurements showed a predominance of sand with a median diameter (d50) of 350 to 1060 µm.

Coarse sand stock exists in the inner part of the channel between Crab Island and the mainland, whereas finer sediments are located near the shore and in Topaze bay where current is weaker or almost non-existant. There, the portion of silt and clays is significant[5] (AFD, 2016).

The Northern part of the bay is composed of mud due to the very weak current and the important water runoff during heavy rains.

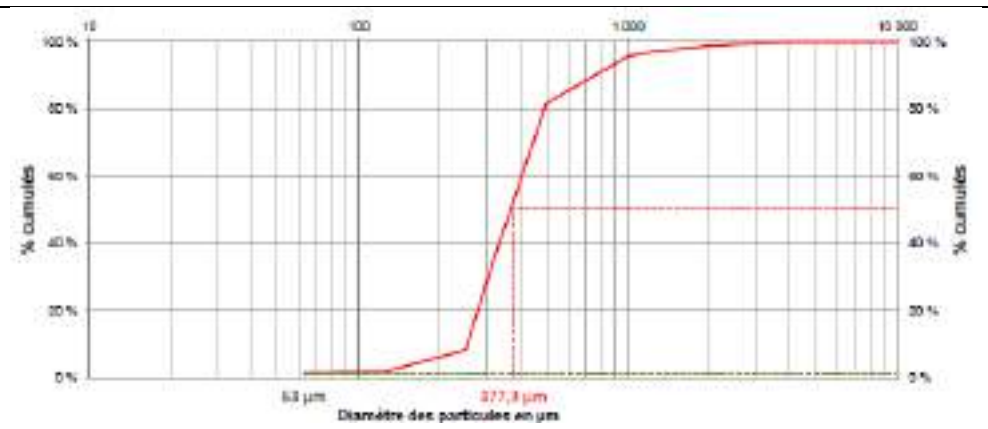
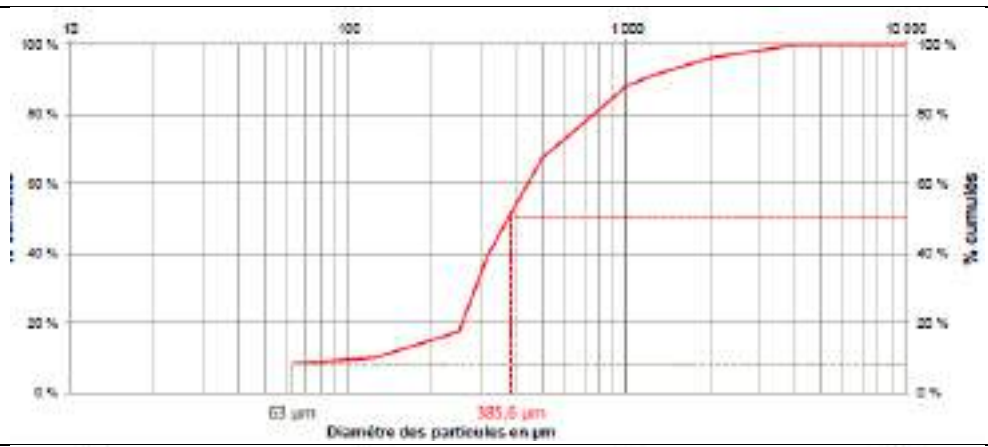
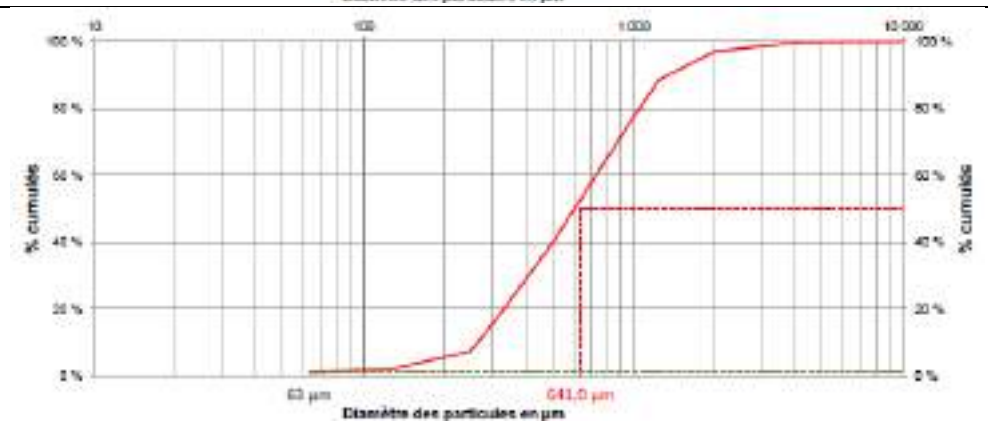
Bed load and resuspension occurs within the lagoon during each tidal cycle. Sediment transport under the influence of the flow is mainly from South-East to North-West. Resuspension is stronger when the current magnitude is important, the maximum is observed with ebb and flow current.

[5] AGENCE FRANCAISE DE DEVELOPPEMENT – Projet d'extension de l'aéroport de Rodrigues (Maurice): réalisation d'un diagnostic écologique / PHASE 1. BIOTOPE – Version finale - Juin 2016



Name	Localisation	D50	Observation
11	Southeastern limit of runway	377.3 um	Medium sand
21	North extension of Runway	365.6 um	Medium sand mixed with mud
26	South Destinée Island	590.3 um	Coarse sand with coral residuals
29	North Crab Island	614.0 um	Coarse sand
33	Channel	784.3 um	Coarse sand
46	North Catherine Island	1059.8um	Very coarse sand

Figure 54: Marine sediment field measurement and grain size distribution.

SAMPLE	PHOTO	GRAIN SIZE DISTRIBUTION
11 Clean medium sand		
21 Silted medium sand		
26 Very coarse sand with coral residuals		
29 Coarse sand		
33 Coarse sand		
46 Very coarse sand		

6.3.6.3 Seawater turbidity

The sea water around Rodrigues is usually very clear. However, during heavy rain, along the North-Western and Western coasts, rivers carry large amounts of debris and soil into the lagoons, increasing the sea water turbidity. In some places, mangroves have been planted to stabilize the sediments and prevent the turbidity spreading into the lagoon.

In the northern area of Plaine Corail Airport, in Baie Topaze, natural turbid plume was identified in the past, see figure below.

Figure 55: Natural turbid plume in Baie Topaze (Google Earth, 25-05-2017)

Under common hydrodynamic conditions[6], inorganic matter levels are usually inferior to 20mg/L, rarely exceeding 30 mg/L in the Topaze bay. Turbidity is higher in the intertidal zone. The turbidity is homogenous in the water columns. Stronger winds increase sediment suspension, inorganic matter levels of 40-50 mg/L can be reached.

6.3.6.4 Marine environment issues

The studied area is characterized by a mild tropical maritime climate and influenced by south-easterly trade winds and Austral westerly ones. The coral reef fringing Rodrigues serves as a natural barrier that protects adjacent shorelines from offshore coastal hazards such as tropical cyclones approaching from the Northeast, southern hemisphere swells and local generated waves.

[6] Appendix Bc Consultation File (DCE) – Projet d'extension de l'aéroport de Rodrigues (Maurice) – Réalisation d'un diagnostic écologique – Phase 1 – Bibliographie, Agence Francaise de Développement (AFD), juin 2016

The coastal zone is surrounded by a shallow lagoon composed of silty sand and deeper channels. Usually crystal clear, the sea water around Plaine Corail can be very turbid after heavy rain.

Based on the description of the existing environment, the key marine receptors of concerns are the following:

- Marine receptor 1: Marine sediment quality: contamination of marine sediments.
- Marine receptor 2: Marine sediment dynamics: physical disturbance of marine sediments.
- Marine receptor 3: Seawater quality: temperature, salinity, concentration of contaminant.
- Marine receptor 4: Physical coastal processes: shoreline, morphology, wave, currents.

Even if the extension will change the shape of the island the area gained on the sea is minimal relative to the size of the channel between Crabe Island and Rodrigues, it would not change the wave dynamic. The receptor “Physical coastal processes” is therefore considered to be of low sensitivity.

“Seawater quality” is categorized as high because the project is located in a rather shallow area and pre-stresses. Natural turbid plumes have been identified in the past after heavy rain events.

The “Marine sediment quality” and “Marine sediment dynamic” receptors are considered to be of medium sensitivity because of the poor knowledge of sediment thickness and local granulometry, due to a lack of in situ data, as well as their temporal evolution.

6.3.7 Hydrology

This chapter aims at describing the rivers and surface water characteristics and how storm water behaves in the project area, depending on the geology, soil properties, and topography. The goal is to base the assessment of the project and earthwork impact on the river flows and floods on it.

It is also aimed at providing input data to base the conception stormwater management system of the project on.

6.3.7.1 Water catchment physical characteristics

The Island of Rodrigues is divided into 38 major river basins. Their catchment areas vary between 0.35 Km^2 and 7.02 Km^2 as shown in the figure below.

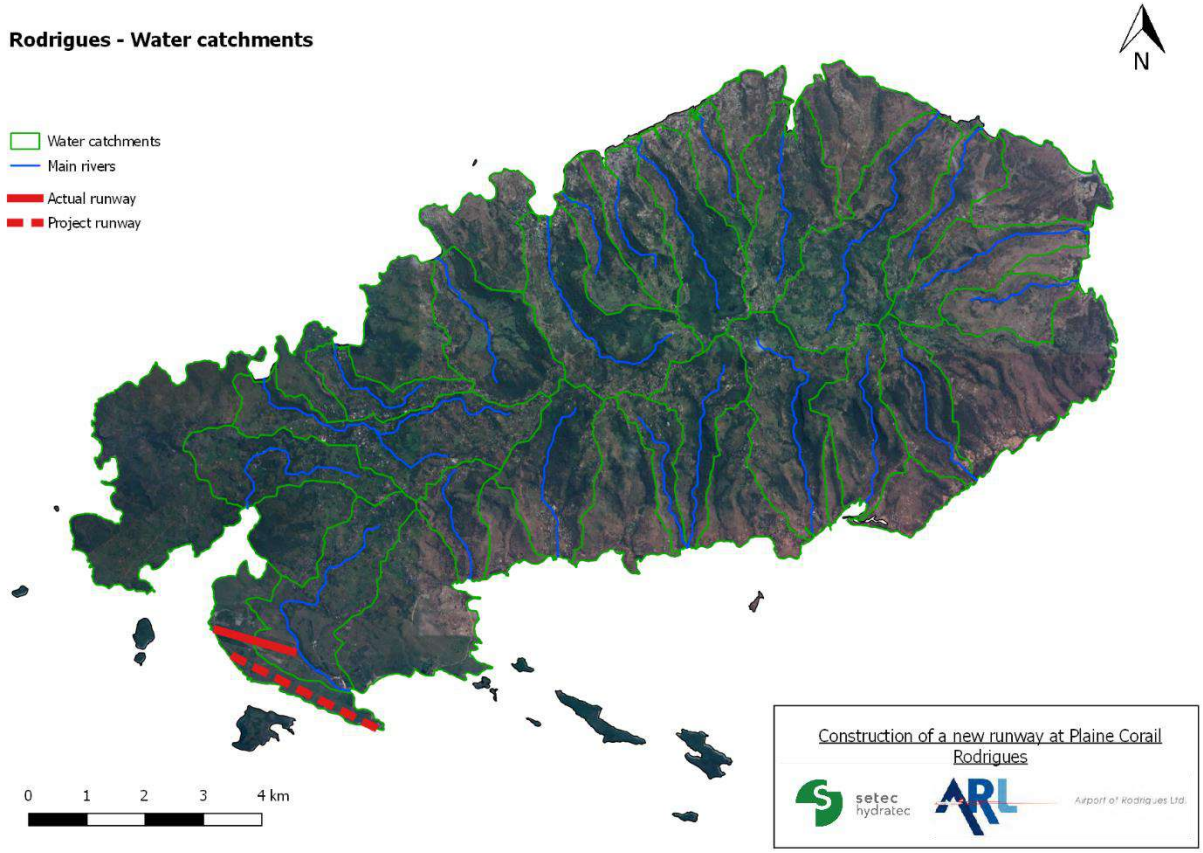


Figure 56: Water catchments

In most water basins, the low permeability of soils generated by alteration of basalt suggests a generally low infiltration capacity, which is sometimes increased locally by the presence of fracture zones.

As for most volcanic islands of comparable geological structure and topography, a proportion of the amount of water infiltrated during rainy episodes is returned to the sea. This part can represent a significant fraction of the water balance of a watershed.

The rivers that lead to the North, East and South coasts of the island have watersheds of similar morphology. Watershed heads are characterized by soft-shaped hills (slopes of 10 to 20%). Further downstream, the rivers have cut into very small valleys. The slopes that generate

the flow are then very steep (30 to 100%), with frequent waterfalls in the beds and cliffs on the top of the slopes. Transfer times of the flow generating zones are very short as a result.

Therefore, although the main watersheds are usually relatively elongated, their concentration times are very short: around 15 to 30 minutes at their mouth into the sea, for the most abundant. Response times are extremely short and hydrological regimes are a succession of fast and short-lived floods separated by dry periods of varying lengths.

The deep cut valleys with steep gradients and the absence of impounding reservoirs in Rodrigues result in most of the rainfall over the island being lost to the sea as high velocity runoff. Due to negligible infiltration to groundwater, base flow of rivers is very low. The flows range from 1.4 l/s in Riv. Grenade to 56.9 l/s in Riv. Baie aux Huîtres.

6.3.7.2 Rainfall analysis

The definition of the hydrology scope depends upon territorial and climatic data, including rainfall data. Rainfall is the main input data for flood estimations (with sea level when it comes to coastal area), due to the availability of historical records and the presence of measuring stations throughout the island.

The main issue for rainfall assessment is the definition of statistical intensities and their spatial repartition on the territory for intense events, which can generate flood events. Indeed, a geographical gradient is observed for the annual rainfall between coastal areas (less than 1,000 mm) and the central plateau (over 1,600 mm).

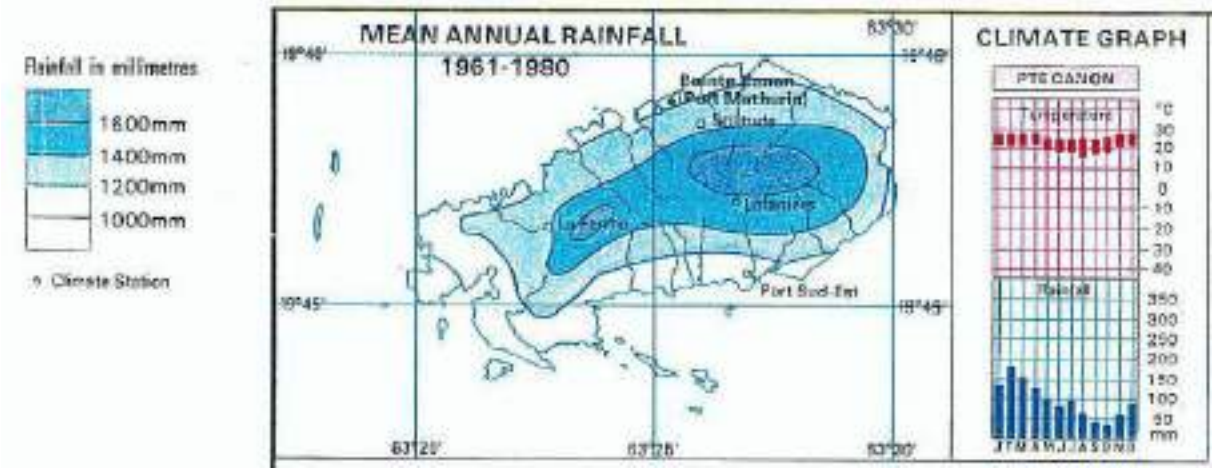


Figure 57: Mean annual rainfall – Rodrigues ("Etude d'un programme de lutte contre l'érosion à Rodrigues", BRGM, ONF, Impact, December 1996)

6.3.7.2.1 Rainfall stations, available data

Mauritius Meteorological Services (MMS) is collecting data from its own recording systems, and from private ones. The existing rainfall stations network (the only automatic weather stations) for Rodrigues Island is shown on the map below.

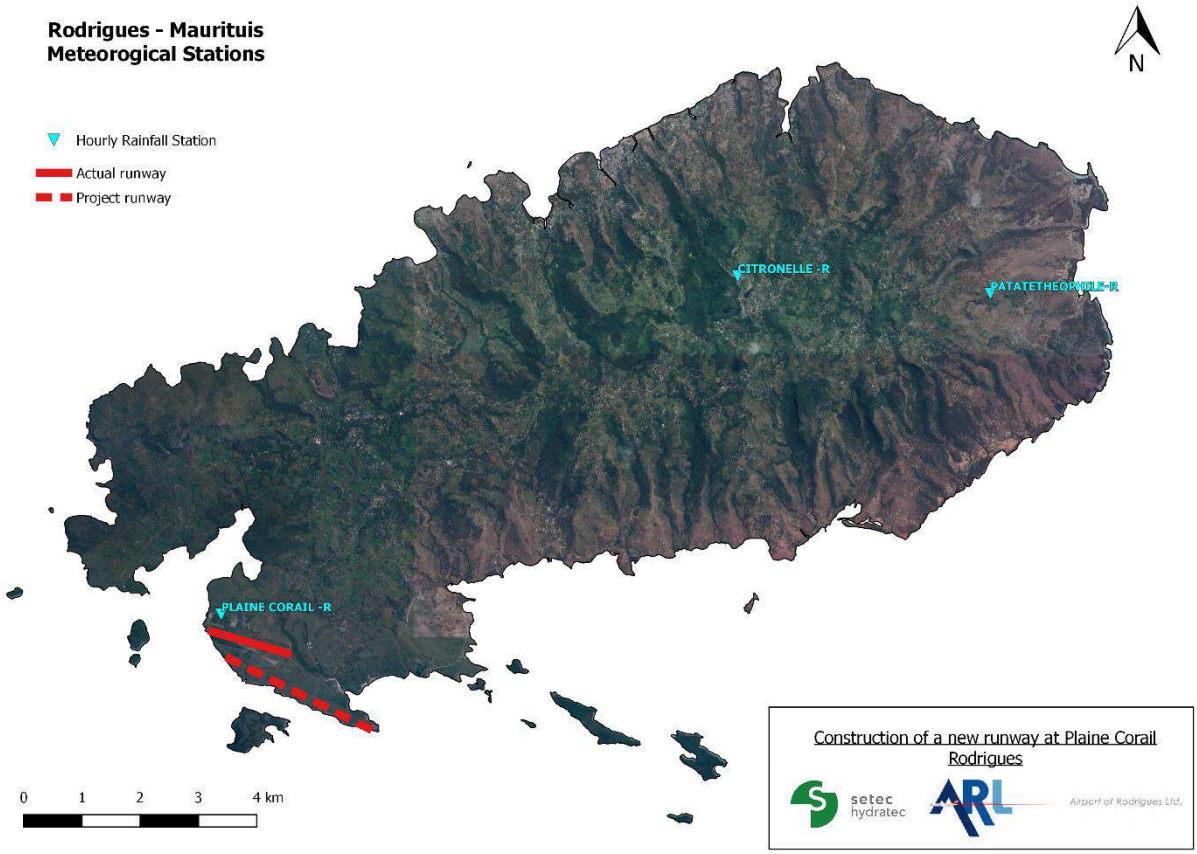


Figure 58: Rainfall stations. Note: The station "Plaine Corail – R" corresponds to the study area

6.3.7.2.2 Statistical analysis

Rainfall statistical analysis can be synthetized in Intensity – Duration – Frequency (IDF) curves.

Hydrological studies for statistical discharge estimation are based on IDF curves established from storm rainfall data across the island.

Note: Rainfall data specific to the Rodrigues Airport platform is not available since they do not exist. Therefore, as in the Preliminary Design, the rainfall data to be considered is the one used for Mauritius and based on the same IDF curves as Mauritius.

6.3.7.3 Runoff, rivers and flooding

The airport is located near the Anse Quitor River. The river is quite deep near the actual airport runway, and there is no potential flooding expected as a result.

The illustration below shows the Digital Elevation Model (DEM) of Rodrigues. This DEM was made from level curves of 10 m. The next figure shows a zoomed-in view of the DEM on the project area with level curves and flood areas for a 100-year return period.

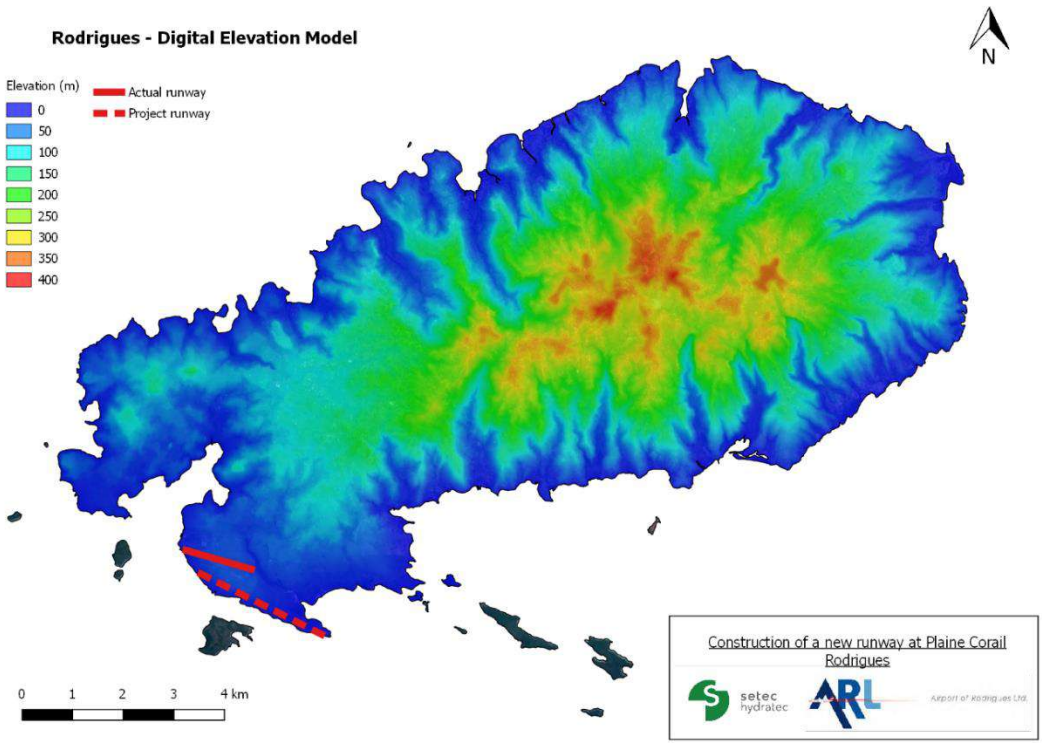


Figure 59: DEM of Rodrigues

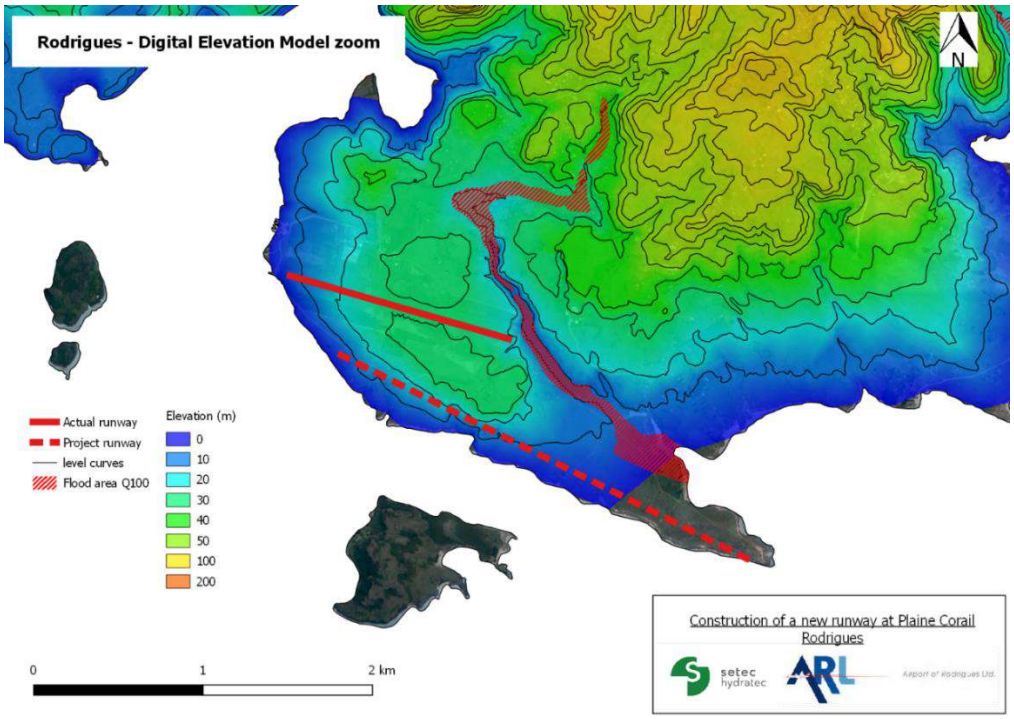


Figure 60: DEM of Rodrigues (zoom) and flood area for Q100

The map below shows a detailed view of the topography of the site from a 2m planimetric resolution point seedling.

On the basis of this topographical data, existing maps and observations made on site during the first field visit carried out at the beginning of April 2019, the sub-watersheds as well as the main runoff and rainwater drains could be specified:

Artificial ditches. During the second site visit carried out with ARL at the beginning of May 2019, a drain was observed only around the existing apron and along the taxiway in front of the passenger terminal building, which passes under the existing taxiway and discharges the stormwater into the natural environment nearby as illustrated hereinafter.
Natural low points of runoff concentration; however, no ditches are marked.

Figure 61: Detailed view of the watersheds and drains of the existing site (topography 2 m planimetric resolution)

Runoff from the current runway flows diffusely to the shoulders and into the natural drains. These runoffs are thus directly discharged into the natural environment.
The topography of the current track makes it possible to manage current rains without damage:

slightly elevated topography compared to the low drainage points of natural watersheds,
slight lateral slope allowing a regular drainage of water to the shoulders.

Figure 62: View south / north of the current runway – April 2019 field visit

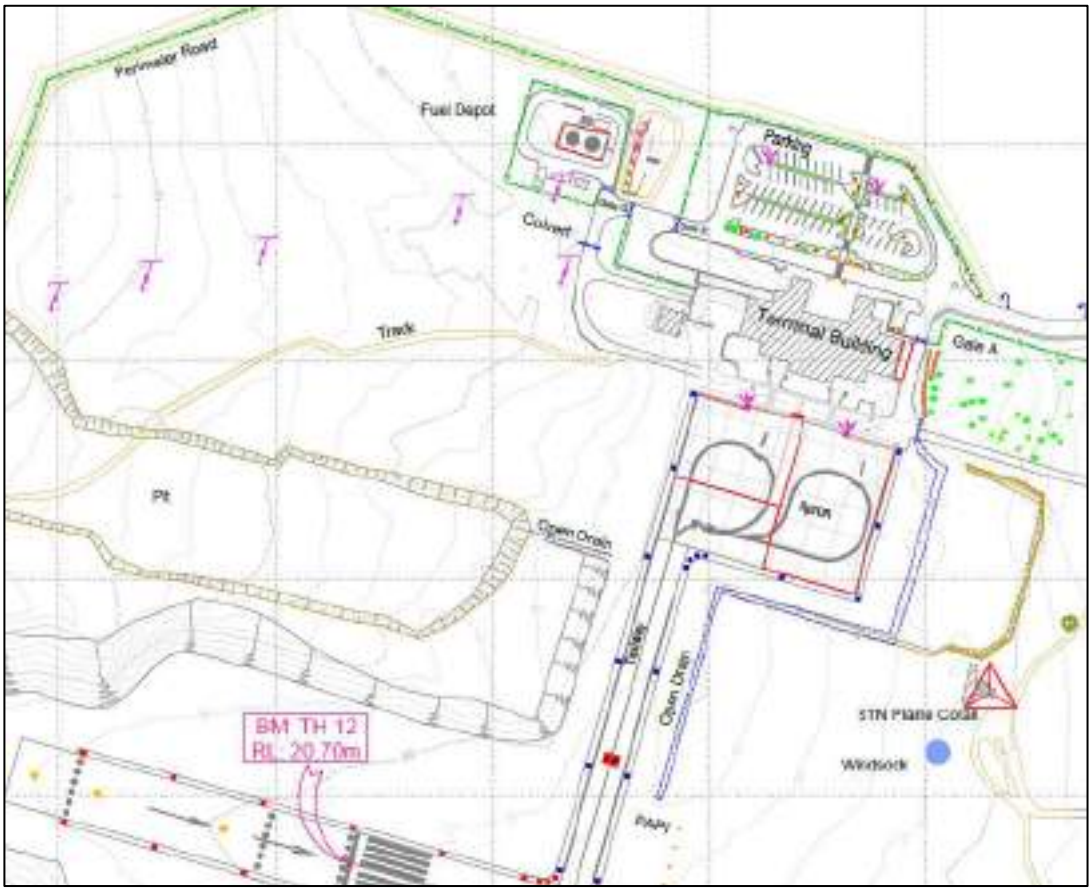


Figure 63: Extract of the general layout drawing showing the existing drains observed around the apron in front of the passenger terminal building

Figure 64: View of the existing drains observed around the apron in front of the passenger terminal building

Figure 65: View of the existing drains observed around the apron in front of the passenger terminal building

An uncertainty still remains on the accuracy of the flood zone observed on the previous map, particularly at the mouth of the Anse Quitor River illustrated below:

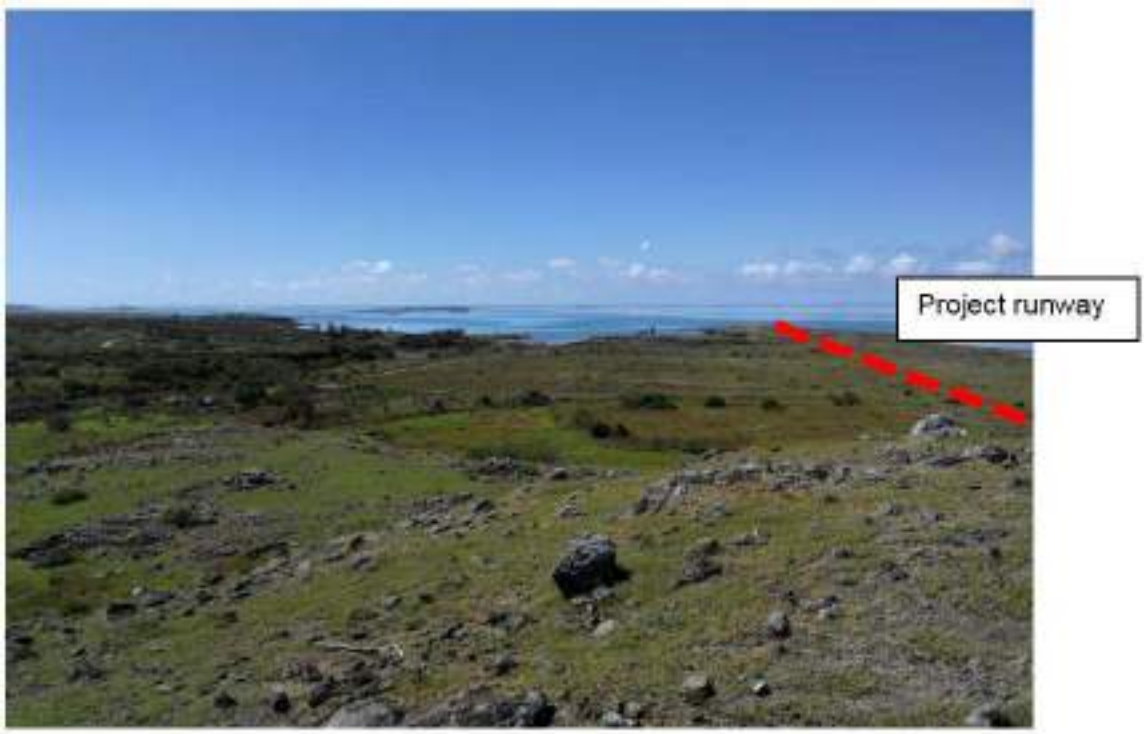


Figure 66: View north/south of the site of the project runway – April 2019 field visit

The first field visit highlighted a flat outlet of the Anse Quitor River, which is probably a flood-prone area.

Even if the boundaries of the project runway are probably in the flood area, the installations on fill above the original ground level will not be concerned by flooding and run-off.

The position on a watershed with no other built-up issues also limits the risks associated with stormwater run-off.

Thus, in light of the above, we can observe that the problem of stormwater run-off only concerns the drainage of the various platforms that will be managed and equipped with drains. In case of extreme events and overflowing of the drainage systems, stormwater will be discharged to the sea in gullies without impacting issues.

6.3.7.4 Hydrology issues

6.3.7.4.1 Stormwater management

Stormwater management is an issue regarding the new runway and its proper drainage is therefore important in order not to disturb the operation of the runway during landing and take-off of airplanes. Furthermore, its proper pre-treatment, with respect to oil, grease and suspended solids in our case, is also important before its discharge in the environment or at sea.

This issue sensitivity is of a major level.

6.3.7.4.2 Flooding of issues downstream of facilities

The development is likely to change the downstream flows. As no watercourses cross the project and all stormwater runoff discharges flow directly to the sea, no built environment issues are likely to be affected by this risk.

This issue sensitivity is of a low level.

6.3.7.4.3 Transfer of pollution to the natural environment

Transfer of possible pollution from the runway by stormwater runoff directly to the natural environment, including effluents generated by a fire fighting operation on the runway.

This issue sensitivity is of a major level.

6.3.7.4.4 Transfer of sediments to the lagoon

Stormwater management including a buffering storage and / or other works facilitating infiltration and reducing soil erosion enables to address climate change adaptation for disaster risk reduction. In fact, reduction of peak flows, run off and soil erosion leads to reduced sedimentation of water bodies including lagoons, thus protecting biodiversity, corals and white sandy beaches. The buffering storage offers an opportunity of confining any pollution generated by an eventual firefighting on the runway.

This issue sensitivity is of a major level.

6.3.8 Hydrogeology

This chapter focuses on the karstic calcarenites formation on the restricted area of influence. It aims to describe how ground water flows in this formation and to analyse the current quality of groundwater.

It also seeks to identify the points of vulnerability and contamination of groundwater, as well as the current use of groundwater.

The goal is to base the project impact assessment on the groundwater: risks of chronic or accidental pollution, flow modification and supply to wells, boreholes or springs due to karstic voids consolidation or filling in the project footprint area.

This subject is particularly sensitive on an island such as Rodrigues where fresh water is a scarce resource.

6.3.8.1 Hydrogeological setting

6.3.8.1.1 General considerations and definitions

The hydrogeological context is closely linked to geology. The hydrogeological units of the Rodrigues Islands are formed mainly by volcanic rocks and by a minority (in terms of coverage) of limestone (called calcarenite hereby) on the coast. The reader is asked to refer to the chapter on geology for more details.

The Figure 67 below shows the main hydrogeological units on Rodrigues Island.

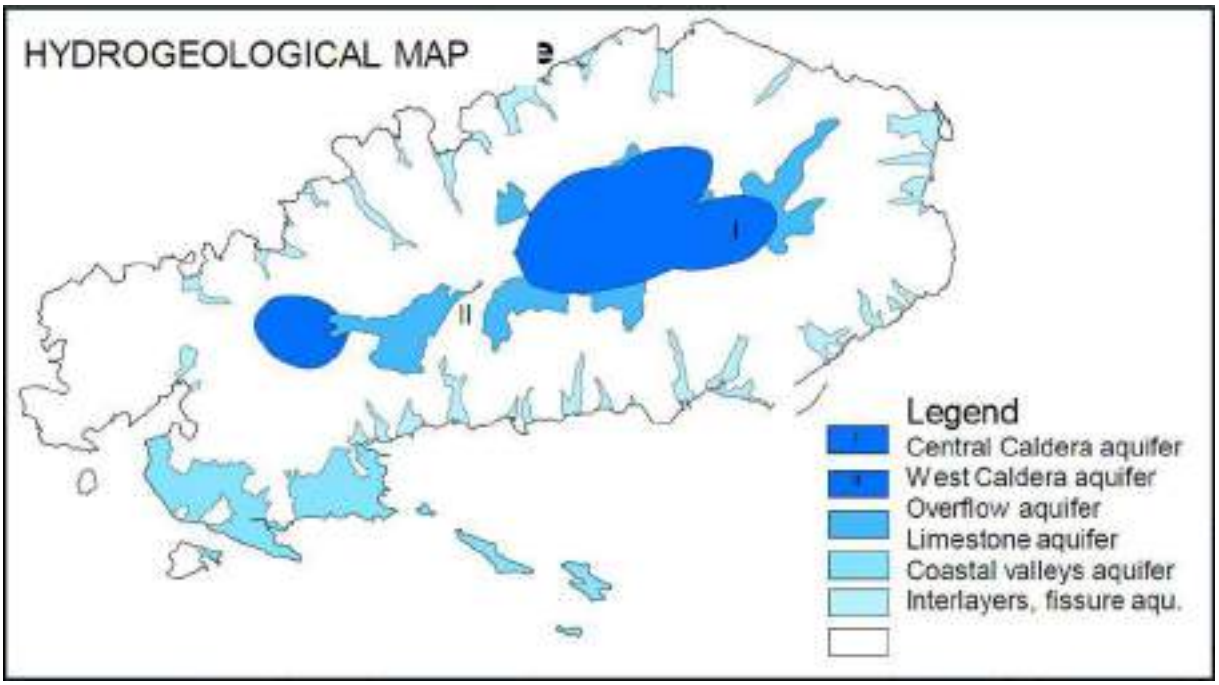


Figure 67: Hydrogeological map (from WRU of Mauritius)

According to surface observations and the interpretation of borehole data, Plaine Corail is characterized by two types of potentially aquiferous formation: basalts and karst calcarenites.

The basalts identified in the project area are weak, altered, and are defined as a fractured aquifer with double porosity: the matrix and the fracture porosity.

These two types of porosities define the aquifer properties and contribute to groundwater flow.

Karst calacarenites represent very complex aquifers since they combine three types of porosities that contribute to groundwater flow: the matrix, fracture and karst network porosities.

6.3.8.1.2 Particularities of karst carbonate aquifers

The restricted study area has elements typical of karst landforms: caves, doline, karren, lapiaz, sink holes, pinnacle, etc. closely linked to groundwater flow paths.

Karst aquifers are the most heterogenic and anisotropic type of aquifer. The secondary porosity, as fracture in fractured aquifer, comes from dissolution conduct networks (sometimes also called tertiary porosity).

This section aims to help with the understanding of groundwater movement in carbonate aquifer with well developed karstic network.

Figure 68 below shows a general conceptual model of a karst system called "double continuum", where water flows into voids (fast flow) and through porosity of the rock (slow flow).

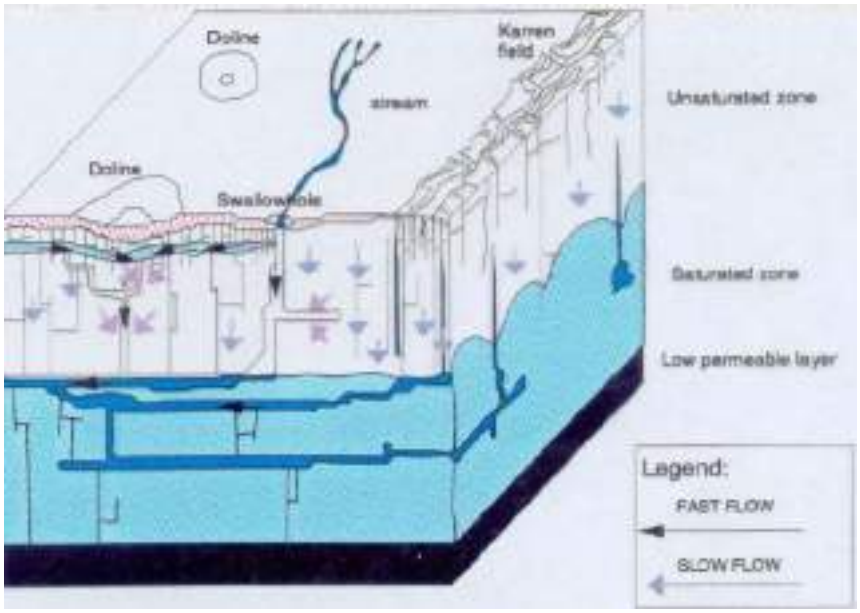


Figure 68: Karstic system conceptual model (modified from M. Bakalowicz, hydrosciences Montpellier 2002)

Hydrodynamically speaking (rapid variation in water conditions over time), the karst network is the most influential because it has a high capacity to transmit water between infiltration and discharge. A well developed karst network will react very quickly to precipitation, resulting in a sudden and significant variation in the groundwater flow regime.

The result of this particularity is that the aquifer reacts quickly to heavy precipitation and the direction of flow may be totally erratic. That is, groundwater flow does not correspond to a conventional pattern related to topography and geological structure. This makes it very difficult to develop a groundwater flow map that is representative of a seasonal period.

The epikarst, the upper part of the karst in which water is stored before it percolates to underlying aquifers, has a considerable importance to karst hydrogeology. The conceptual model above graphically shows how surface water from a stream flows, or direct infiltration from rain reaches first the unsaturated zone and then the saturated zone.

The concept of “elementary representative volume” is important in karst hydrogeology because local and regional groundwater flows can have very different behaviours and directions. The phreatic surface can be extremely variable in karst, due to high permeability contrasts.

6.3.8.1.3 Local considerations

6.3.8.1.3.1 Recharge process

The epikarst in the project area is partially represented by sinkholes when visible but also by numerous non-observable dissolution structures below the soil deposit. The process of recharge can occur by different mechanisms:

- Direct infiltration through the soil;
- Streambed infiltration (sinking stream);
- Lateral recharge from basaltic material.

In terms of volume, usually, sinking streams represent the one mode of recharge for the underlying karst aquifers. Floods may temporarily create an inflow to the cave network through riverbeds like the Anse Quitor River or through the large number of cave collapse sinkholes. In some areas, such as the Grande Caverne cave system’s Canyon Tiyel section, the presence of an elongated collapsed depression could also act as preferential inflow during rain to the underground network. A considerable amount of water can circulate in the karstic network during rainstorms.

Basaltic outcrops are present in the new runway area indicating the presence of a potential basaltic fractured aquifer. This aquifer is probably in relation to the overall phreatic water in the Pointe Corail peninsula.

6.3.8.1.3.2 Hydraulic properties

There is not sufficient information to provide hydraulic properties of the potential basaltic or karstic aquifer. Due to the high hydraulic anisotropy of the Karst aquifer, for the local scale of Plaine Corail, there is no practical reason to provide any range of permeability or transmissivity value. This agrees with the elementary representative volume concept discussed in the previous section. Indeed, the volume represented by the Plaine Coral Peninsula is too small to identify a flow pattern with certainty. Therefore, only an estimate based on a few observations will allow a conceptual model of groundwater flow to be presented in the following section.

6.3.8.2 Groundwater flow

Geotechnical investigations for the new runway extension highlighted groundwater level in 55 rotary coring boreholes out of 111 in total. Water level depths were converted to water elevation using borehole’s ground elevation references. The groundwater level in Phase B boreholes (south of the projected runway) is between 1.2 and 12.8 m deep below the ground surface.

Figure 69 below shows the groundwater elevation curves (isopiestic line) and the arrows indicate the hypothetical groundwater flow direction. Natural groundwater flow is relatively consistent with topography, but saturated karst features probably disturb the local groundwater flow. At this time, the only information about groundwater level mapping could be interpreted as above the level of tide influence. The groundwater level between 3 and 13 m AMSL on the map is consistent with topographic elevation in the area.

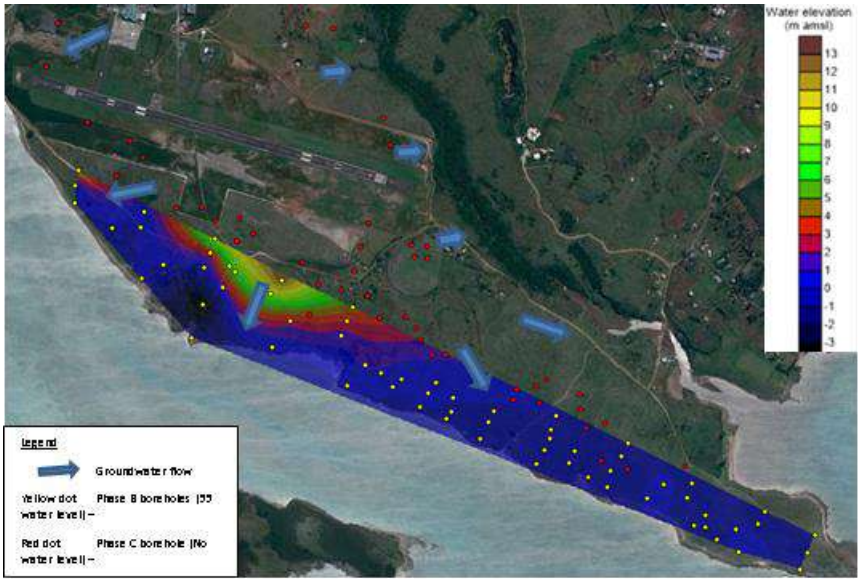


Figure 69: Location of two drilling campaign data sets and groundwater map contour

Negative groundwater elevation seems not to have any coherent signification. Tidal influence may affect consistence between values, as expressed in the geotechnical report. For example, based on the tidal prediction chart of May and June in 2016 (information on hand), the highest tide was 2.77 m. Spatial distribution of groundwater level is therefore probably not representative of a specific time. Unless a groundwater monitoring program with a datalogger is performed, no realistic groundwater level could be graphically produced at an exact representative time.

In the second geotechnical drilling campaign (Phase C), no groundwater was encountered in any boreholes. The red dots in Figure 69 show the locations of the phase C borehole campaign, while the yellow dots indicate the locations of the first (Phase B) borehole drilling campaign. The groundwater level from the Phase C geotechnical investigations does not appear to be reliable because the bottoms of 11 of the 47 boreholes drilled during phase C of the field work are under the sea level, with no groundwater level report. So the dry conditions of these boreholes are incoherent.

Figure 70 below shows a vertical profile of ground surface and groundwater levels (isopiestic lines in previous figure) from a section (red line) on both levels data. The solid blue line represents the measured water level and the dashed blue line represents the projected water level.

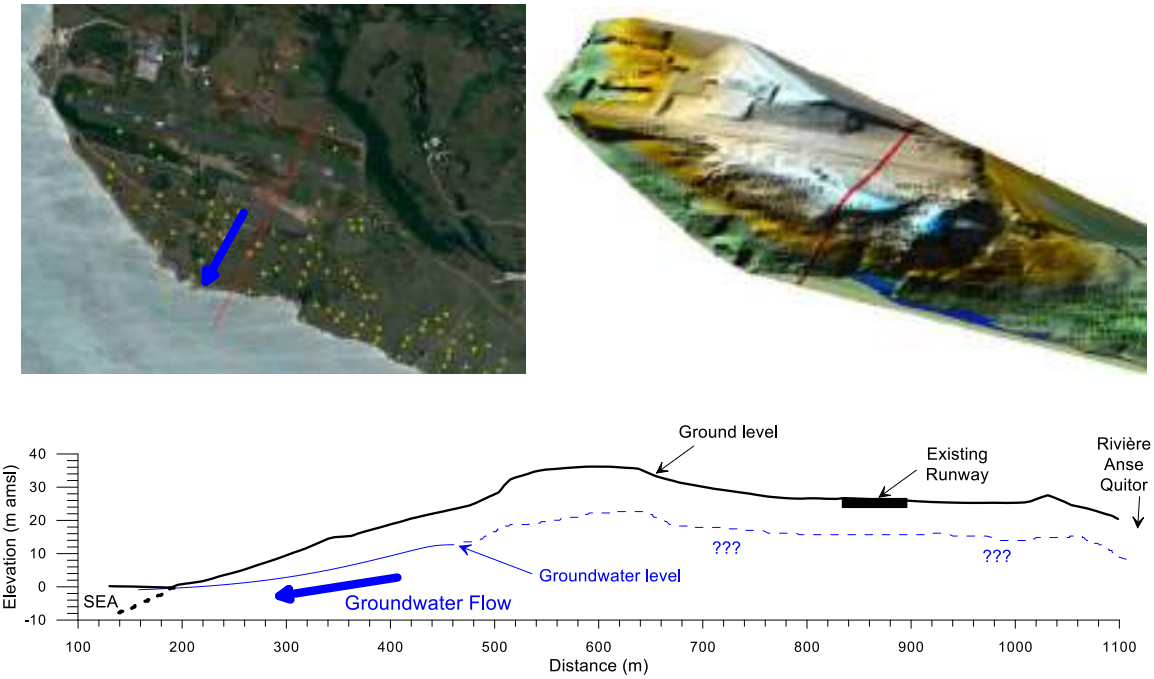


Figure 70: Vertical section of topographic and groundwater level

In conventional porous medium, groundwater is naturally flowing from a high land elevation to the sea, relatively associated to the landform. In a karstic medium, flow path is probably completely disturbed by saturated or partially saturated karstic networks and flow direction is probably not landform dependent.

Apparently, there are springs in the lower topographic part of the airport area because groundwater elevation is already close to sea level below the inland. There is not enough information to identify local groundwater patterns associated with all caves already identified in the airport area.

6.3.8.3 Hydrogeological receptors identification

The three receiving environments identified in the project area that are related to the hydrogeological context are as follows:
Receptor #1: Carbonate Karstic aquifer
Receptor #2: Basaltic aquifer
Receptor #3: Caves

6.3.8.3.1 Carbonate Karstic aquifer

The carbonate eolian calcarenites aquifer on the left side of the Rivière Anse Quitor (northern side) has a consistent karst developed area with numerous opened caves and gallery connections. The calcarenites in Plaine Corail are probably affected as well by karstic development and numerous entries of caves as identified.

There is calcarenites outcrop in most of Plaine Corail site but it is also covered by mainly topsoil in the western part of the area. The geotechnical description of the topsoil is a very weak orangish cream coral with frequent seams of black silt and frequent rootlets. The average thickness of the topsoil in the area of borehole investigation is about 0.3 m and up to a maximum of 1 meter. This material does not represent an aquifer in the footprint area. A hydraulic permeability test will have to be performed in further investigations.

Based on the geotechnical and geophysical investigations, cavities appear to be scattered in calcarenite formation all over the study area, except in areas where the basaltic substratum outcrops to the surface. The cavities are mainly located below a 10 m depth. No cavity has been identified at 0 to 5m deep and laboratory tests indicate an average porosity of 33.8% for the weathered calcarenite in the first 5m of depth. This material seems to be relatively permeable (hydrogeologically speaking) and is probably part of the epikarst that contributes to surface water infiltration into the weathered and non-weathered calcarenite aquifer. The numerous cavities identified in the calcarenite below 5m depth consist of the karstic network up and below the groundwater level.

6.3.8.3.2 Basaltic aquifer

The basaltic aquifer represents a small part of the geological material in the project area because it is mostly covered by calcarenite materials. The MontSainte-Marie is the main outcrop of the basalt and no information on the groundwater level is available but probably lower than the deepest borehole, that is to say 25 m deep. Weathered basalt has usually high permeability compared to unweathered basalt. Geotechnical investigations identified mostly weathered basalt in most of the boreholes.

6.3.8.3.3 Caves

In the project area, caves are karst features expression as a disolution of carbonate rock. Based on the observations of the Riviere Anse Quitor's left bank, there are large caves and well-developed galleries of pluri-metric size and up to 500m (Grande Caverne) and 1 km long. (i.e. Caverne Patate in the vicinity of the project: Plaine Caverne). Several speleological and karst studies have identified interconnections between caves.

The right bank of Rivière Anse Quitor did not benefit from as many studies and galleries development and interconnections are only considered as a similar development. However, there are a few visible caves or sinkholes in Plaine Corail calcarenite that confirm the presence of potential large-scale karstic development. Geotechnical investigations also identified over 500 cavities (or drilling anomalies) in around 140 boreholes located mainly in the footprint of the projected runway.

Three caves are located near Plaine Corail village, around the end of the footprint of the projected runway (Figure 71). Evidence of paleontological materials were identified in one of them.

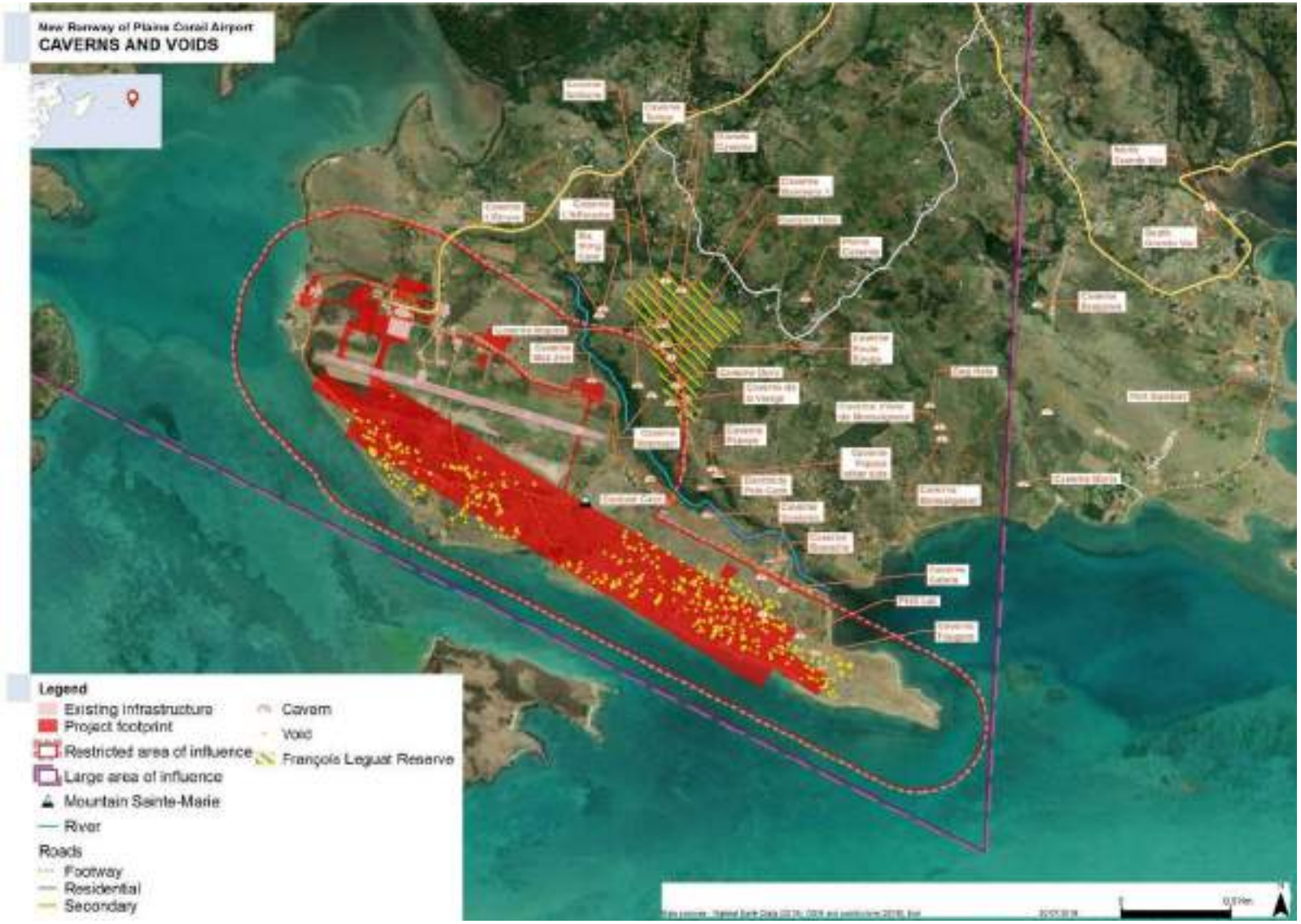


Figure 71: Caves location of the Plaine Corail area

Caverne Bouteille is a small opening that gives access to a water filled chamber that is used for pumping water for the desalination plant. Groundwater quality is brackish probably mixed with fresh groundwater. Information on the quality of the water pumped to the Bottle Cave suggests that the supply of fresh water is significant. Indeed, the average electrical conductivity and salinity of the pumped water are respectively 25 000 us/cm and 15.4 ppt. However, the average conductivity and salinity values of seawater are respectively 55000 us/cm and 35 ppt. As the value of these upstream groundwater parameters is unknown, the ratio of fresh water to seawater cannot be determined, but according to standard values for groundwater, this should be close to 1/1 for the current operating flow rate. Any change in the operating rate may affect this ratio in the same location of extraction. Caverne Bouteille has galleries that reach a maximum length of 25m, a maximum depth of 8.5m. The small underground lake that occupies part of the cave reaches 2.5m in depth. Figure 72 shows Caverne Bouteille abstraction.

Figure 72: Caverne Bouteille orifice and abstraction

Caverne Petit Lac is a small pond in a natural depression in the surficial calcarenite. This pond contains no significant sediment accumulation (Figure 73).

Figure 73: The pound of Caverne Petit-Lac

Grotte Fougère is a collapse feature (sinkhole) with an anchialine pond (a landlocked body of water with a subterranean connection to the ocean that is also under slight tidal influence) as it shows variations over 30 cm during the tidal cycle. Fine organic sediment has accumulated inside the small cave. The sediments contain over 3000 years of well preserved bones, terrestrial and freshwater gastropod shells, and microfossils that include pollen, spores, and algal skeletons. For scientists and cave specialists, Caverne Fougère sediments represent an important paleoenvironmental site to preserve on the island. However, the fossiliferous sediments are probably already affected by sheep excrements and need immediate protection. Figure 74 shows the sinkhole – Caverne Fougère – and the presence of livestock (sheep).
Burney et al (2015) mapped the Grotte Fougère, which is estimated to have a development of about 25m. Figure 74 shows the topography of the Grotte Fougère

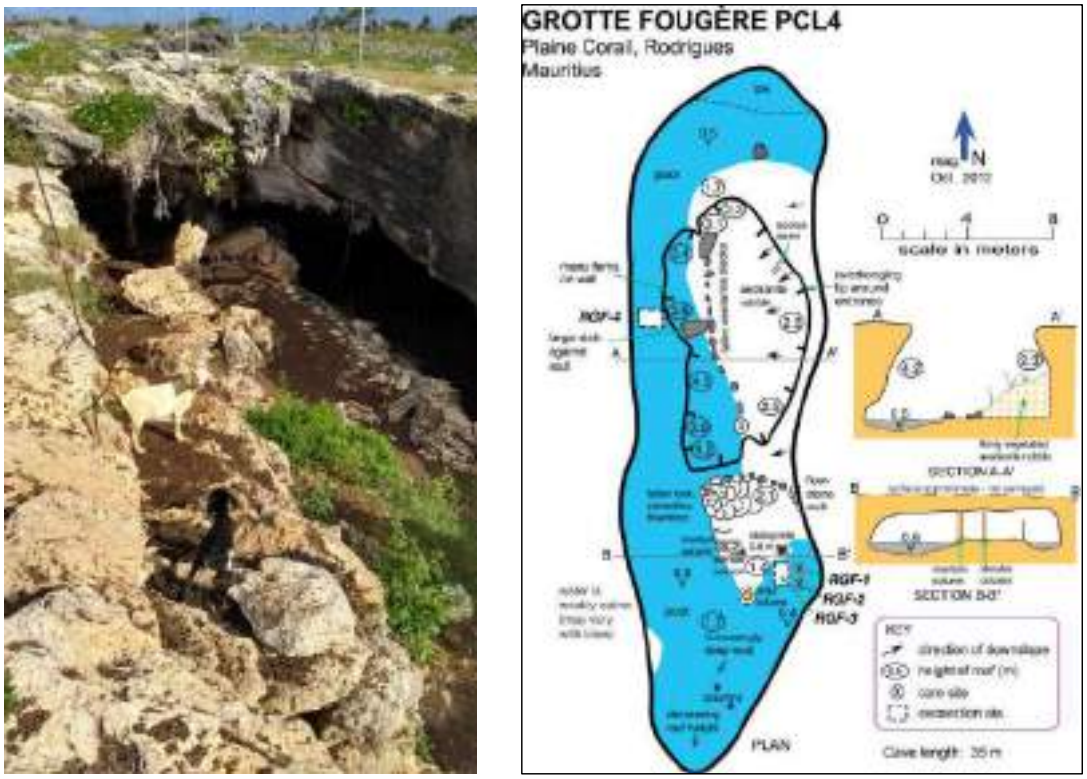


Figure 74: Grotte Fougère sinkhole view (left picture) and topography (right picture) from Burney and al. (2015)

Two other caverns also situated on the Rivière Anse Quitor's right bank and close to the project, include Caverne Gastonia and Caverne Cabris:

Caverne Gastonia has an explored length of 142m. Its floor varies between 8 to 12 m AMSL. The larger cavities may have headroom of 12 m. Caverne Gastonia contains an underground lake in which there are several large cones composed of white calcite flakes. This phenomenon is rare in the world and may be the only occurrence in the southern hemisphere.
Caverne Cabris runs over 68m of galleries. There is no more available information about this cavern.

6.3.8.4 Water quality, vulnerability and contamination

6.3.8.4.1 Water quality

There is no information about groundwater quality in the area of the airport. Water in the caves close to sea level is probably salted, at least in the tidal influence area. Salted intrusions in land are not documented in Rodrigues (so far, the information where collected). Stagnant freshwater ponds inside the caves are usually quickly invaded by biological elements and

quickly become inappropriate for human consumption. Water inflow from storms probably "flush" or dilute the stagnant water in the cave's pond changing the water quality for a relatively short term.

The water pumped into Caverne Bouteille is brackish and probably results from a mixture of tide influenced seawater and fresh water from the karst aquifer.

6.3.8.4.2 Vulnerability

Generally, when there is groundwater use for drinking water, the vulnerability of an aquifer becomes a main issue.

The concept of vulnerability is strong considering the nature of the superficial material as a "first barrier" to a potential contamination event from the surface. Topsoil has been encountered in most exploratory holes with an average thickness of 0.25m and it was generally described as gravelled, low plasticity sandy silt with roots (from Geotechnical investigation report phase C). This description of topsoil corresponds to a thin layer of non-impermeable material.

However, most of the material will probably be removed for the new airport infrastructure development. Vulnerability analysis on existing conditions will not reflect the vulnerability of the groundwater after the new installations are built.

Nevertheless, the information available on soil type and rock formation characteristics would indicate that the aquifers identified so far on the coral plain site would be highly vulnerable.

Future investigations should provide more information and, if necessary, develop a detailed vulnerability map.

6.3.8.4.3 Potential sources of contamination

Potential sources of groundwater contamination must be identified in the airport area. The usual contaminant vectors in the airport are:

Fuel storage and operation (Kerosene, diesel and gas)
Firefighting foam
Industrial waste water
Sanitary waste water
Any chemical liquid or highly soluble material
Contact rainwater, runoff water and infiltration
To our knowledge, there is no groundwater monitoring history at Plaine Corail Airport.

6.3.8.5 Groundwater uses in the Island

In 2009, KMPG indicated about 62% of water is captured by surfaces and 38% by boreholes. In 2009 the groundwater extraction from the boreholes was about 3780 and 2670 m^3/d respectively during the wet and dry season. It is to be noted that all boreholes are persistently over-utilized. The limit for borehole water has long been reached. Production is at maximum capacity and falling year after year. Based on the existing information review, no borehole is extracting groundwater in the vicinity of the airport.

The extraction of brackish water from Caverne Bouteille is not really considered a groundwater use in the same way as inland drilling. Nevertheless, the dissolution of seawater in Caverne Bouteille is indeed provided by a groundwater supply of karstic origin.

6.3.8.6 Hydrogeological receptors sensitivity

The hydrogeological issues mainly concern change in groundwater quality and quantity, no matter the nature of the aquifer. The change in water quality infiltrating the environment can then affect the physicochemical processes that naturally occur in the saturated or unsaturated levels of aquifer formations.

Caves are particular receptors that may or may not be part of the aquifer system. A karst network that is no longer active nevertheless plays a decisive role, especially during heavy precipitation. The interconnection of the cavities then transforms the underground regime for more or less short periods of time. Changing the recharge of these cavities or networks will therefore influence the natural temporary or permanent groundwater flow.

6.3.8.6.1 Carbonate aquifer

The hydraulic conductivity of karst aquifers is mainly ensured by the saturated or unsaturated gallery network. Aquifer recharge can be achieved both by infiltration through the ground and the epikarst and laterally by depending on the connectivity of the karst network.

Implementing an impermeable layer over the surface can therefore affect the recharge rate and therefore the groundwater flow regime. This aquifer is therefore considered sensitive to surface changes.

On the other hand, in Plaine Corail, the only use of groundwater from these cavities has been identified at Caverne Bouteille.

6.3.8.6.2 Basalt aquifer

There are groundwater users from this formation on the left bank (north) of the Anse Quitor River but no users have been identified in the Plaine Corail area. According to available information, there are no groundwater quality references for this formation on Plaine Corail.

6.3.8.6.3 Caves

Caves are partially part of carbonate aquifers when they contribute temporarily or permanently to the control of groundwater flow.

The sensitivity of caves is mainly associated with their palaeontological content present in sediments accumulated at the bottom of the caves for nearly 3000 years. The interest is therefore mainly scientific knowledge rather than environmental concern since some of these caves have already been affected by the presence of humans and livestock.

Table 36: Hydrogeological receptors sensitivity

Receptors identification	Receptors description	Sensitivity	Justification
Hydrogeology 1	Carbonate Karstic aquifer	High	Only one catchment structure has been identified in the nearby area (Caverne Bouteille). The water collected is already unsuitable for consumption due to its high salinity. Nevertheless, a change in water quality could lead to changes in the karst dissolution regime and affect the structure of the underground cavity network.
Hydrogeology 2	Basaltic aquifer	Medium	There are no catchment points in this aquifer on the Coral Plain. There are no water quality references. The basaltic formation outcrops on two areas that are precisely on the path of the new track.
Hydrogeology 3	Caves (Plaine Corail)	Major	Some caves (Caverne Fougère and Caverne Cabris) represent a fairly considerable scientific interest for the paleoenvironmental material in the sediments.

6.3.9 Water resource and waste water management

6.3.9.1 Water supply in Rodrigues

6.3.9.1.1.1 Current water supply

As Rodrigues is a small island, fresh water is a scarce resource. It comes from dams built on rivers, but also many boreholes and springs that are typical of karst areas.

The daily **water demand** for Rodrigues is estimated to be 11.000 to 12.000 m³/day.

This demand is satisfied by rainwater harvested by private individuals in private reservoirs and by water provided by the public services.

The production of water varies depending on rainfall intensity and frequency. The daily fresh water production is provided by surface water harvesting, boreholes, and desalination of marine water, in the following proportions:

Table 37: Water production for 2017/ 2022

Serial No.	Sources	2017	2019	2020	2021	2022
1	Surface water	1273	3000	3404	3033	2887
2	Boreholes	2529	3148	3510	1899	1878
3	Desalination	628	1200	1677	1805	1135
	Total	**4430**	**7348**	**8591**	**6737**	**5900**

Two desalination plants are already operational in Rodrigues:

- Songe, with a capacity of 500 m³/day;
- Caverne Bouteille, partially powered by solar energy and located close to the project area, with a capacity of .
    - Solar hybrid plant : 240 m³/day of potable water
    - Electricity plant : 300 m³/day of potable water
    - A project is currently under consideration to rise the capacity of the electric plant up to 1000 m3/ day.

Caverne Bouteille plant'spotable water is distributed to about 1 500 families in :

- Vangassailles
- Anse Quitor/Corail
- Cascade Jean Louis
- Petite Butte
- Grand Var
- Plaine Corail/Airport
- Grand La Fouche Corail
- Mt Cabris
- Camp Pintade
- Citadelle
- Pistaches
- Piment/ Reposoire
- Baie Topaze
- La Ferme.

The capacity of extraction of salty water is about 3 200 m³/day.

Here are the water quality results according to analysis carried out in Caverne Bouteille intake:

1.0 Intake Borehole water (before treatment)
2.0

Frequency	Parameters	Range of results
Daily	pH	6.2 - 8.4
	Cond	20100 - 29900
	TDS	10300 - 17900
	Salinity	12.2 - 18.6
Monthly	Chloride	10997 - 12876
	Sulphate	1602 - 2370
	Potassium	152.77 - 234.61
	Sodium	5119 - 6485
	Nitrate	<0.04

2.0 Desalinated Water (after treatment)

Frequency	Parameter	Range of results
Daily	pH	6.52 - 8.45
	Conductivity	119 - 550
	TDS	59 - 280
	Salinity	0.06 - 0.26
Monthly	pH	6.5 – 6.9
	Conductivity	511 - 561
	TDS	343 - 389
	Salinity	0
	Hardness	42 - 59
	CaCO3(alkalinity)	16.9 – 19.8
	Chloride	209 - 232
	Sulphate	9.67 – 12.89

Water distribution is managed by the water resources, water is collected from dams, boreholes and desalination plants, pumped uphill for storage into reservoirs prior to distribution by gravity on the network.

Water is treated prior to distribution on the network, the water from boreholes is not necessarily treated prior to storage into distribution reservoirs.

The map below shows the water network in Rodrigues.
A reservoir is located in the project area, named Bangelique reservoir, but it's not used anymore. A spring used for fresh water is located north of the project area, very close to the restricted area.

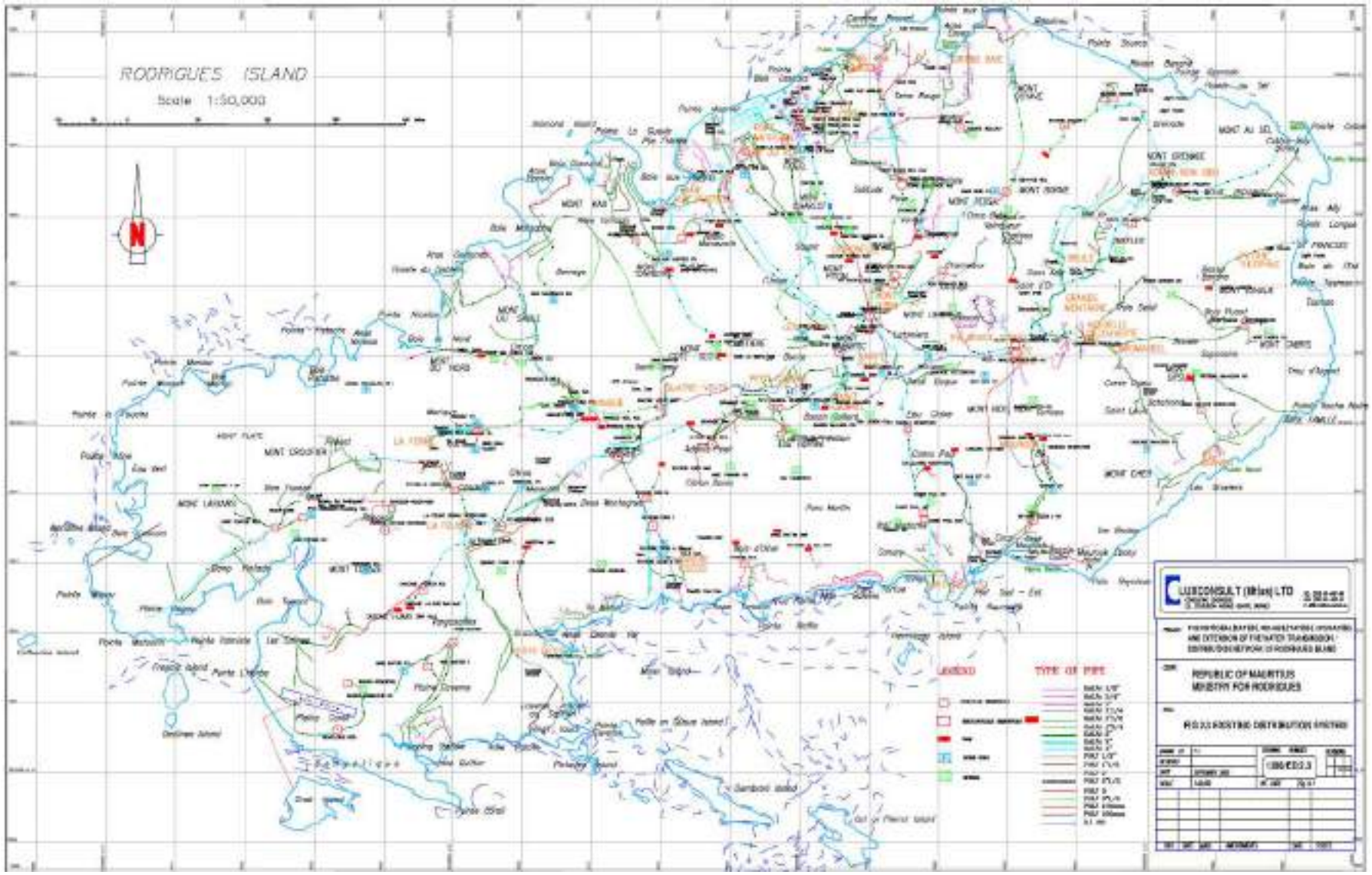


Figure 75: Water network of the island

Figure 76: Water network in Plain Corail and the restricted area

6.3.9.1.1.2 Project for increasing water production

Two new desalination plants are to be commissioned:

- Pointe cotton;
- Baie malgache.

There is also a project of construction of a dam at Pave la Bonte or Anse Baleine, still under study. New boreholes could be projected, not precisely defined.

There is currently no master plan available for the water development at the commission for water resources. A consultation with the Government of India is currently ongoing to master and control the development of Rodrigues up to 2045.

6.3.9.1.2 Water supply and consumption in Plaine Corail Airport

The airport platform is connected to the public water supply distribution network. However, due to the erratic water supply from the public water network, the airport of Rodrigues relies mainly on rainwater harvesting to meet its daily water requirements.

The water collected from the roof of the terminal building is not treated and is used mainly for sanitary purposes and general maintenance and cleaning of the facilities at the passenger terminal building at Plaine Corail Airport.

The airport has a total storage capacity of 400 m^3 plus 2 additional individual tanks for rainwater harvesting. The main storage of 400 m^3, comprising 2 compartments in connection with each other (isolation of any one compartment possible) caters for a reserved volume for firefighting. The storage is also supplied by drinking water from the public water network. The water is used at the passenger terminal building and for firefighting (fuel depot) purposes using booster pumps installed in a room behind the storage concrete tank, as illustrated below.

Figure 77: Water storage and distribution facilities at the airport passenger terminal building

The graph below, provided by ARL, shows the water consumption of the airport for the year 2017. It can be observed that the water demand is highest during the months of October, November and December, which corresponds to Rodrigues' highest passenger traffic period, coinciding with school holidays in the Mauritius and Rodrigues Islands. During this period, the average daily water consumption reaches an average of 12.5 m^3 per day. For the rest of the

year when traffic is at its lowest, the minimum average daily water consumption is 3.6 m^3 per day. The average daily water consumption is estimated to 5.6 m^3 per day irrespective of the time of the year. This amount is expected to increase proportionally with the increase in passenger traffic at Plaine Corail Airport.

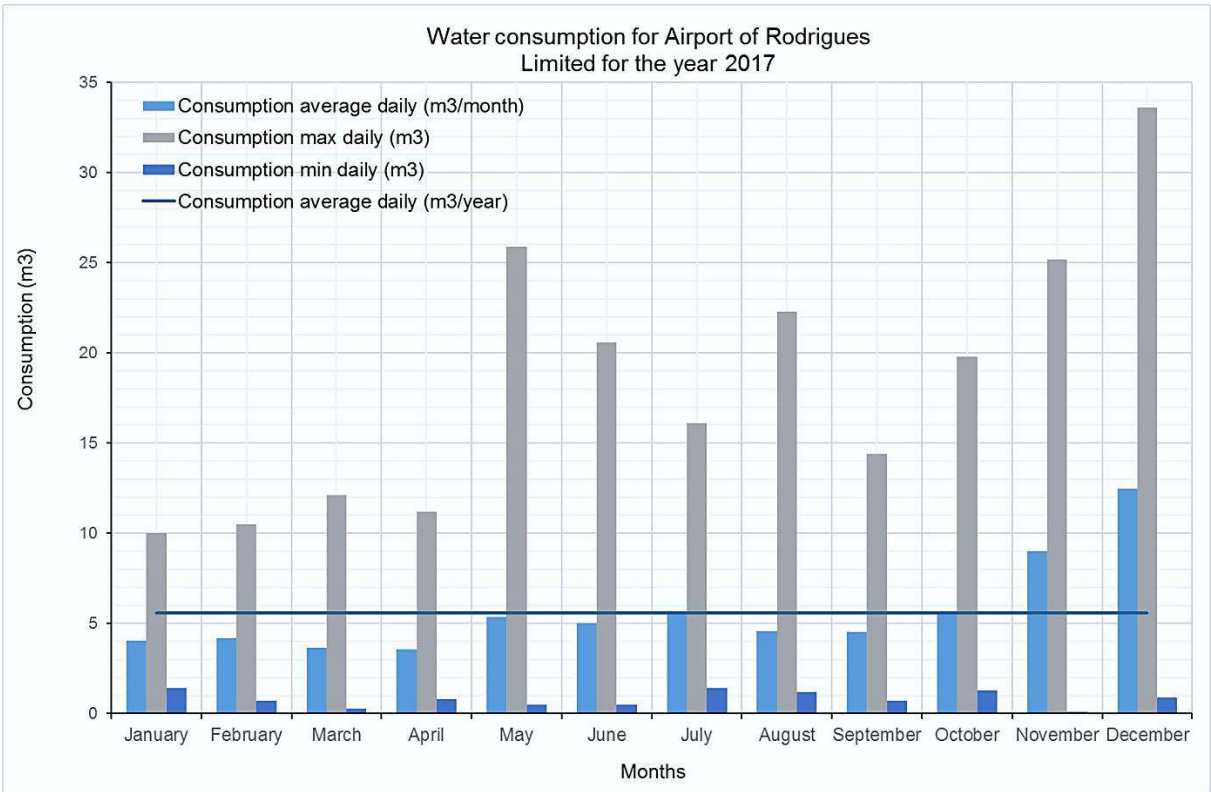


Figure 78: Graph of the water consumption for Airport of Rodrigues Limited for the year 2017

Table 38: Data table of the water consumption for Airport of Rodrigues Limited for the year 2017

Months	**January**	**February**	**March**	**April**	**May**	**June**
Consumption average daily (m3/month)	4.0	4.2	3.6	3.6	5.4	5.0
Consumption max daily (m3)	10.0	10.5	12.1	11.2	25.9	20.6
Consumption min daily (m3)	1.4	0.7	0.3	0.8	0.5	0.5
Months	**July**	**August**	**September**	**October**	**November**	**December**
Consumption average daily (m3/month)	5.5	4.6	4.5	5.5	9.0	12.5
Consumption max daily (m3)	16.1	22.3	14.4	19.8	25.2	33.6
Consumption min daily (m3)	1.4	1.2	0.7	1.3	0.1	0.9

The figure below illustrates an extract of the existing rainwater harvesting network from the roof of the passenger terminal building to the dedicated storage site.

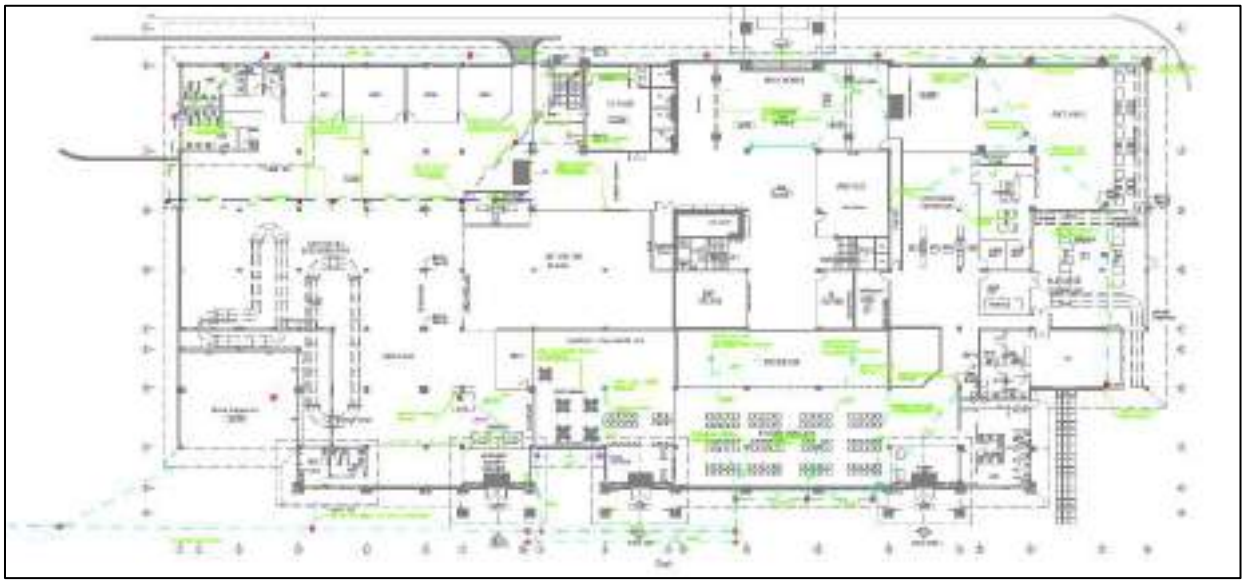


Figure 79: Extract of the existing rainwater harvesting network

Note: This principle will be included in the "integrated" water management plan, potentially envisaged at this stage, together with the overall wastewater and stormwater management of the whole airport platform.

6.3.9.2 Waste water management

6.3.9.2.1 Waste water management in Rodrigues Island

Rainwater is collected into drains and discharged into the sea.

There is no network of wastewater treatment on the island; most buildings have pit latrines. The existing airport has its own treatment system. Over 90% of households are owners of their dwellings, of these, 94% had access to sanitation facilities in 2000 (either flush toilets or pit latrines) (KPMG, July 2009). The existing airport has its own treatment system.

There is an underway water management plan for Rodrigues

6.3.9.2.2 Waste water management in Plaine Corail airport

The airport is currently equipped with a leaching field instead of the usual infiltration field. The leaching dates back to 2003, coinciding with the construction of the passenger terminal building and has been selected due the impermeability of the coral substrate at the airport.

The wastewater produced by the airport is directed to its own on-site wastewater treatment system consisting of a sceptic tank and a leaching field; which corresponds roughly to a primary treatment. The overflow from the septic tank is released to a leaching field. However, currently regular pumping of the overflow from the septic tank is done because the system does not work properly and the leaching field is not permeable enough. This pre-treated wastewater is carted away to the municipal wastewater treatment plant of Grenade.

The aircraft lavatory wastewater is not unloaded from the plane and is taken to Mauritius for disposal. No facilities are currently available in Rodrigues to handle it.

No heavy maintenance/repair activities are carried out on site at the moment. However, small maintenance operations can be done if necessary. The real extent of this activity cannot currently be estimated.

Note: In the framework of the “integrated” water management plan potentially envisaged, the specific effluents generated by maintenance/repair operations must be specifically collected and evacuated separately.

The figure below illustrates an extract of the sewerage network from the different collection points of the passenger terminal building to the dedicated septic tank.

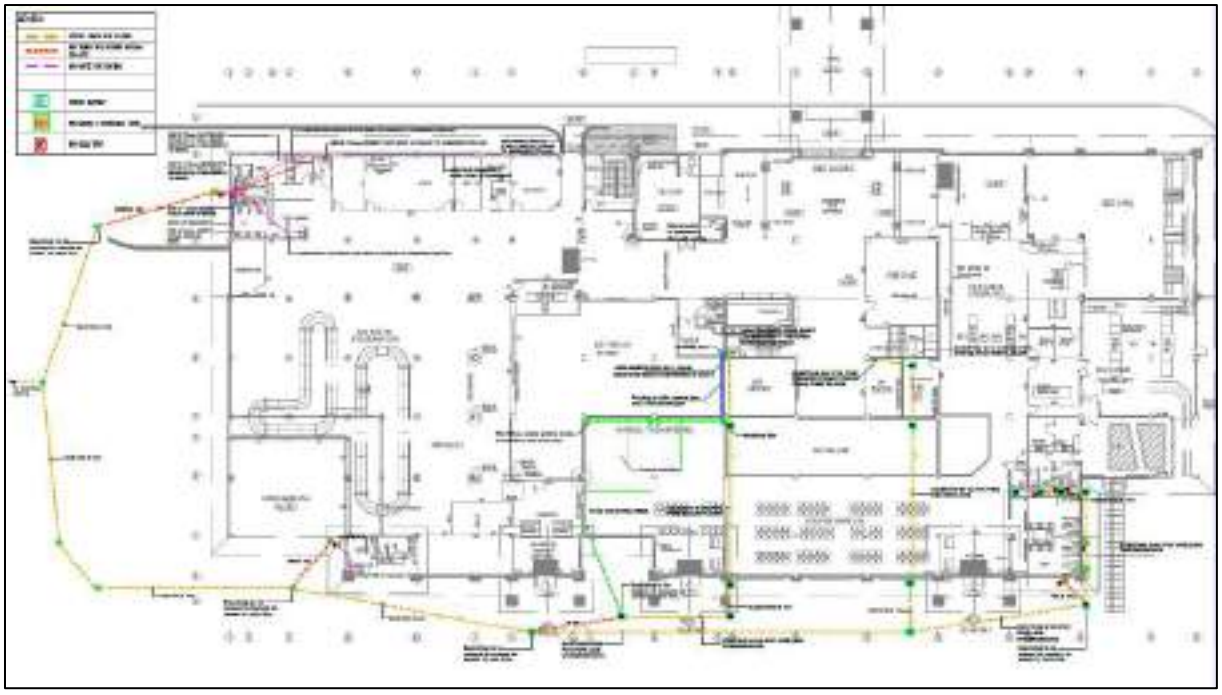


Figure 80: Extract of the existing wastewater network provided

6.3.9.3 Stormwater

As described above, only natural drains enable the stormwater drainage on the site, in addition to the natural slope of the existing runway which helps to drain the stormwater towards the sea, without any specific pre-treatment such as an oil and grease separator. An existing natural drain can be observed only around the apron and along the taxiway in front of the passenger terminal building, which passes under the taxiway and discharges the stormwater into the natural environment nearby.

The fuel depot is equipped with a retention capacity (equipped with a disconnection valve) to collect stormwater generated therein. Collected stormwater is then pumped for evacuation by dedicated wastewater tankers. The loading / unloading platform is equipped with a disconnecting valve in order to direct the stormwater from the platform towards an open-air oil separator (visual control for maintenance) during “off duty” periods and to isolate the platform during fuel loading / unloading operations. However, the disconnection valves are rusty and therefore show that they have not been used for a long time and further need a replacement, as illustrated below, as observed during our last site visit in May 2019.

Note: As indicated in the Preliminary Design Study, the new runway will be equipped with stormwater drains and oil and grease separators for pre-treatment purposes. However, due to the impermeability of the coral substratum, unlike what is mentioned in the Preliminary Design Study, infiltration will be difficult unless the infiltration drains and trenches are deep enough to go beyond the coral layer.
Anyway, in order to collect the storm water and pre-treat it on oil separators, the drains have to be impermeable to convey all the stormwater to be pre-treated. Therefore, it is expected that the stormwater be collected, pre-treated and managed within the framework of the "integrated" water management plan envisaged away from the runway. The impermeable drains are further required to collect and confine effluents generated by an eventual fire fighting operation on the runway.

Figure 81: View of the Fuel depot and associated facilities to prevent environmental accidental pollution

6.3.9.4 Water resource and waste water issues

6.3.9.4.1 Domestic wastewater management

Domestic wastewater management is an issue regarding the preservation of the surrounding receiving environment with the increasing number of passengers. Its proper treatment / management is therefore important before discharge in the environment or at sea.

This issue sensitivity is of a high level.

6.3.9.4.2 Water supply management

Water supply management is an issue regarding the sufficiency and availability of water at the airport for the different basic uses. Drinking water supply is very irregular and therefore alternatives have to be implemented. An integrated water management combining reuse of treated wastewater and stormwater, together with rainwater harvesting, is thus important and necessary. This can reduce the burden on the existing public water supply network. Given the island context and the limitation of freshwater resources and the potential relocation of one of the supply sources (Caverne Bouteille), the sensitivity of the drinking water supply is considered high.

This issue sensitivity is of a high level.

6.3.10 Summary: Physical environment sensitivity

Table 39: Physical environment sensitivity

Theme	Sub-theme	Receptor	Sensitivity
Physical environment	Marine and shores geology and marine turbidity	Marine sediment quality: contamination of marine sediments	Medium
		Marine sediment dynamics: physical disturbance of marine sediments	Medium
		Seawater quality: temperature, salinity, concentration of contaminant	High
		Physical coastal processes: shoreline, morphology, wave, currents	Medium
	Hydrology	Stormwater management	Major
		Flooding of issues downstream of facilities	Low
		Transfer of pollution to the natural environment	Major
		Transfer of sediments to the lagoon	Major
	Terrestrial geology and geotechnics and Hydrogeology Karstic environment	Carbonate Karstic aquifer	High
		Basaltic aquifer	Medium
		Caves (Plaine Corail)	Major
	Water resource and wastewater management	Domestic wastewater management	High
		Water supply management	High

6.4 Biological environment

6.4.1 Terrestrial biological context

6.4.1.1 Area of influence

The area of influence from a terrestrial natural context is mapped on the figure below.

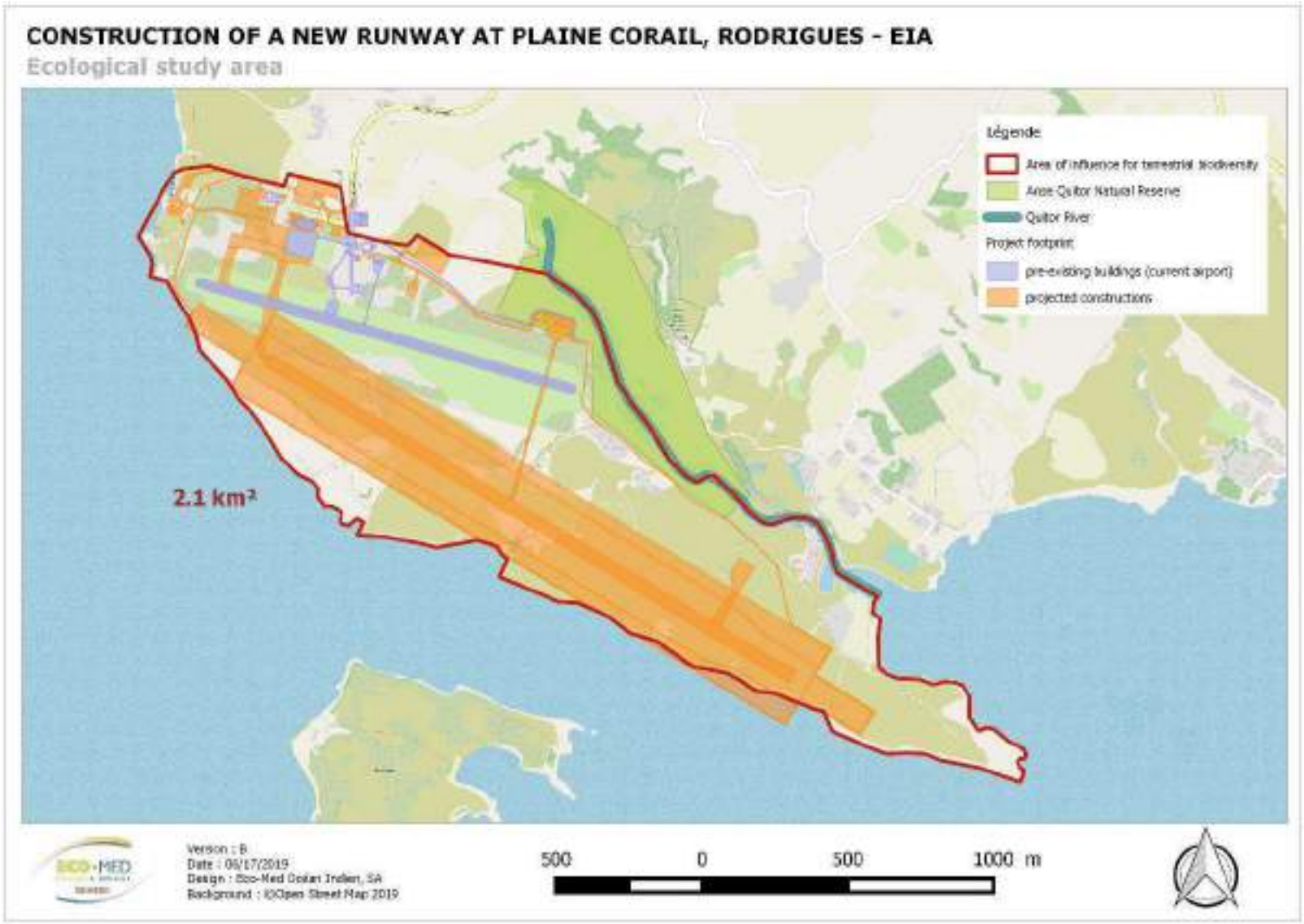


Figure 82: Area of influence

6.4.1.2 Vegetation and flora

6.4.1.2.1 Methodology (2018)

Main habitats and significant land features within the site were initially inspected from aerial photographs (Google Earth 2019). This was followed by site inspections from the 1st to the 4th of April, 2019. Distinct floral habitats were noted during this field campaign. Flora species of interest (native, endemic, endangered, protected) were mapped with a handheld GPS (Garmin GPS Map62), and the number of plants recorded when necessary and/or possible.
Botanical names, author citations, IUCN Red List categories for Rodrigues and regional status follows Strahm et al. 1989, Walter et al. 1997, Rivers et al. 2015 and Kirsakye 2015, the Mauritius Herbarium and the IUCN Red List (2019).

Sensitivity assessment of the habitats
Each of the terrestrial vegetation and habitat types were assigned a relative ecological rank (from “negligible” to “major”) based on species diversity, contributions to ecosystem functions (breeding sites for birds or reptiles…), the presence of rare endangered species and how common the vegetation and habitat type is within the island of Rodrigues.

Sensitivity assessment of the native flora
The sensitivity of the native flora observed in the area of influence was assessed according to the following criteria:

- ⇒ Endemicity or indigenous status: indigenous = 1 point; endemic to the Mascarenes = 2 points; endemic to Rodrigues = 3 points.
- ⇒ Protection status: protected in Rodrigues = 1 point; protected under the Forestry Act (1983) = 3 points
- ⇒ Threat level according to the red list: LC = 0 point; NT = 1 point; VU = 2 points; EN = 3 points; CR = 4 points.

A maximum of 10 points can be assigned to a species. An adjustment by the expert can be made to correct deficiencies in the status of certain species.
Depending on the score obtained, the species is classified according to the following sensitivity levels:

Table 40: Scale value used to assess the plant species sensitivity

Receptor sensitivity	Scale value
Negligible	**0 - 2**
Low	**2 – 4**
Medium	**4 – 6**
High	**6- 8**
Major	**8 – 10**

WARNING: Most of the vegetation (trees, shrubs) was burned (see Figure 83) because of salt sprays propagated by the last two cyclones that reached Rodrigues in early 2019. As a consequence, most of the trees, shrubs and thickets from the inner and shore-line communities were defoliated and thus difficult to identify properly in certain cases.

Figure 83: Example of burned vegetation

6.4.1.2.2 Methodology 2022/2023

The methodology of vulnerability assessment will be revised in the final ESIA update to meet the requirements of the World Bank ESF and the relevant ESS.

As per the World Bank ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, “Habitat” is defined as a terrestrial, freshwater, or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment.

ESS 6 requires a differentiated risk management approach to habitats based on their sensitivity and values. This ESS addresses all habitats, categorized as ‘modified habitat’, ‘natural habitat’, and ‘critical habitat’, along with ‘legally protected and internationally and regionally recognized areas of biodiversity value’ which may encompass habitat in any or all of these categories;

Modified habitats are areas that may contain a large proportion of plant and/or animal species of nonnative origin, and/or where human activity has substantially modified an area’s primary ecological functions and species composition. Modified habitats may include, for example, areas managed for agriculture, forest plantations, reclaimed12 coastal zones, and reclaimed wetlands;
Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area’s primary ecological functions and species composition.;
Critical habitat is defined as areas with high biodiversity importance or value, including: (a) Habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent national approaches; (b) Habitat of significant importance to endemic or restricted-range species; (c) Habitat supporting globally or nationally significant concentrations of migratory or congregatory species; (d) Highly threatened or unique ecosystems; and € Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d).
AQNR is hence a ‘critical habitat’ as per ESS6.

6.4.1.2.3 Results

This section describes the terrestrial vegetation and habitat types recorded in the area of influence for terrestrial biodiversity and briefly outlines the relative ecological ranking for each.

Descriptions of the ten various vegetation types are provided in the table below and mapped in Figure 88.

Table 41: Habitat types recorded at the area of influence

ID	Sensitivity	Name	Area (ha)	% of the total surface
HA1	**Medium**	Grazing lands on basaltic resurgences	4.55	**2.03%**
	Medium	Grazing lands on calcarenic substratum	66.61	**29.73%**
HA2	**Medium**	Coastal vegetation dominated by Ipomoea pes caprae (shore-line community)	11.52	**5.14%**
HA3	**Negligible**	Anthropized areas	62.77	**28.02%**
HA4	**Major**	Dry forest	17.57	**7.84%**
HA5	**Medium**	Riparian vegetation	1.20	**0.54%**
HA6	**Medium**	Estuarine habitat	8.25	**3.68%**
HA7	**Medium**	Calcarenic dry lawns of anthropogenic origin	2.19	**0.98%**
HA8	**Low**	Coastal grasslands dominated by secondarized thickets (*Lantana camara*)	25.55	**11.40%**
HA9	**Negligible**	Secondarized thickets (*Leucaena leucocephala*)	23.84	**10.64%**

Originally, there was no natural open savannah or grasslands by the coast of Rodrigues. Drought, starvation and grazing are likely to be the most important factors responsible for the disappearance of forested lands throughout the island. Rodrigues, estimated to now support 3,000 cattle and 7,000 sheep and goats, had 4,000 and 12,000 respectively in 1981.

The study site comes on a limestone substratum (calcarenite) mostly turned into pastoral landscapes, though patches of basalt are punctually found (**Figure 86**). Species growing on calcarenite (mainly grasses) are generally the same as those growing on basalt and we found no relevant differences in the vegetation communities from the two substratum. **Grazing lands dominated by introduced grasses** (**ID1**) now dominate the landscape in Plaine Corail. The pastoral landscapes cover about 43% of the total surface area of the study site. A **shore-line community** can be distinguished (**ID2**) with halophytic/halotolerant species, such as *Portulaca oleraceae* or *Ipomoea pes-caprae*, the latter forming a dense mat of low growth, completely covering the soil (**Figure 86A**). The **inner littoral community** (**ID1**) is now composed of intensely grazed grasses spiked with small twisted trees or shrubs which usually do not exceed more than 3 meters. A very large population of *Elaeodendron orientale* (“Bois d’olives”), endemic to the Mascarenes, occurs in Plaine Corail and is of great interest within the limits of the area of influence (**Figure 86B**). Other introduced shrub or tree species can be found, such as *Euphorbia tiraculli*, *Wikstroemia indica* or *Prosopis juliflora.* Some scarce and threatened endemic trees and shrubs were able to survive within the grazing lands: i.e. *Foetidia rodriguesiana* (critically endangered) and *Phyllanthus dumentosus* (vulnerable). The range of grass species can also be seen as a component of biodiversity in the area of influence, with a broad array of prostrate and erect forb species that considerably enhance the floral biodiversity: *Sarcostemma viminale* (vulnerable), *Fimbristylis* spp., *Cyperus* spp. or the

prostrate and rare fern *Adiantum rhizophorum*. A dry calcarenic lawn sequence (**ID7, Figure 86F**) is noted on the area of influence (less than 1% of the total surface area), composed of a sparse but original herbaceous vegetation dominated by *Fimbristylis cymosa* and *Fimbristylis dichotoma*.

Lantana's thickets cover a large part of the grasslands (**ID8**). The species were introduced in the late 1920s and already considered widespread in the lowlands in 1970. It now covers more than 10% of the total surface area of the study site, which is probably underestimated as most of the thickets were totally burned by salt sprays after the tropical storm winds of the cyclone Gelena in March 2019.

Anse Quitor valley, right beside the island's airport, is one of the few reserves that had been created from the 1970s proposals for protecting the remnants of native vegetation. Anse Quitor was finally fenced in 1986 thanks to a FAO funding for revitalizing agriculture. Elsewhere, there are no intact native forests left on Rodrigues. Anse Quitor is known as one of two most important sites for endemic plants of **the lowland dry forest** (**ID4, Figure 86D**). It covers 30 ha, where about 7 ha has been weeded and planted with native species. The valley contains viable populations of several of Rodrigues's most important endemic plants, such as *Zanthoxylum paniculatum, Polyscias rodriguesiana* and large populations of the palms *Latania vershaffeltii* (**Figure 86A**) and *Hyophorbe verschaffeltii*. Restoration started in 1997 with the propagation of 28 native and endemic species, providing a long term security for several species that were intended to disappear in the near term.

The upper part of the Anse Quitor River is composed of degraded **freshwater riparian habitats (ID5, Figure 86H)**, a degradation probably accentuated by the floods caused recently by the past two cyclones in early 2019. Some sequences of riparian habitats are still preserved with shrubs composed of the native *Thespesia populnea*, which is resistant to salt spray and strong winds. The shrub's spreading lower branches leads to dense and impenetrable thickets that is very attractive for the reproduction of the striated heron (*Butorides striata*). Wetland plant communities are locally observed at the boundary between the freshwater banks and the estuarine habitats as we recorded the submersed *Paspalidium geminata* herbaceous community along with the native and rare *Cyperus iria.*

Figure 84: Submersed grass bed of Paspalidium geminata

The lower part of the Anse Quitor River forms an **estuarine ecosystem** (**ID6, Figure 86G**) in which a mangrove restauration program seems to have been conducted in the past 10 years. We found two remnant specimens of mangrove trees with one species, *Rhizophora mucronata*. As reported in the literature, a mangrove replanting program has been implemented in Mauritius under which seven hectares have been planted with *Rhizophora mucronata* and *Bruguiera gymnorhiza*. Some 90 ha of mangroves have been planted in 11 sites in Rodrigues in an effort to create a barrier against terrigenous sediment runoff from reaching the sea, as part of a European Union Development Fund (EDF) project.

In total, **8% of the area of influence for terrestrial biodiversity (=Anse Quitor Nature Reserve) is composed of habitats associated with a high ecological value (meeting the criteria of "Critical Habitats")**, while 42% come with a medium value (grass land, calcarenic lawns, and riverine habitats), 39% with a negligible value (anthropized areas) and 11% with a low value. Most of the grazing lawns were associated with a medium value as it shelters a large population of *Elaeodendron* (Bois d'olives) and a few specimens of rare and threatened (per IUCN categorization) endemic species.

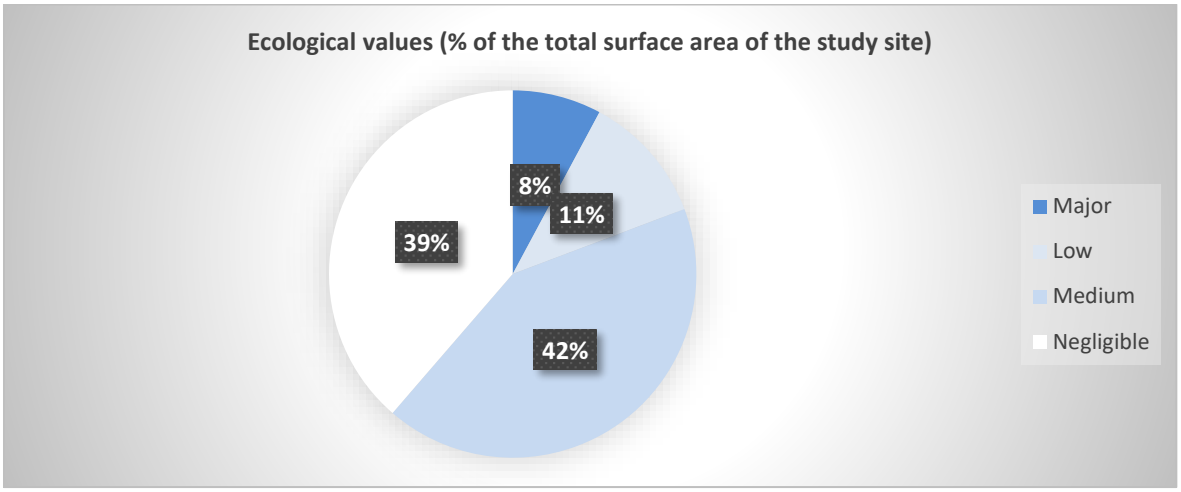


Figure 85: Ecological values of the vegetation on the area of influence

A – Mat of *Ipomoea pes-caprae*

B – Grasslands spiked with shrubs of *Elaeodendron orientale*

C – Leucaena leucoephala thickets

D – Anse Quitor Nature Reserve

F – Dry calcarenic lawns

G – Estuarine habitat (brackish waters)

H – Riparian habitats (fresh water)

Figure 86: Photographic plates of habitat types encountered at the area of influence

Figure 87: Rhizophora mucronota down the Anse Quitor River

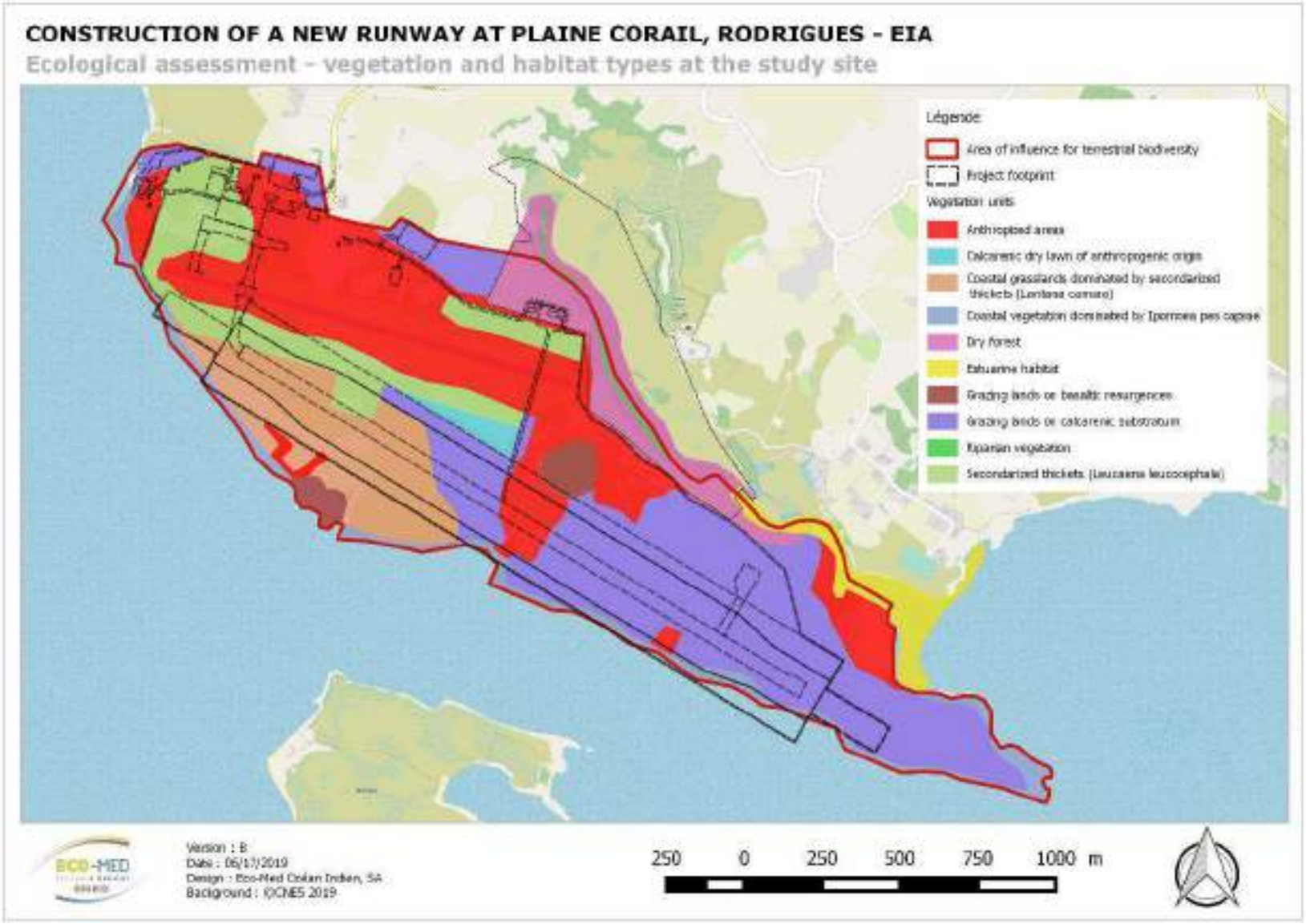


Figure 88: Vegetation and habitat types mapping

6.4.1.2.4 Flora

One hundred and nine plant species were recorded during the field survey (4 days), including 51 native species (15 are endemic to Rodrigues and 4 to the Mascarenes). 57 species are introduced on the study site and represent by far the major part of the total vegetation cover. Moreover, in the lowland dry forest of the Anse Quitor nature reserve, native plant communities (27 species) cover probably more than 50% of the total vegetation cover even if invasive species are still well represented (*Pongamia pinnata, Tabebuia pallida, Leucaena leucocephala*).

The most threatened species recorded in the area of influence for terrestrial biodiversity, as per IUCN red list of threatened species: (updated 2022):

- Critically endangered (CR) species are recorded at the study site, both are located inside the project area, such as *Hyophorbe verschaffeltii, Polyscias rodriguesiana, Latania verschaffeltii, Zanthoxylum paniculatum, Antirhea bifurcate, Foetidia rodriguesiana;*
- Endangered (EN) species are recorded at the study site, which are all partially located inside the project footprint such as *Diospyros diversifolia, Fernelia buxifolia; Clerodendrum laciniatum*

Sarcostemma viminale (now referenced as *Cynanchum viminale (L.) L.*), *Terminalia bentzoe subsp. Rodriguesensis*.are not listed on the IUCN red list of threatened species; they are listed in the red list of Reunion Island.

Table 42: Summary of the plant species status listed in the area of influence

Species status	Number of species
Unknown species	1
Endemic	15
Exotic	54
Indigenous	32
Naturalized	3
Sub-endemic	4
Total	**109**

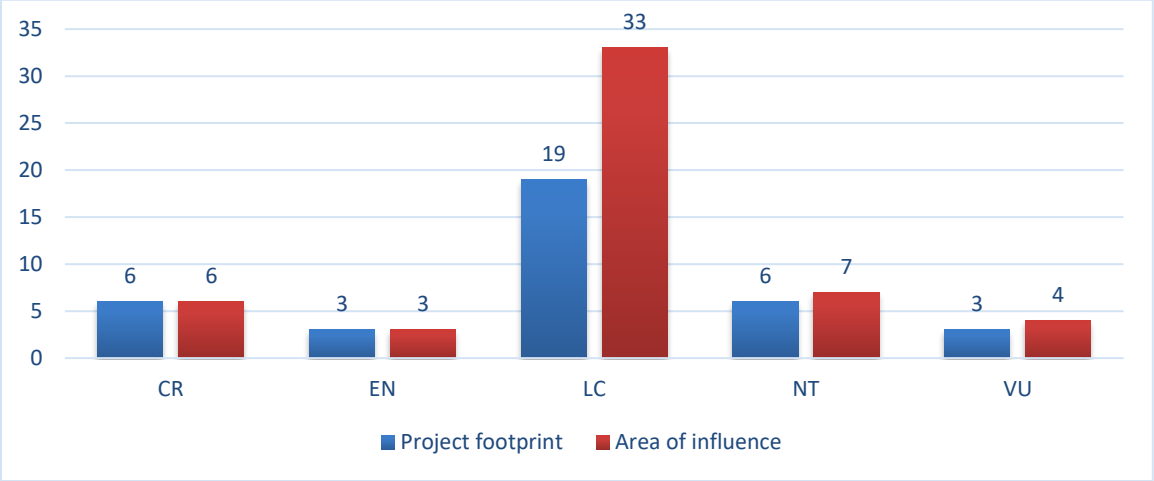


Figure 89: IUCN status and number of associated plant species through the study site/project area


Camptocarpus sphenophyllus NT


Elaeodendron orientale LC


Zanthoxylum paniculatum CR


Polyscias rodriguesiana CR


Latania verschaffeltii EN


Tournefortia argentea LC


Terminalia bentzoe VU


Cyperus iria LC

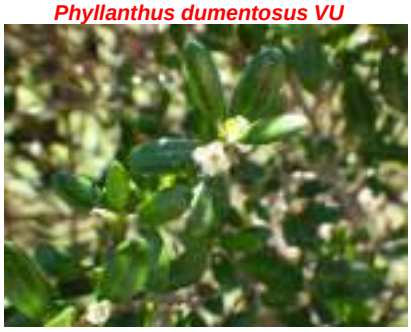

Foetidia rodriguesiana EN


Pandanus heterocarpus NT


Phyllanthus dumentosus VU


Antirhea bifurcata EN


Mathurina penduliflora NT


Fernelia buxifolia EN


Sarcostemma viminale VU

Figure 90: Photographic plates with some native plant species recorded on the area of influence for terrestrial biodiversity (in red, species recorded inside the project footprint)

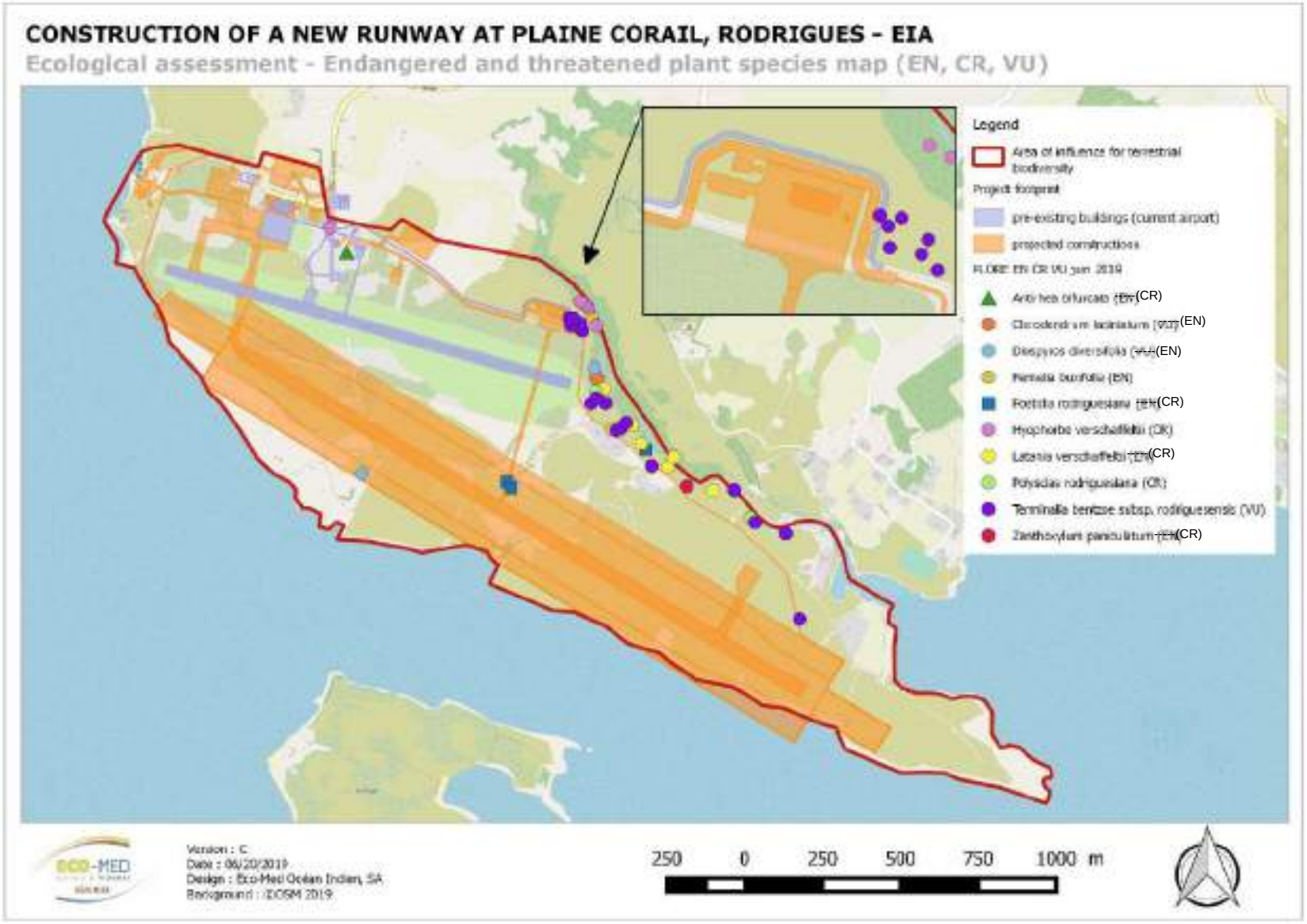


Figure 91: Endangered and threatened plant species map

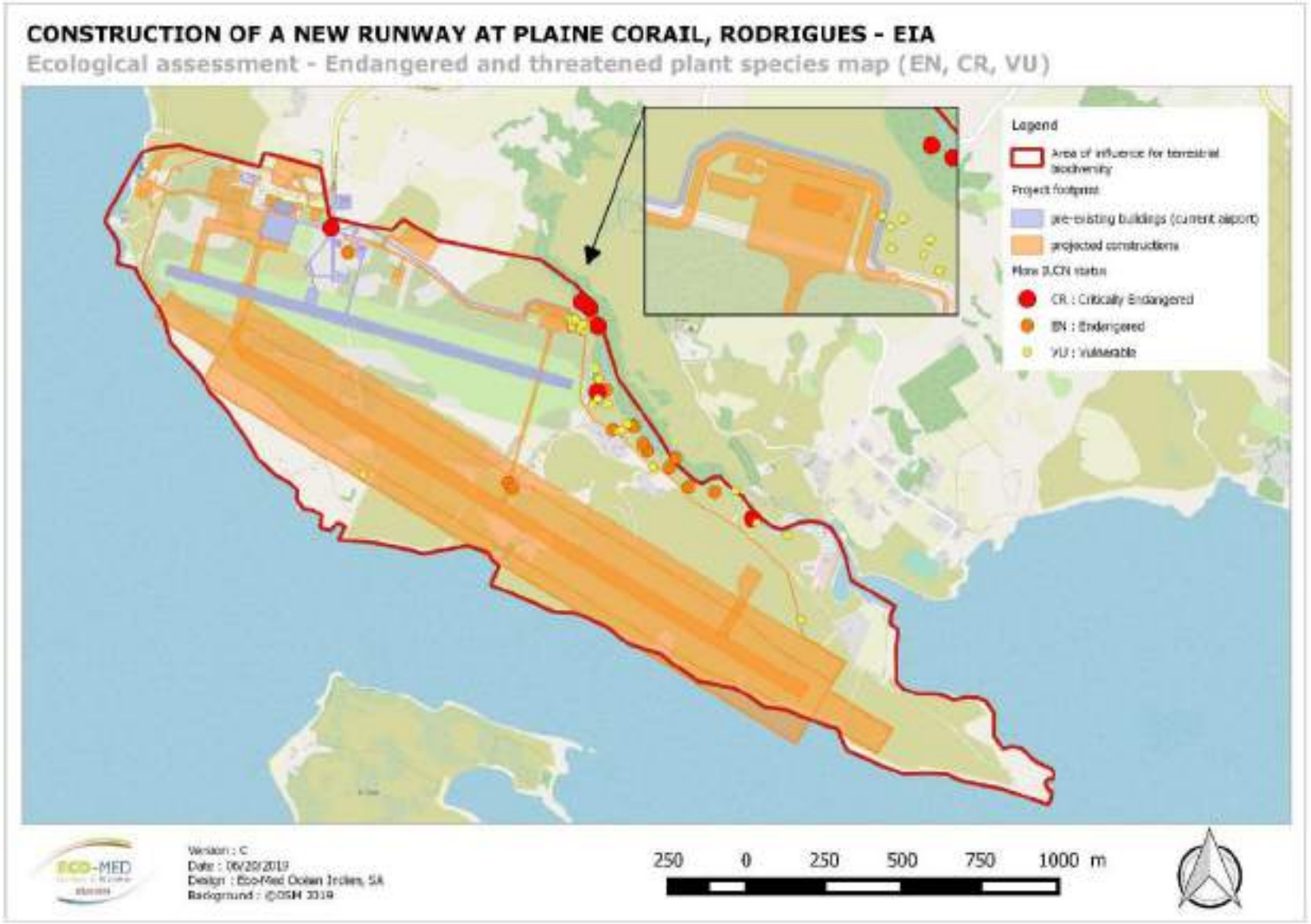


Figure 92: Endangered and threatened plant species map (status)

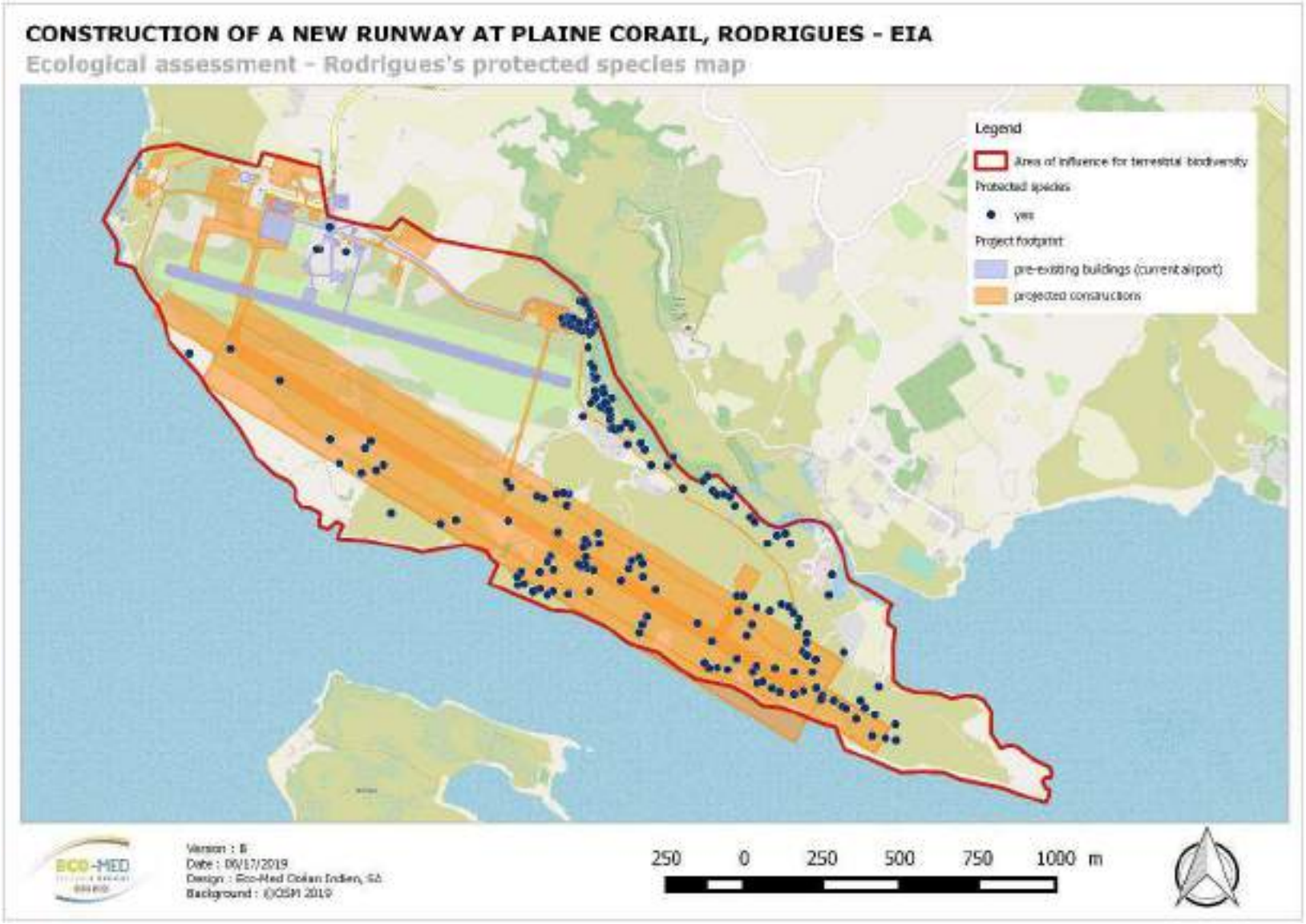


Figure 93: Rodrigues' protected species map

Table 43: List of plant species recorded on site (purple background: species recorded inside the project footprint) and sensitivity assessment for native species

Scientific name	French name	Family	Status	IUCN (status retained)	Criteria 1 Indigenous/e...	Criteria 2 Protection	Criteria 3 IUCN status	Senstivity score	Sensitivity	Protection Forestry Services	Protection Forestry Act 1983
Achyranthes aspera L.	Herbe d'Eugène	Amaranthaceae	Indigenous	LC	1	0	0	1	Negligible		
Adiantum rhizophorum Sw.		Pteridaceae	Sub-endemic	LC	2	3	0	5	Medium		yes
Alternanthera sessilis (L.) DC.	Brède emballage	Amaranthaceae	Indigenous	LC	1	0	0	1	Negligible		
Alysicarpus vaginalis (L.) DC.		Fabaceae	Indigenous	LC	1	0	0	1	Negligible		
Antirhea bifurcata (Desr.) Hook.f.	Bois goudron	Rubiaceae	Endemic	CR	3	1	4	8	Major	yes	
Boerhavia coccinea Mill.	Bécabar batard	Nyctaginaceae	Indigenous	LC	1	0	0	1	Negligible		
Bothriochloa pertusa (L.) A. Camus		Poaceae	Indigenous	LC	1	0	0	1	Negligible		
Caesalpinia bonduc (L.) Roxb.	Cadoque	Fabaceae	Indigenous	LC	1	0	0	1	Negligible		
Camptocarpus sphenophyllus (Balf. F.)		Asclepiadaceae	Endemic	NT	3	0	1	4	Medium		
Clerodendrum laciniatum Balf.f.	Bois cabri	Lamiaceae	Endemic	EN	2	1	3	6	High	yes	
Cynodon dactylon (L.) Pers.	Petit-chiendent	Poaceae	Indigenous	LC	1	0	0	1	Negligible		
Cyperus dubius Rottb.		Cyperaceae	Indigenous	LC	1	0	0	1	Negligible		
Cyperus iria L.		Cyperaceae	Indigenous	LC	1	0	0	1	Medium		
Cyperus rubicundus Vahl		Cyperaceae	Indigenous	LC	1	0	0	1	Negligible		
Dactyloctenium ctenioides (Steud.) Lorch ex Bosser		Poaceae	Indigenous	LC	1	0	0	1	Negligible		
Diospyros diversifolia Hiern	Bois d'ébène / Ebénier	Ebenaceae	Endemic	EN	2	1	3	6	High	yes	
Dodonaea viscosa Jacq.	Bois d'arnette	Sapindaceae	Indigenous	LC	1	1	0	2	Low	yes	
Dracaena reflexa Lam.	Bois de chandelle	Asparagaceae	Indigenous	LC	1	1	0	2	Low	yes	
Elaeodendron orientale Jacq.	Bois rouge	Celastraceae	Sub-endemic	LC	2	1	0	3	Low	yes	
Eragrostis tenella		Poaceae	Indigenous	LC	1	0	0	1	Negligible		
Euphorbia thymifolia L.	Rougette	Euphorbiaceae	Indigenous	LC	1	0	0	1	Negligible		
Fernelia buxifolia Lam.	Bois bouteille	Rubiaceae	Sub-endemic	EN	2	1	3	6	High	yes	
Ficus reflexa Thunb.	Ti l'affouche	Moraceae	Indigenous	LC	1	1	0	2	Low	yes	
Ficus rubra Vahl	Affouche rouge	Moraceae	Indigenous	LC	1	1	0	2	Low	yes	
Fimbristylis cymosa R. Br.		Cyperaceae	Indigenous	LC	1	0	0	1	Negligible		
Fimbristylis dichotoma (L.) Vahl		Cyperaceae	Indigenous	LC	1	0	0	1	Negligible		
Foetidia rodriguesiana F. Friedmann	Bois puant	Lecythidaceae	Endemic	CR	3	1	4	8	Major	yes	
Heteropogon contortus (L.) P. Beauv. ex Roem. et Schult.	Herbe polisson	Poaceae	Indigenous	LC	1	0	0	1	Negligible		
Hyophorbe verschaffeltii H. Wendl.	Palmiste marron	Arecaceae	Endemic	CR	3	1	4	8	Major	yes	
Ipomoea pes-caprae (L.) R. Br.	Liane batatran	Convolvulaceae	Indigenous	LC	1	0	0	1	Negligible		

Scientific name	French name	Family	Status	IUCN (status retained)	Criteria 1 Indigenous/e...	Criteria 2 Protection	Criteria 3 IUCN status	Sensitivity score	Sensitivity	Protection Forestry Services	Protection Forestry Act 1983
Latania verschaffeltii Lem.	Latanier jaune	Arecaceae	Endemic	CR	3	1	4	8	Major	yes	
Ludwigia octovalvis (Jacq.) Raven	Herbe à bourrique	Onagraceae	Indigenous	LC	1	0	0	1	Negligible		
Mathurina penduliflora Balf. f.	Bois gandine	Passifloraceae	Endemic	NT	3	1	1	5	Medium	yes	
Nephrolepis biserrata (Sw.) Schott	Fougère rivière	Nephrolepidaceae	Indigenous	LC	1	3	0	4	Medium		yes
Pandanus heterocarpus Balf. f.	Vacoa parasol	Pandanaceae	Endemic	NT	3	1	1	5	Medium	yes	
Paspalidium geminatum (Forssk.) Stapf.		Poaceae	Indigenous	LC	1	0	0	1	Medium		
Phyllanthus dumentosus Poir.		Phyllanthaceae	Indigenous	NT	1	1	1	3	Low	yes	
Phymatosorus scolopendria (Burm. f.) Pic. Serm.	Patte de lézard	Polypodiaceae	Indigenous	LC	1	3	0	4	Medium		yes
Pleurostylia putamen Marais	Bois d'olive blanc	Celastraceae	Endemic	NT	3	1	1	5	Medium	yes	
Polyscias rodriguesiana (Marais) Lowry & G.M. Plunkett	Bois blanc	Araliaceae	Endemic	CR	3	1	4	8	Major	yes	
Portulaca oleracea L.	Pourpier rouge	Portulacaceae	Indigenous	LC	1	0	0	1	Negligible		
Premna serratifolia L.	Bois sureau	Lamiaceae	Sub-endemic	LC	2	1	0	3	Low	yes	
Rhizophora mucronata	Palétuvier rouge	Rhizophoraceae	?	LC	1	0	0	1	Medium		
Sarcanthemum coronopus Cass.		Asteraceae	Endemic	NT	3	1	1	5	Medium	yes	
Sarcostemma viminale (L.) R. Br.	Liane calé	Apocynaceae	Indigenous	VU	1	0	2	3	Low		
Secamone rodriguesiana F.Friedmann		Apocynaceae	Endemic	NT	3	0	1	4	Medium		
Striga asiatica (L.) Kuntze	Goutte de sang	Orobanchaceae	Indigenous	LC	1	0	0	1	Negligible		
Terminalia bentzoe (L.) G.Forst.. subsp. rodriguesensis Wickens	Bois benjoin	Combretaceae	Endemic	VU	3	1	2	6	High	yes	
Thespesia populnea (L.) Sol. ex Corrêa	Sainte Marie	Malvaceae	Indigenous	LC	1	1	0	2	Low	yes	
Tournefortia argentea L.f.	Veloutier argenté	Boraginaceae	Indigenous	LC	1	0	0	1	Medium		
Zanthoxylum paniculatum Balf. f.	Bois pasner	Rutaceae	Endemic	CR	3	1	4	8	Major	yes	

6.4.1.2.4.1 Sensitivity assessment of native flora found in the area of influence

A number of species show a major and high level of sensitivity according to our assessment criteria (see 6.4.1.2.1Methodology). The results of the evaluation are presented in figures below.
A reassessment of the sensitivity will be undertaken when updated the baseline survey and study for the final ESIA.

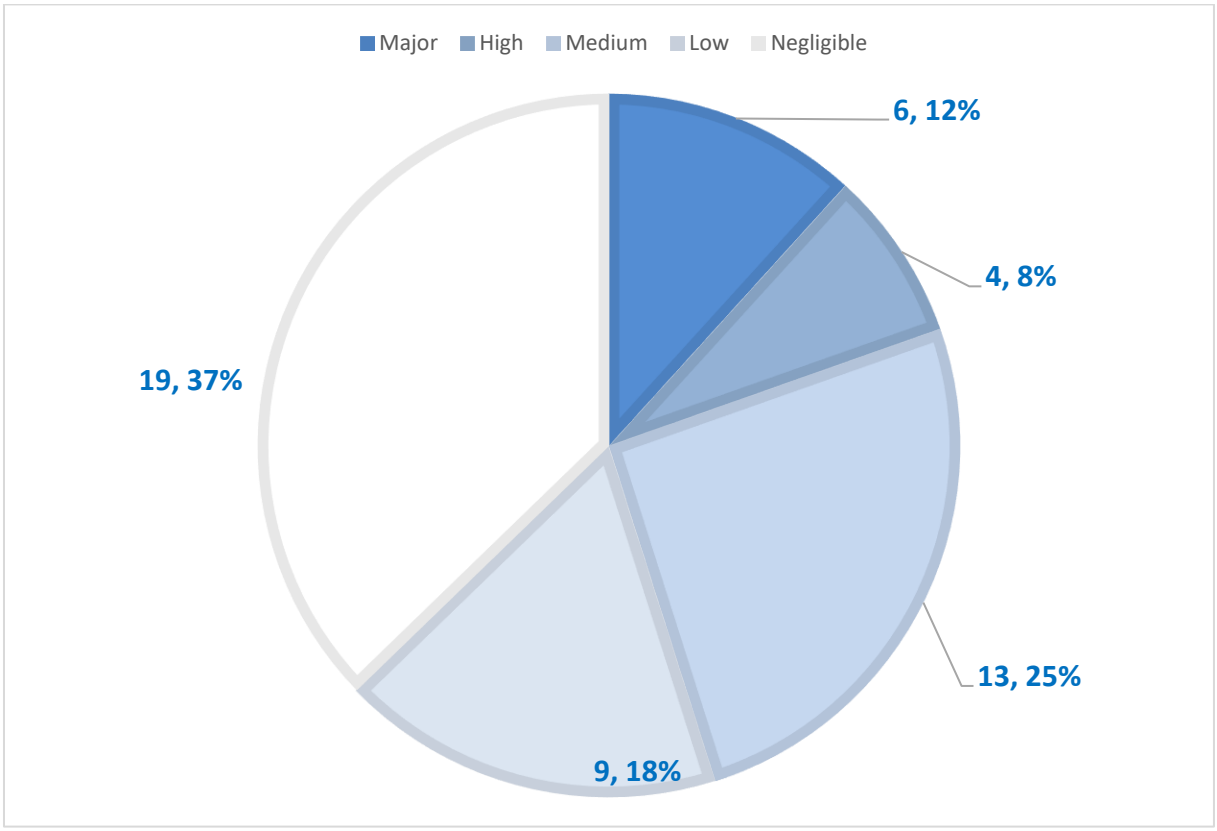


Figure 94: Assessment of the native flora sensitivity inside the area of influence

Table 44: Native flora recorded in the area of influence and sensitivity assessment

Type	Items	Sub items	Area/number of specimens inside the area of influence	Sensitivity
Flora	Plant species of major sensitivity (IUCN - CR)	*Hyophorbe verschaffeltii*	43	**Major**
		Polyscias rodriguesiana	7	
		Latania verschaffeltii	10	
		Zanthoxylum paniculatum	1	
		Antirhea bifurcata	1	
		Foetidia rodriguesiana	3	
Flora	Plant species of high sensitivity (IUCN - EN)	*Diospyros diversifolia*	2	**High**
		Fernelia buxifolia	2	
		Clerodendrum laciniatum	3	
Flora	Plant species of high sensitivity (not found in IUCN)	*Terminalia bentzoe subsp. Rodriguesensis*	28	
Flora	Plant species of medium sensitivity: 13 species	*Adiantum rhizophorum, Camptocarpus sphenophyllus, Cyperus iria, Mathurina penduliflora, Nephrolepis biserrata, Pandanus heterocarpus, Paspalidium geminatum, Phymatosorus scolopendria, Pleurostylia putamen, Rhizophora mucronata, Sarcanthemum coronopus, Secamone rodriguesiana, Tournefortia argentea.*	118	**Medium**
Flora	Plant species of low sensitivity: 9 species	*Dodonaea viscosa, Dracaena reflexa, Elaeodendron orientale, Ficus reflexa, Ficus rubra, Phyllanthus dumentosus, Premna serratifolia, Sarcostemma viminale, Thespesia populnea*	287	**Low**

6.4.1.2.4.2 Focus on the most threatened plant species

Some endemic species encountered inside the area of influence had become very rare on the island and show a very critical conservation status. To our knowledge, the following plants are on the edge of extinction and show a high or a major sensitivity:

- ⇒ *Antirhea bifurcata (Desr.) Hook.f.*
- ⇒ *Clerodendrum laciniatum Balf.f.*
- ⇒ *Diospyros diversifolia Hiern*
- ⇒ *Fernelia buxifolia Lam.*
- ⇒ *Foetidia rodriguesiana F. Friedmann*
- ⇒ *Hyophorbe verschaffeltii H. Wendl.*
- ⇒ *Latania verschaffeltii Lem.*
- ⇒ *Polyscias rodriguesiana (Marais) Lowry & G.M. Plunkett*
- ⇒ *Terminalia bentzoe (L.) G.Forst.. subsp. rodriguesensis Wickens*
- ⇒ *Zanthoxylum paniculatum Balf. f.*

The species mentioned above in red are described in more detail below. It corresponds to the species located within the project's footprint or to species assessed at a major sensitivity level.

***Hyophorbe verschaffeltii* H. Wendl.**	
Hyophorbe verschaffeltii (the palmiste marron or spindle palm) is a critically endangered species of flowering plant in the Arecaceae family. It is endemic to Rodrigues island, but is widely grown in cultivation. Fewer than 60 individuals remain in the wild, occurring in Grand Montagne, Anse Quitor and Ravine de la Cascade, St Louis. There is no evidence of regeneration and grazing pressures are strong. There is also a threat of hybridisation with the introduced *H. lagenicaulis* (Johnson, 1998).	
Family	**Arecaceae**
Local name	**Palmiste marron**
Endemicity	**Rodrigues**
IUCN Status *It has been assessed CR by the IUCN in 1998 (Johnson 1998)*	**CR ↓**
Rarity	**Very rare?**
Number of specimens in the wild (Rodrigues)	Probably less than **50** (Strahm 1989) or **60** (Johnson, 1998)
Number of specimens (Area of influence & Anse Quitor Nature Reserve)	**None** are reported from the forestry services, at least **43** recorded in Anse Quitor (Eco-Med Océan Indien) **66** specimens were planted in *ex situ* collections (Rivers et al. 2015)
Number of specimens (Project footprint)	**7** specimens are threatened by the project
Receptor sensitivity	**Major**

***Polyscias rodriguesiana* (Marais) Lowry & G.M. Plunkett**	
Mainly occurs on Plaine Corail. Less than 50 individuals exist in the wild as isolated specimens. Grows on calcarenite and basalt. Attempts at propagation have been successful and young specimens have been planted in the wild (Strahm 1998).	
Family	**Araliaceae**
Local name	**Bois blanc**
Endemicity	**Rodrigues**
IUCN Status *It has been assessed CR by the IUCN in 1998 (Strahm 1998) after having previously been assessed EN (Strahm 1989)*	**CR ↓**
Rarity	**Very rare?**
Number of specimens in the wild (Rodrigues)	Probably less than **50** (Strahm 1998)
Number of specimens (Area of influence & Anse Quitor Nature Reserve)	**7** specimens are reported from the forestry services (1999), at least **2** recorded in Anse Quitor in 2019 (Eco-Med Océan Indien) **6** specimens were planted in *ex situ* collections (Rivers et al. 2015)
Number of specimens (Project footprint)	**1** specimen
Receptor sensitivity	**Major**

Foetidia rodriguesiana F. Friedmann

Seventeen species of *Foetidia* are recognized; one from East Africa, two from the Mascarene Islands and the remaining fourteen from Madagascar. One species is confined to forest remnants on Rodrigues island. This species is present in Anse Quitor region, Anse Baleine, Mourouk valley, Cascade St Louis, Graviers, Baie Malgache, Terre Rouge, Anse aux Anglais and have been planted in the Grand Montagne Nature Reserve. Due to the low number in propagation and the very low number of individuals that still exist, this species is potentially on a decline together with the rapid invasion of exotic species (animals and plants) in these locations (WF, pers. Com.). Wild regeneration is very rare because young trees are eaten by animals (Payandee, pers. Com). The species has a preliminary assessment of being "Critically Endangered" under the IUCN Red Listing (WF, pers. Com.).

Family	**Lecythidaceae**
Local name	**Bois puant**
Endemicity	**Rodrigues**
IUCN Status *It has been classified Endangered (EN) in 1989 by Strahm, a status confirmed in 1997 (Walter and Gillett, 1997) and in 2015 (Rivers et al., 2015). Kyrsakye et al. proposed a CR status but all evaluation criteria were not properly taken into account to validate the analysis* *Commission for Forestry in Rodrigues suggest that the species should be downgraded to VU (R. Payandee, pers. Com.). Human-aided interventions led to increase significantly the number of individuals from at least 50 in 1989 to 100 specimens today.* *EN status is retained as it is the only one to have been properly assessed in regard to IUCN criteria. It also reflects an interim evaluation between CR and VU.*	**CR ↓**
Rarity	**Very rare?**
Number of specimens in the wild (Rodrigues)	Probably between **50** (Strahm 1989) and **100** (WF, com. Pers.) **4** specimens were planted in *ex situ* collections (Rivers et al. 2015)
Number of specimens (Area of influence & Anse Quitor Nature Reserve)	**2** are reported from the forestry services
Number of specimens (Project footprint)	At least **3** specimens
Receptor sensitivity	**High**

***Antirhea bifurcata* (Desr.) Hook.f.**	
Endemic to the islands of Mauritius and Rodrigues, almost extinct in Rodrigues (Flore des Mascareignes). 2 specimens were reported in Plaine Corail in 1978 but only one was rediscovered in 1980. It seems still a fairly common species in the lowland forests of Mauritius. Differences between the individuals from Mauritius and Rodrigues might indicate that there could be an endemic variety on each of the 2 islands.	
Family	**Rubiaceae**
Local name	**Bois Goudron**
Endemicity	**Rodrigues, Mauritius**
IUCN Status *It has been classified Endangered (EN) in 1989 by Strahm, and re-evaluated "Rare" in 1997 by Walter et al. In Rodrigues, local status EN from Strahm should be kept as the species had become very rare.*	**EN**
Rarity	**Very rare?**
Number of specimens in the wild (Rodrigues)	Probably less than **10** (Strahm 1989)
Number of specimens (Area of influence & Anse Quitor Nature Reserve)	**None** are reported from the forestry services **1** specimen inside the airport area
Number of specimens (Project footprint)	**1** specimen
Receptor sensitivity	**High**

***Diospyros diversifolia* Hiern**	
Endemic to Rodrigues. Strahm reports that the species is occasionally found in many localities with regeneration, even on badly degraded slopes with practically nothing except *Elaeodendron orientale*. Conservation works were carried out very successfully by WWF and the Forestry Services (50 000 plants planted)	
Family	**Ebenaceae**
Local name	**Bois d'Ebène**
Endemicity	**Rodrigues**
IUCN Status *It has been classified Vulnerable (VU) in 1989 by Strahm, and re-evaluated and confirmed as "VU" in 1997 by Walter et al.* *Kirsakye et al. (2015) propose a re assessment to the level Endangered "EN"*	**EN ↑**
Rarity	Mauritian Wildlife): Mourouk valley, Cascade St louis, English Bay (Baie aux Anglais), Creve Coeur, Cascade Pigeon, Oyster Bay (Baie aux Huitres), Cascade Pistache, Plaine Corail, Dan Coco, Riviere Coco, Anse Raffin, Anse Baleine, Cascade Victoire, Port Sud Est
Number of specimens in the wild (Rodrigues)	**Unknown**
Number of specimens (Area of influence & Anse Quitor Nature Reserve)	**None** are reported from the forestry services **1** specimen reported inside the airport area
Number of specimens (Project footprint)	**1** specimen
Receptor sensitivity	**High**

***Terminalia bentzoe* (L.) G.Forst.. subsp. *rodriguesensis* Wickens**	
Very occasionally seen with little regeneration. Recorded from Anse Mourouk, Anse aux Anglais, Rivière Baleine, Mont Chéri, Plaine Corail and Anse Quitor, with a small population on Ile Aux Crabes (Strahm 1989).	
Family	**Combretaceae**
Local name	**Bois Benjoin**
Endemicity	**Rodrigues (subspecies)**
IUCN Status *It has been classified Vulnerable (VU) in 1989 by Strahm, and re-evaluated and confirmed as "VU" in 1997 by Walter et al. and Kirsakye et al. (2015)*	**VU**
Rarity	**Rare?**
Number of specimens in the wild (Rodrigues)	Less than 50 (Source: Mauritian Wildlife): Mourouk Valley, Cascade St louis, St Francois, Anse Ally, English Bay, Pointe Canon, Oyster Bay, Ile Aux Crabes, Plaine Corail, Anse Quitor, Anse Baleine
Number of specimens (Area of influence & Anse Quitor Nature Reserve)	**3** are reported from the forestry services **24** are recorded by Eco-Med Océan Indien in 2019
Number of specimens (Project footprint)	**3** specimens
Receptor sensitivity	**High**

***Fernelia buxifolia* Lam.**	
Endemic to the Mascarenes (La Réunion, Mauritius, Rodrigues). Found in Rodrigues in La Plaine Corail, Anse Mourouc, Cascade Saint-Louis, Grande Montagne, Mont Limon, Mont Malartic, Cascade Victoire, Mont Lubin. Populations from Rodrigues might belong to a different taxa, the leaves are less elliptical than the typical *F. buxifolia* and resembles *F. obovata* (Flore des Mascareignes). This species has still been drastically reduced in number in just over a century (Strahm, 1989).	
Family	**Rubiaceae**
Local name	**Bois Bouteille**
Endemicity	**Mascarenes**
IUCN Status *It has been classified EN in La Réunion (IUCN 2010). The same category has been applied by Kirsakye et al. (2015) and should be kept for Rodrigues*	**EN**
Rarity	**Very Rare?**
Number of specimens in the wild (Rodrigues)	Probably **a dozen** of specimens according to Strahm (1989)
Number of specimens (Area of influence & Anse Quitor Nature Reserve)	**2** are reported from the forestry services **2** are recorded by Eco-Med Océan Indien in 2019
Number of specimens (Project footprint)	**1** specimen
Receptor sensitivity	**High**

6.4.1.3 fauna

Baselines studies have been carried out on mammals, birds, reptiles, molluscs, crustaceans, insects, arachnids and myriapods. The inventories carried out and the bibliographical review reveal a rich and varied animal biodiversity, but also endangered species endemics such as *Pteropus rodricensis* and *Tropidophora articulata*. Additional studies and inventory will be conducted in 2023 during the survey update for these two endemic species of Rodrigues.

6.4.1.3.1 Mammals

Like in the whole of Rodrigues Island, the mammal populations on the site are mainly bovid (cows, goats, sheep) and other domestic (cat, dog) or introduced animals (rats).

The only native species is an endemic bat: *Pteropus rodricensis*. This species is classified as endangered (IUCN). No roost was found near the study site. Several tens of bats are observed at the end of the day, but only some individuals were seen punctually flying over the area of influence. They go up Anse Quitor to eat there, but they do not seem to be flying over the airport area. Around the Area of influence, the habitat favourable for flyingfoxes like *Pteropus rodricensis* correspond to the dry forest sectors (Anse Quitor). These habitats are rare on an island scale, but according to the local experts, *Pteropus rodricensis* is not rare and its numbers are increasing.

Ultrasonic recording devices allow us to confirm the absence of Microchiroptera species on site (no mention of such species has been reported on Rodrigues before).

Figure 95: Mammals on site: Pteropus rodricensis / Bos taurus / Capra hircus (©ECO-MED Océan Indien, 2019)

Table 45: List of mammals observed on site

Order	Family	Taxa	Status	Local protection *	Common name (ENG)	IUCN
Carnivora	Canidae	*Canis familiaris*	Introduced		Dog	NA
Carnivora	Felidae	*Felis catus*	Introduced		Domestic cat	NA
Cetartiodactyla	Bovidae	*Bos taurus*	Introduced		Cow	NA
Cetartiodactyla	Bovidae	*Capra hircus*	Introduced		Feral Goat	NA
Cetartiodactyla	Bovidae	*Ovis aries*	Introduced		Red Sheep	NA
Chiroptera	Pteropodidae	*Pteropus rodricensis*	**Endemic**	**x**	Rodrigues Flying Fox	**EN**
Rodentia	Muridae	*Rattus*	Introduced		rats	NA

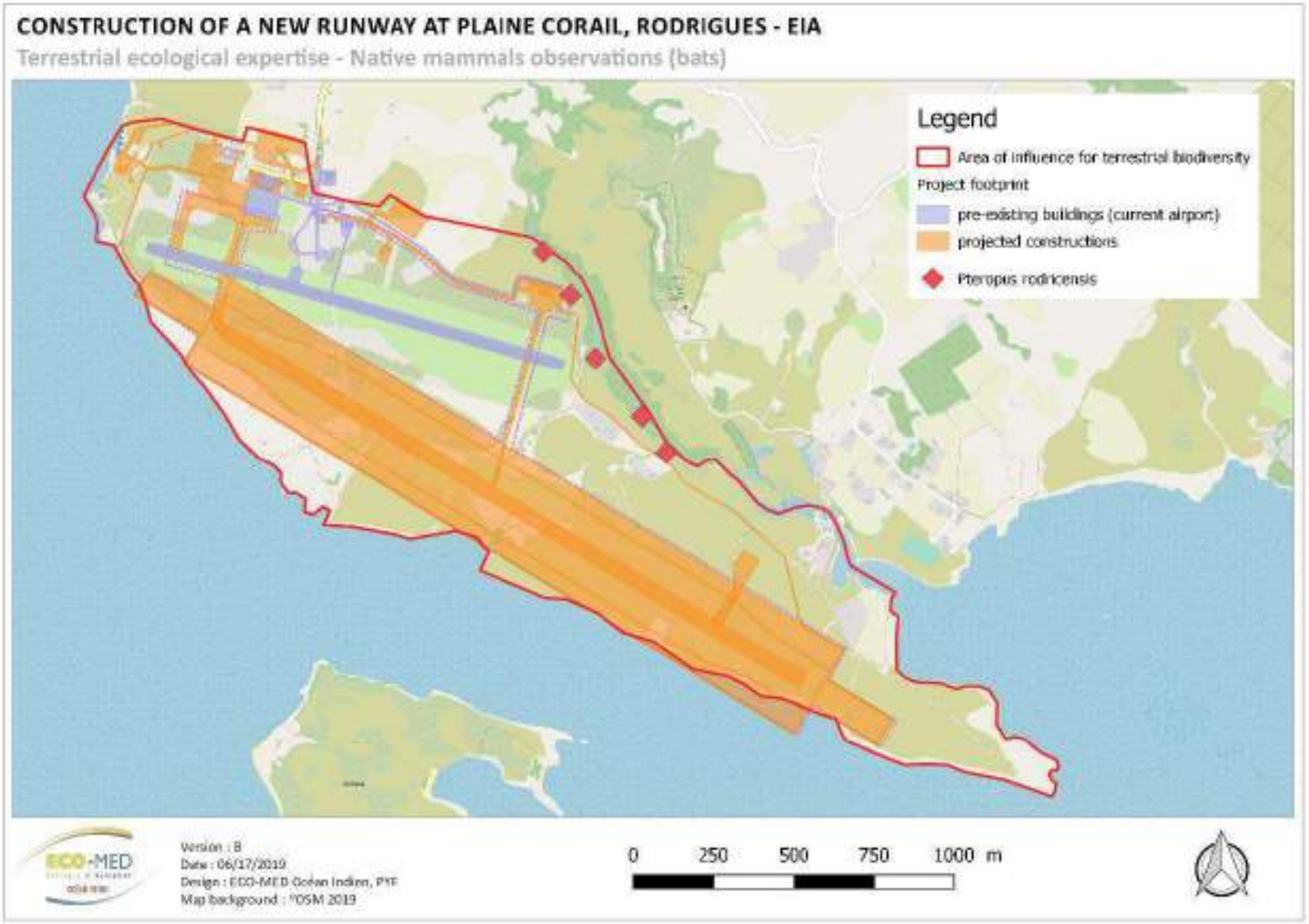


Figure 96: Native mammal observation mapping

6.4.1.3.2 Reptiles

The terrestrial reptiles observed are mainly of exotic origin. The lizard species *Hemidactylus frenatus* is the most common. It has adapted locally with a terrestrial behaviour, sheltering under the omnipresent rocks.

The only species supposedly native to Rodrigues (there is scientific controversy), is *Lepidodactylus lugubris* and was observed 3 times (see map below). Its more arboreal behaviour hinders its occurrence on the site, which is particularly devoid of trees. This species does not have an unfavourable conservation status.

Figure 97: Reptiles on site: Hemidactylus frenatus / Lepidodactylus lugubris (©ECO-MED Océan Indien, 2019)

Table 46: List of reptiles observed on site

Order	Family	Taxa	Status	Local protection *	Common name (ENG)	IUCN
Squamata	Agamidae	*Calotes versicolor*	Introduced		-	NA
Squamata	Gekkonidae	*Hemidactylus frenatus*	Introduced		Common House Gecko	LC
Squamata	Gekkonidae	*Hemidactylus parvimaculatus*	Introduced		-	NA
Squamata	Gekkonidae	*Lepidodactylus lugubris*	**Native**	**x**	Sad Gecko	NA
Squamata	Typhlopidae	*Indotyphlops braminus*	Introduced		Braminy Bling Snake	NA

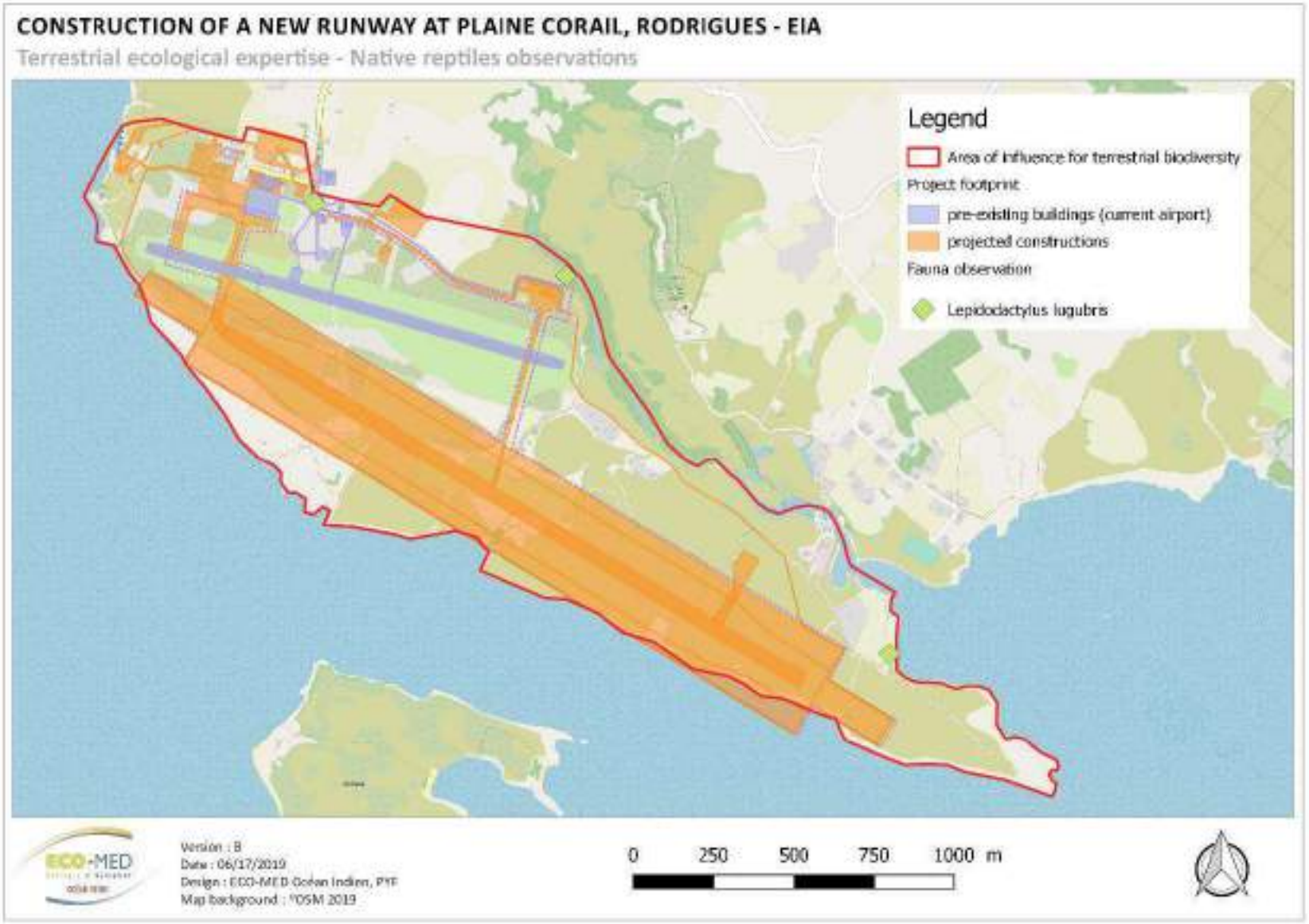


Figure 98: Native reptile observation mapping

6.4.1.3.3 Birds

The bird populations observed are mainly exotic. *Acridotheres tristis, Geopelia striata, Passer domesticus, Estrilda astrild* are the most common.

Three indigenous (or migratory) species frequent the site for their food: *Butorides striata*, *Arenaria interpres, Numenius phaeopus*. They are mainly observed on the banks of Anse Quitor and on the coast. *Numenius phaeopus* is also observed on grassy areas along the airport runways. *Butorides striata* is likely to nest in trees along the Anse Quitor River. *Arenaria interpres* and *Numenius phaeopus* are assumed to be migratory, as their nesting is not locally reported.

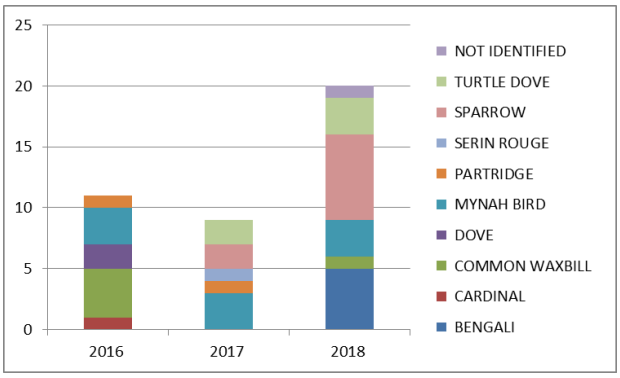
Phaethon lepturus, also native, was observed flying over the site. It is likely to nest on the cliffs of Anse Quitor.

No single bird species has a particular conservation status issue.

Two species of endemic passerines present a very strong local challenge in Rodrigues: *Acrocephalus rodericanus* and *Foudia flavicans*. Although Anse Quitor is a suitable native habitat, these species do not appear to be established at this time. However, the presence of a female *Foudia* has recently been reported (pers. comm. Aurèle Anquetil André & Mauritian Wildlife Foundation (**WF**)). The current population dynamics could lead them to gain this territory effectively adding an additional challenge to this nature reserve.

Finally, it should be noted that the site is obviously overflown by seabirds regularly observed on Rodrigues and nesting on the lagoon islets (Ile aux sables, Iles aux Cocos, Ile Frégate): *Anous ssp., Onychoprion ssp., Sterna dougallii, Ardenna pacificus, Gygis alba, etc.*

In terms of aircraft collisions with birds, the airport records the following statistics:



Species reported	Assumed taxon
BENGALI	*Estrildidae sp.?*
CARDINAL	*Foudia madagascariensis*
COMMON WAXBILL	*Estrilda astrild*
DOVE	*Geopelia striata / Columba livia / Streptopelia sp.?*
MYNAH BIRD	*Acridotheres tristis*
PARTRIDGE	*Francolinus pondicerianus?*
SERIN ROUGE	*Foudia madagascariensis*
SPARROW	*Passer domesticus*
TURTLE DOVE	*Geopelia striata / Columba livia / Streptopelia sp.?*
NOT IDENTIFIED	*?*

Figure 99: Bird strike statistics in the past 3 years

These statistics confirm the predominance of alien species and the real impact of airport activity on this group.

Figure 100: Birds on site: Butorides striata / Numenius phaeopus / Estrilda astrild (©ECO-MED Océan Indien, 2019)

Table 47: List of birds observed on site

Order	Family	Taxa	Status	Local protection *	Common name (ENG)	IUCN
Anseriformes	Anatidae	*Anser*	Introduced		-	NA
Charadriiformes	Scolopacidae	*Arenaria interpres*	**Native**	**x**	Turnstone	LC
Charadriiformes	Scolopacidae	*Numenius phaeopus*	**Native**	**x**	Whimbrel	LC
Columbiformes	Columbidae	*Columba livia*	Introduced		Rock Pigeon	LC
Columbiformes	Columbidae	*Geopelia striata*	Introduced		Zebra Dove	LC
Galliformes	Phasianidae	*Francolinus pondicerianus*	Introduced		Gray Francolin	LC
Passeriformes	Estrildidae	*Estrilda astrild*	Introduced		Common Waxbill	LC
Passeriformes	Fringillidae	*Serinus mozambicus*	Introduced		Yellow-fronted Canary	LC
Passeriformes	Passeridae	*Passer domesticus*	Introduced		House Sparrow	LC
Passeriformes	Ploceidae	*Foudia madagascariensis*	Introduced		Madagascar Red Fody	LC
Passeriformes	Sturnidae	*Acridotheres tristis*	Introduced		Common myna	LC
Pelecaniformes	Ardeidae	*Butorides striata*	**Native**	**x**	Striated Heron	LC
Phaethontiformes	Phaethontidae	*Phaethon lepturus*	**Native**	**x**	White-tailed Tropicbird	LC

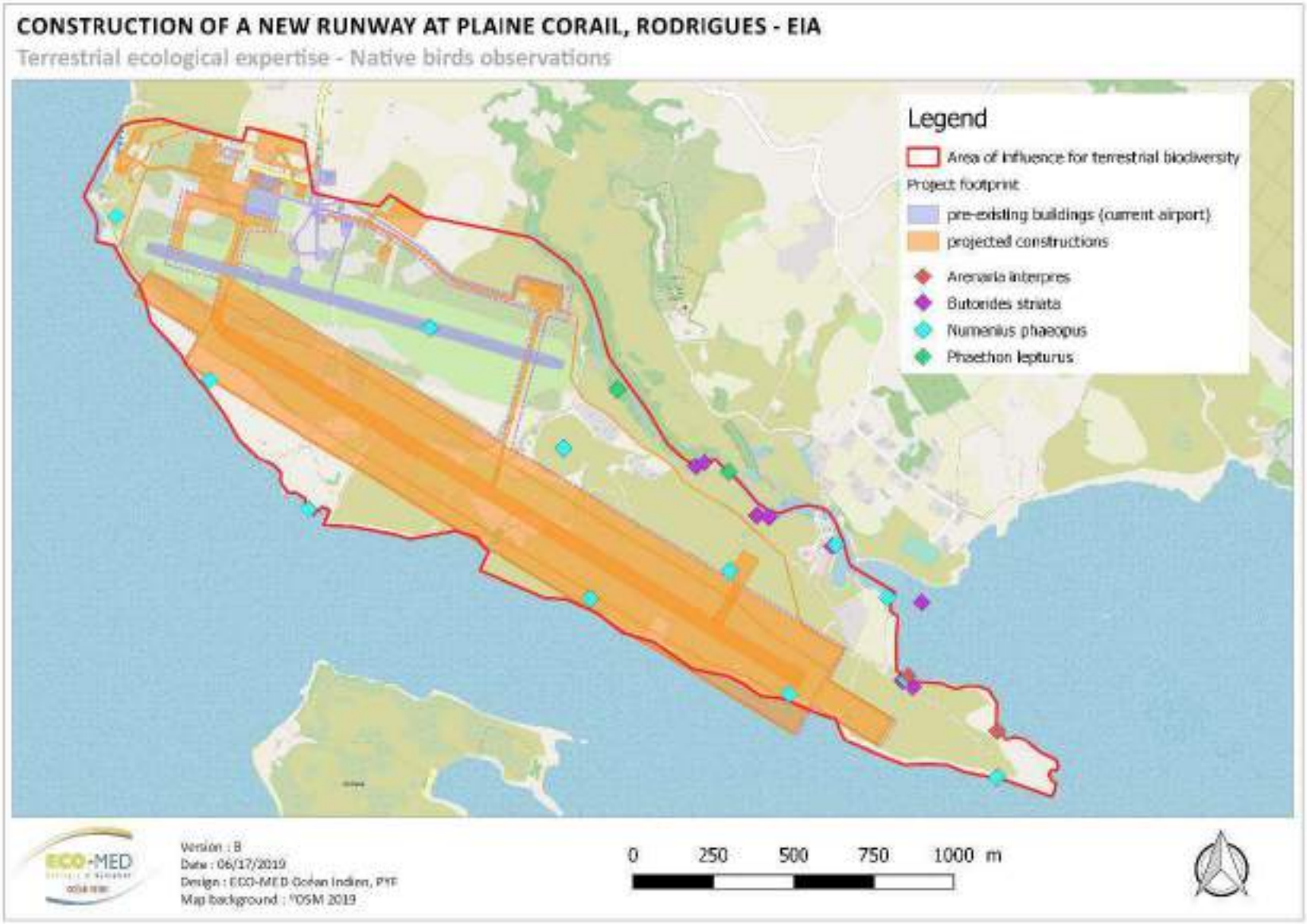


Figure 101: Native bird observations mapping

6.4.1.3.4 Molluscs

Representative of the fauna of Rodrigues, the mollusc group is well represented here by native, even endemic species. Despite the omnipresence of potentially harmful exotic species (*Lissachatina fulica*, *Euglandina rosea*), species such as *Tropidophora ssp*. are widely present in the area of influence.

The habitats favourable for *Tropidophora articulata* correspond to the calcareous substrates, which are relatively rare on an island scale. The "endangered" status of *Tropidophora articulata*, assessed by “The IUCN Red List of Threatened Species” in 1996, makes it a particularly sensitive point here. However, only empty shells were found. The *Tropidophora articulata* populations inventory will be completed in the survey update 2023, in accordance with the World Bank requirements.

Figure 102: Molluscs on site: Tropidophora articulata / T. eugeniae / Subulina octona / Melanoides tuberculata (©ECO-MED Océan Indien, 2019)

Table 48: List of molluscs observed on site

Order	Family	Taxa	Status	Local protection *	Common name (ENG)	IUCN
Caenogastropoda	Thiaridae	*Melanoides tuberculata*	**Native**	**x**	Red-rimmed Melania	NA
Littorinimorpha	Pomatiidae	*Tropidophora articulata*	**Sub-endémique**	**x**	-	**EN**
Littorinimorpha	Pomatiidae	*Tropidophora eugeniae*	**Sub-endémique**	**x**	-	NA
Stylommatophora	Achatinidae	*Lissachatina fulica*	Introduced		Giant African snail	NA
Stylommatophora	Achatinidae	*Subulina octona*	Introduced		The eight-whorled Achatina	NA
Stylommatophora	Helicarionidae	*Gen. sp.*	Native?		-	NA
Stylommatophora	Spiraxidae	*Euglandina rosea*	Introduced		Cannibal snail	NA

these

6.4.1.3.5 Crustaceans

Two taxa are observed on the site (undetermined species). No terrestrial crustacean species with an unfavourable conservation status is known to Rodrigues.

Figure 103: Crustacean on site: Isopoda sp. (©ECO-MED Océan Indien, 2019)

Table 49: List of crustaceans observed on site

Order	Family	Taxa	Status	Local protection *	Common name (ENG)	IUCN
Decapoda	Coenobitidae	*Coenobita*	Native?		-	NA
Isopoda		*Gen. sp.*	Native?		-	NA

6.4.1.3.6 Insects

The insect taxa known to Rodrigues and having a high conservation status belong to the orders Lepidoptera, Odonata and Orthoptera.

These species have been researched more specifically. For the other groups, these are more opportunistic observations.

It should be noted that the inventory period, one week after the passage of the cyclone Joaninha (26 March 2019), is not favourable to a representative vision of the usual diversity for this site. Therefore, as part of the updated ESIA study, a rapid assessment will be conducted during the finalization of the ESIA

The species identified, although some of them are native, do not present a significant challenge for this project.

The water points, rare on the site, are particularly attractive places for wildlife and in particular entomofauna: river, karst collapses, old quarry.

Figure 104: Insects on site: Junonia rhadama/Ischnura senegalensis/Gryllodes sigillatus (©ECO-MED Océan Indien, 2019)

Table 50: List of insects observed on site

Order	Family	Taxa	Status	Local protection *	Common name (ENG)	IUCN
Blattodea	Blaberidae	*Pycnoscelus surinamensis*	**Native**	**x**	Surinam Cockroach	NA
Blattodea	Blattidae	*Gen. sp.*	Native?		-	NA
Blattodea	Blattidae	*Periplaneta*	Native?		-	NA
Hemiptera	Pyrrhocoridae	*Dysdercus fasciatus*	**Native**	**x**	-	NA
Hymenoptera	Apidae	*Apis mellifera*	Introduced		Honey Bee	NA
Hymenoptera	Apidae	*Xylocopa*	Native?		-	NA
Hymenoptera	Vespidae	*Polistes olivaceus*	**Native**	**x**	-	NA
Lepidoptera	Crambidae	*Spoladea recurvalis*	**Native**	**x**	-	NA
Lepidoptera	Lycaenidae	*Leptotes pirithous*	**Native**	**x**	Lang's Short-tailed Blue	NA
Lepidoptera	Lycaenidae	*Zizeeria knysna*	**Native**	**x**	-	NA
Lepidoptera	Nolidae	*Earias biplaga*	**Native**	**x**	-	NA
Lepidoptera	Nymphalidae	*Danaus chrysippus*	**Native**	**x**	-	NA
Lepidoptera	Nymphalidae	*Junonia rhadama*	**Native**	**x**	-	NA
Lepidoptera	Nymphalidae	*Phalanta phalantha*	**Native**	**x**	-	NA
Lepidoptera	Pieridae	*Catopsilia florella*	**Native**	**x**	-	NA
Odonata	Coenagrionidae	*Ischnura senegalensis*	**Native**	**x**	Tropical Bluetail	LC
Odonata	Libellulidae	*Pantala flavescens*	**Native**	**x**	Globe Wanderer	LC
Orthoptera	Acrididae	*Locusta migratoria*	**Native**	**x**	-	NA
Orthoptera	Gryllidae	*Gryllodes sigillatus*	**Native**	**x**	-	NA
Orthoptera	Gryllidae	*Gryllus bimaculatus*	Introduced		-	NA
Orthoptera	Tettigoniidae	*Conocephalus iris*	**Native**	**x**	Yellowtail Meadow Katydid	NA
Orthoptera	Trigonidiidae	*Trigonidium cicindeloides*	**Native**	**x**	-	NA

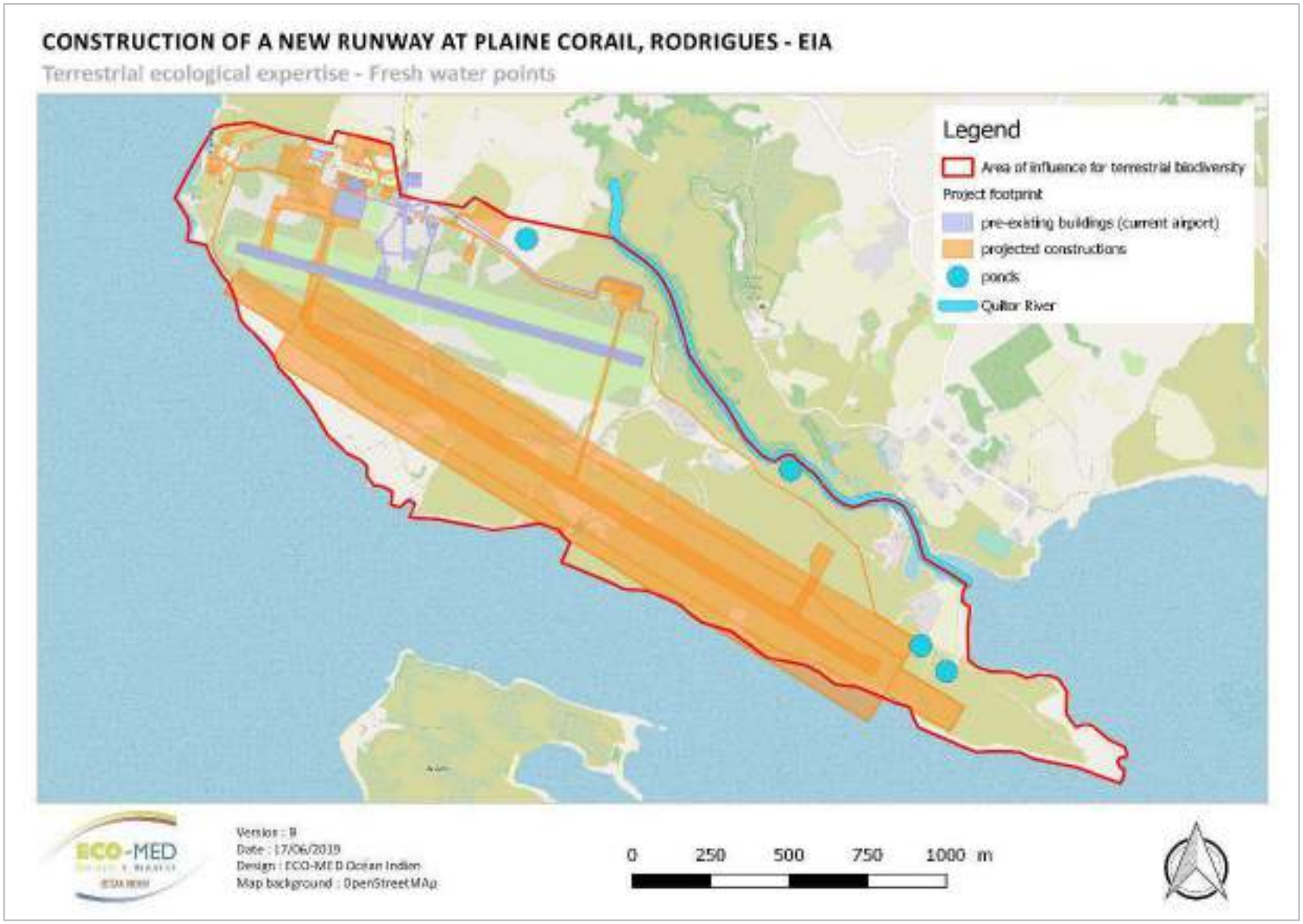


Figure 105: Fresh water point on site

6.4.1.3.7 Arachnids

The diversity of Rodrigues arachnids is poorly documented in the literature. We sighted 14 species, some of which could not be identified. In fact, endemicity and threat status are difficult to assess for this group. However, no threatened species in families including these unidentified species are known to Rodrigues to date.

Figure 106: Arachnids on site: Nephila inaurata/Salticidae sp./Smeringopus pallidus/Isometrus maculatus (©ECO-MED Océan Indien, 2019)

Table 51: List of arachnids observed on site

Order	Family	Taxa	Status	Local protection *	Common name (ENG)	IUCN
Araneae	Araneidae	*Cyrtophora citricola*	**Native**	**x**	-	NA
Araneae	Araneidae	*Neoscona moreli*	**Native**	**x**	-	NA
Araneae	Nephilidae	*Nephila inaurata*	**Native**	**x**	-	LC
Araneae	Oxyopidae	*Gen. sp.*	Native?		-	NA
Araneae	Pholcidae	*Smeringopus pallidus*	**Native**	**x**	Cellar Spider	NA
Araneae	Salticidae	*Gen. sp. (x2)*	Native?		-	NA
Araneae	Tetragnathidae	*Gen. sp. (x3)*	Native?		-	NA
Araneae	Tetragnathidae	*Leucauge undulata*	**Native**	**x**	-	NA
Araneae	Theridiidae	*Gen. sp.*	Native?		-	NA
Araneae	Thomisidae	*Thomisus*	Native?		-	NA
Scorpiones	Buthidae	*Isometrus maculatus*	Introduced		-	NA

6.4.1.3.8 Myriapods

The three species of myriapods, which were commonly observed on the site, are not of significant interest.

Figure 107: Myriapods on site: Orthomorpha coarctata/Pachybolidae sp. (©ECO-MED Océan Indien, 2019)

Table 52: List of myriapods observed on site

Order	Family	Taxa	Status	Local protection *	Common name (ENG)	IUCN
Polydesmida	Paradoxosomatidae	*Orthomorpha coarctata*	Introduced		Flatback Millipede	NA
Spirobolida	Pachybolidae	*Gen. sp.*	Native?		-	NA
Scolopendromorpha	Scolopendridae	*Scolopendra subspinipes*	**Native**	**x**	Vietnamese Giant Centipede	NA

6.4.1.3.9 Sensitivity assessment of native fauna found inside the area of influence

The sensitivity of the native fauna observed in the area of influence was assessed according to the following criteria:

⇒ Endemicity or indigenous status: indigenous = 1 point; endemic to the Mascarenes (sub endemicity) = 2 points; endemic to Rodrigues = 3 points.

⇒ Protection status: protected in Rodrigues = 1 point; protected under the Forestry Act (1983) = 3 points

⇒ Threat level according to the red list: LC = 0 point; NT = 1 point; VU = 2 points; EN = 3 points; CR = 4 points.

A maximum of 10 points can be assigned to a species. An adjustment by the expert can be made to correct deficiencies in the status of certain species. Depending on the score obtained, the species is classified according to the following sensitivity levels:

Table 53: Scale value used to assess the plant species sensitivity

Receptor sensitivity	Scale value
Negligible	**0 - 2**
Low	**2 – 4**
Medium	**4 – 6**
High	**6- 8**
Major	**8 – 10**

A total of 2 species were assessed to a high level of sensitivity inside the area of influence of the project (both Endangered): the bat *Pteropus rodricensis* and the gastropoda *Tropidophora articulata*.
However as only some individuals were seen punctually flying over the area of influence, *Pteropus rodricensis* is considered as of low sensitivity. Similary, as only empty shells of *Tropidophora articulate* were found over the area, this species is considered of memdium-high sensitivity.
A third species has been assessed to a low level of sensitivity: the gastropoda *Tropidophora eugeniae.*

Table 54: Native fauna recorded at the area of influence and sensitivity assessment

Class	Order	Family	Taxa	Status	Local protection *	IUCN	note statut	note protection	note IUCN	note total	Receptor sensitivity
Mammalia	Chiroptera	Pteropodidae	*Pteropus rodricensis*	**Endemic**	**x**	**EN**	3	1	3	7	**Low**
Gastropoda	Littorinimorpha	Pomatiidae	*Tropidophora articulata*	**Sub-endémique**	**x**	**EN**	2	1	3	6	**Medium/High**
Gastropoda	Littorinimorpha	Pomatiidae	*Tropidophora eugeniae*	**Sub-endémique**	**x**	NA	2	1	0	3	**Low**
Reptilia	Squamata	Gekkonidae	*Lepidodactylus lugubris*	**Native**	**x**	NA	1	1	0	2	**Low (↑)**
Gastropoda	Caenogastropoda	Thiaridae	*Melanoides tuberculata*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Arachnida	Araneae	Araneidae	*Cyrtophora citricola*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Arachnida	Araneae	Araneidae	*Neoscona moreli*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Arachnida	Araneae	Nephilidae	*Nephila inaurata*	**Native**	**x**	LC	1	1	0	2	**Negligible**
Arachnida	Araneae	Pholcidae	*Smeringopus pallidus*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Arachnida	Araneae	Tetragnathidae	*Leucauge undulata*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Aves	Charadriiformes	Scolopacidae	*Arenaria interpres*	**Native**	**x**	LC	1	1	0	2	**Negligible**
Aves	Charadriiformes	Scolopacidae	*Numenius phaeopus*	**Native**	**x**	LC	1	1	0	2	**Negligible**
Aves	Pelecaniformes	Ardeidae	*Butorides striata*	**Native**	**x**	LC	1	1	0	2	**Negligible**
Aves	Phaethontiformes	Phaethontidae	*Phaethon lepturus*	**Native**	**x**	LC	1	1	0	2	**Negligible**
Chilopoda	Scolopendromorpha	Scolopendridae	*Scolopendra subspinipes*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Blattodea	Blaberidae	*Pycnoscelus surinamensis*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Hemiptera	Pyrrhocoridae	*Dysdercus fasciatus*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Hymenoptera	Vespidae	*Polistes olivaceus*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Lepidoptera	Crambidae	*Spoladea recurvalis*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Lepidoptera	Lycaenidae	*Leptotes pirithous*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Lepidoptera	Lycaenidae	*Zizeeria knysna*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Lepidoptera	Nolidae	*Earias biplaga*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Lepidoptera	Nymphalidae	*Danaus chrysippus*	**Native**	**x**	NA	1	1	0	2	**Negligible**

Class	Order	Family	Taxa	Status	Local protection *	IUCN	note statut	note protection	note IUCN	note total	Receptor sensitivity
Hexapoda	Lepidoptera	Nymphalidae	*Junonia rhadama*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Lepidoptera	Nymphalidae	*Phalanta phalantha*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Lepidoptera	Pieridae	*Catopsilia florella*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Odonata	Coenagrionidae	*Ischnura senegalensis*	**Native**	**x**	LC	1	1	0	2	**Negligible**
Hexapoda	Odonata	Libellulidae	*Pantala flavescens*	**Native**	**x**	LC	1	1	0	2	**Negligible**
Hexapoda	Orthoptera	Acrididae	*Locusta migratoria*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Orthoptera	Gryllidae	*Gryllodes sigillatus*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Orthoptera	Tettigoniidae	*Conocephalus iris*	**Native**	**x**	NA	1	1	0	2	**Negligible**
Hexapoda	Orthoptera	Trigonidiidae	*Trigonidium cicindeloides*	**Native**	**x**	NA	1	1	0	2	**Negligible**

Table 55: Fauna conservation issues inside the area of influence

ID	Type	Items	Sub items	Sensitivity	Area/number of specimens inside the area of influence
FA01	**Fauna**	Fauna species of low sensitivity	*Pteropus rodricensis (Chiroptera)*	**Low**	>10
FA02	**Fauna**	Fauna species of medium / high sensitivity	*Tropidophora articulata (Gastropoda)*	**Medium / High**	Unknown*
FA03	**Fauna**	Fauna species of low sensitivity	*Tropidophora eugeniae (Gastropoda)*	**Low**	Unknown*
FA04	**Fauna**	Fauna species of low sensitivity	*Lygodactylus lugubris*	**Low**	Unknown (at least 3)

6.4.1.4 Ecological continuities

An ecological network must make it possible to maintain and restore a network of exchanges on the territory so that animal and plant species can communicate, circulate, feed, reproduce, rest, etc. by themselves to ensure their survival.

An ecological network is composed of different elements:
Biodiversity reservoirs. These are areas where biodiversity is the richest, they generally include areas subject to protection and heritage environments outside protected areas.
Ecological corridors that connect (or could connect) biological reservoirs to each other.
Obstacles to continuity, in particular by locating the artificial network (urbanization, roads, various networks, etc.).

On the site, Anse Quitor (wooded banks) could be considered as a corridor and a biodiversity reservoir at the same time, given the indigenous biodiversity it shelters and the continuous forested corridor it constitutes. We associate the caves of François Leguat Reserve with this core with regard to the ecological restoration efforts made in this area directly linked to the reserve.

The restoration parcels and plantations bordering it form a buffer zone (including the official delimitation of the Anse Quitor nature reserve, the François Leguat Reserve and the downstream portion of the river).

The axis of the river from upstream to downstream is an ecological corridor.

Finally, it should be noted that the coastline (shore and grazing lands in-shore) itself forms a specific aerial and terrestrial corridor mainly used by three indigenous (or migratory) species as a foraging habitat: Butorides striata, Arenaria interpres, Numenius phaeopus. All species and groups of species concerned by local continuities are listed in Table 56.

Figure 108: Numenius phaeopus uses the coastal and open grazing lands corridor for feeding

Table 56: List of ecological continuities included within the area of influence

Ecological continuites	Function	Species concerned
Anse Quitor river	***Terrestrial corridor***	Native breeding birds (*Acrocephalus rodericanus, Foudia flavicans*), bats (*Pteropus rodricensis*), waterbirds (*Butorides striata*), reptiles (L*ygodactylus lugubris*)
Anse Quitor river	***Aerial corridor***	Bats (*Pteropus rodricensis*), marine birds (*Phaeton lepturus*)
Anse Quitor Nature Reserve	***Biodiversity reservoir***	Native plant species, i.e.: *Camptocarpus sphenophyllus, Clerodendrum laciniatum, Diospyros diversifolia, Fernelia buxifolia, Foetidia rodriguesiana, Hyophorbe verschaffeltii, Latania verschaffeltii, Mathurina penduliflora, Pleurostylia putamen, Polyscias rodriguesiana, Sarcanthemum coronopus, Secamone rodriguesiana, Terminalia bentzoe subsp. rodriguesensis, Zanthoxylum paniculatum…* Native breeding birds (*Acrocephalus rodericanus, Foudia flavicans*), bats (*Pteropus rodricensis*), waterbirds (*Butorides striata*), reptiles (*Lygodactylus lugubris*)
Coast	***Terrestrial corridor***	Waterbirds (*Butorides striata*), waders (N*umenius phaeopus, Arenaria interpres…*)
Grazing lands		
Coast	***Aerial corridor***	Waterbirds (*Butorides striata*), waders (*Numenius phaeopus, Arenaria interpres…*), marine birds (*Phaeton lepturus, Anous ssp., Onychoprion ssp., Sterna dougallii, Ardenna pacifica, Gygis alba, et*c)
Grazing lands		

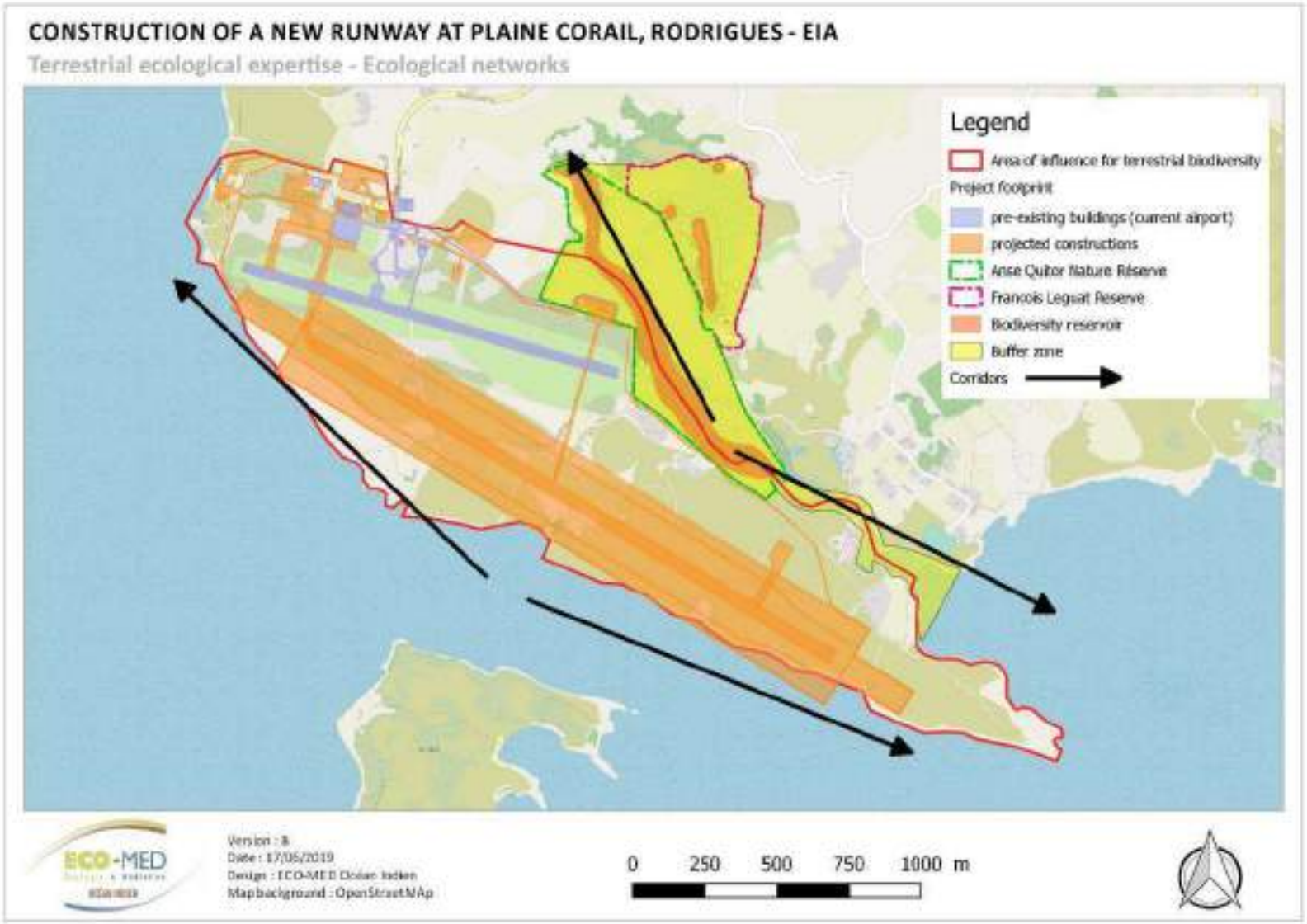


Figure 109: Ecological network mapping

6.4.1.5 Terrestrial biological environment issues

6.4.1.5.1 Terrestrial protected area

The protected area network in Rodrigues includes 4 protected sites, mentioned in the Forest and Reserves Act (1983), covering less than 1% of the total area of the island, namely: Great Mountain (30 ha fenced and 25.5 ha declared reserve), Anse Quitor (35 ha fenced and 10.3 ha declared reserve), Ile aux Sables (8 ha) and Ile aux Cocos (14.4 ha).

As shown in the previous map (Figure 109), the Anse Quitor Reserve adjoins the airport area.

This reserve has also been identified as "Key Areas for Biodiversity" by the Critical Ecosystems Partnership Fund.

Any impact on the core of the Reserve will be prohibited. Impacts on the buffer zone will be avoided as much as possible.

The extension of the airport area to Anse Quitor Reserve could weaken the acceptability of the project.

6.4.1.5.2 Protected species

Forestry Act 1983

All plants in forest land and reserves are prohibited from being destroyed by the **Forestry Act 1983**. Outside Anse Quitor, the project area does not seem to be affected. The text also lists the protected plants:

All indigenous orchids
Ochna mauritiana
Hornea mauritiana
All Diospyros species
Sideroxylon grandiflorum
Cordyline mauritiana
All Tambourissa species
All Trochetia species
Erythroxylon laurifolium
All indigenous ferns

The following plants are concerned within the limits of the area of influence:

Adiantum rhizophorum Sw.
Nephrolepis acutifolia (Desv.) Christ
Phymatosorus scolopendria (Burm. f.) Pic. Serm.
Diospyros diversifolia

Wildlife and National Parks Act 2016

Any person who plans to destroy native wildlife shall make a written application to the Director for a permit.

Many species, both animal and plant, are present on the site, as mentioned in the above tables.

The text mentions species of wildlife where more severe penalties are provided. Based on the field observations, the following could be impacted by this project:

Pteropus rodricensis

Phaethon lepturus.

Local protection of flora species (source: Rodrigues Regional Assembly, 16/04/2019)

A list of protected fauna and flora species has been sent by the Rodrigues Regional Council in April 2019. The list includes 3 species of fauna and 48 species of flora, as shown below.

Table 57: List of protected plant species in Rodrigues (Source: Rodrigues Regional Assembly, 2019): (in red, species recorded inside the area of influence; in yellow background: species recorded inside the project footprint)

Scientific name	Family	Local name	French name
Antirhea bifurcata (Desr.) Hook. f.	Rubiaceae	Bois goudron	
Badula balfouriana (Kuntze) Mez	Primulaceae	Bois papaye	
Carissa spinarum L.	Apocynaceae	Bois amer	
Clerodendrum laciniatum	Lamiaceae	Bois cabri	
Dictyosperma album (Bory) H. Wendl. et Drude ex Scheff.	Arecaceae	Palmiste blanc	Dictyosperme blanc
Diospyros diversifolia Hiern	Ebenaceae	Bois d'ébène / Ebénier	
Dodonaea viscosa Jacq.	Sapindaceae	Bois d'arnette	Dodonée visqueuse
Dombeya acutangula Cav.	Malvaceae	Mahot tantan	Mahot acutangulé
Dombeya rodriguesiana F. Friedmann	Malvaceae	Mahot / Bois Julien	
Doricera trilocularis	Rubiaceae	Bois chauve-souris	
Dracaena reflexa Lam.	Asparagaceae	Bois de chandelle	
Elaeodendron orientale Jacq.	Celastraceae	Bois rouge	Olivetier d'Orient
Eugenia rodriguesensis J. Guého & A.J. Scott	Myrtaceae	Bois fer	
Fernelia buxifolia Lam.	Rubiaceae	Bois bouteille	Fernel à feuilles de buis
Ficus reflexa Thunb.	Moraceae	Ti l'affouche	
Ficus rubra Vahl	Moraceae	Affouche rouge	Figuier rouge
Foetidia rodriguesiana F. Friedmann	Lecythidaceae	Bois puant	
Hibiscus liliiflorus Cav.	Malvaceae	Augerine	Ketmie à fleurs de lys
Hyophorbe verschaffeltii H. Wendl.	Arecaceae	Palmiste marron	
Latania verschaffeltii Lem.	Arecaceae	Latanier jaune	
Lomatophyllum lomatophylloides	Asphodelaceae	Ananas marron	
Mathurina penduliflora Balf. f.	Passifloraceae	Bois gandine	
Myoporum mauritianum A. DC.	Scrophulariaceae		
Obetia ficifolia (Poir.) Gaudich.	Urticaceae	Bois d'ortie	Obétie à feuilles de figuier
Olea lancea Lam.	Oleaceae	Bois malaya	
Pandanus heterocarpus Balf. f.	Pandanaceae	Vacoa parasol	
Phyllanthus casticum Soy.-Will.	Phyllanthaceae	Bois de demoiselle	
Phyllanthus dumentosus Poir.	Phyllanthaceae		
Pittosporum balfourii Cuf.	Pittosporaceae	Bois bécasse	
Pleurostylia putamen Marais	Celastraceae	Bois d'olive blanc	
Polyscias rodriguesiana (Marais) Lowry & G.M. Plunkett	Araliaceae	Bois blanc	
Poupartia castanea (Baker) Engl.	Anacardiaceae	Bois lubine / figue marron	

Scientific name	Family	Local name	French name
Premna serratifolia L.	Lamiaceae	Bois sureau	Premme à feuilles dentelées
Psiadia rodriguesiana Balf. f.	Asteraceae		
Psychotria balfouriana Verdc.	Rubiaceae		
Ramosmania rodriguesii Tirveng.	Rubiaceae		
Sarcanthemum coronopus Cass.	Asteraceae		
Scolopia heterophylla (Lam.) Sleumer	Salicaceae	Goyave marron	Scolopie héterophylle
Senecio boutonii Baker	Asteraceae		
Sideroxylon galeatum (A.W. Hill) Baehni	Sapotaceae		
Sophora tomentosa L.	Fabaceae		Sophore tomenteux
Syzygium balforii (Baker) J. Guého & A.J. Scott	Myrtaceae		
Terminalia bentzoë (L.) L. f.	Combretaceae	Benjoin	
Terminalia bentzoe rodriguesensis	Combretaceae	Bois benjoin	
Thespesia populnea (L.) Sol. ex Corrêa	Malvaceae	Sainte Marie	
Turraea lacinata (Balf. f.) Harms	Meliaceae	Bois balai	
Vepris lanceolata (Lam.) G. Don	Rutaceae	Patte poule	Vépride lancéolé

6.4.1.5.3 Critical habitats

As per the World Bank ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, “Habitat” is defined as a terrestrial, freshwater, or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment.

ESS 6 requires a differentiated risk management approach to habitats based on their sensitivity and values. This ESS addresses all habitats, categorized as ‘modified habitat’, ‘natural habitat’, and ‘critical habitat’, along with ‘legally protected and internationally and regionally recognized areas of biodiversity value’ which may encompass habitat in any or all of these categories.

AQNR is defined as a ‘critical habitat’ as per ESS6 in as such as it meets the definition below: Critical habitat is defined as areas with high biodiversity importance or value, including: (a) Habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent national approaches; (b) Habitat of significant importance to endemic or restricted-range species; (c) Habitat supporting globally or nationally significant concentrations of migratory or congregatory species; (d) Highly threatened or unique ecosystems; and € Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d).

In the preliminary designed, the ATC tower was located in Anse Quitor critical habitat. It was recommended that, since the reserve is very well delineated by its property line, shifting the control tower a few meters to the south or west would put the project out of the critical habitat limits and avoid the destruction of the critical habitat by the project.

2022 update: the ATC tower and RFFSD have been relocated outside the critical habitat, hence reducing the impact rating.

6.4.2 Marine biological context

6.4.2.1 Regulatory context

For the Republic of Mauritius, various regulatory texts define the modalities of protection and/or harvesting for marine fauna and flora. For marine environments, the fauna and flora are protected by the following texts:

The Environment Protection Act 2002;
The Fisheries and Marine Resources Act 2007;
Maritime Zone Act 2005.
For these texts, provisions specify the habitats or species protected or regulated.

6.4.2.2 Management responses and marine protected area

The Government of Mauritius and the Rodrigues Regional Assembly have implemented various measures in recognition of the need to protect coastal and marine biodiversity such as declaring Fishing Reserves where throwing net fishing is prohibited (Fisheries Act 75 of 1984). In Rodrigues, 5 areas were created: Pointe Venus to Pointe la Gueule, Pointe la Gueule to Pointe Manioc, Baie Topaze, **Anse Quitor**, and Grande Passe.

There are also four Marine Reserves: Grand Bassin (14.1 km²), Passe Demi (7.2 km²), Passe Cabri (1.5 km²) and Rivière Banane (1.5 km²); and one multiple-use Marine Protected Area, the newest South-East Marine Protected Area (SEMPA). SEMPA is a multiple use MPA covering a total area of 43 km² including Anse Quitor and Grande Passe.

The marine environment of Rodrigues is protected by the Fisheries and Marine Resources Act signed in 2007. Several marine areas are protected as fishing and marine reserves.

Six fishing reserves have been established in the lagoon:

- Pointe Vénus;
- Pointe la Gueule;
- Pointe Manioc;
- Baie Topaze;
- Anse Quitor;
- Grande Passe.

These areas cover an area of 6 km². Their aim is to preserve the environment but also to perpetuate the artisanal fishing activity. These reserves regulate fisheries by controlling the size of fishing nets and the period of activity, and by prohibiting certain practices such as seining.

There are also five marine reserves in Rodrigues:

- Four little areas in the north of the island: Riviere Banane, Anse aux Anglais, Grand Bassin and Passe Demi;
- A large area in the south called South East Marine Protected Area (SEMPA).

SEMPA covers the entire southern coast of the island and the lagoon. It covers an area of 42.5 km². Under the responsibility of the Rodrigues Regional Assembly, SEMPA is administered in a community way by a Management Committee that brings together the RRA administration, NGOs, partners (Shoals, MRC, Terre Mer Rodrigues), fishermen, tourism stakeholders and users.

The project is located between the Topaze Bay Fishing Reserve and the South East Marine Protected Area. It is not included in any marine protected area.

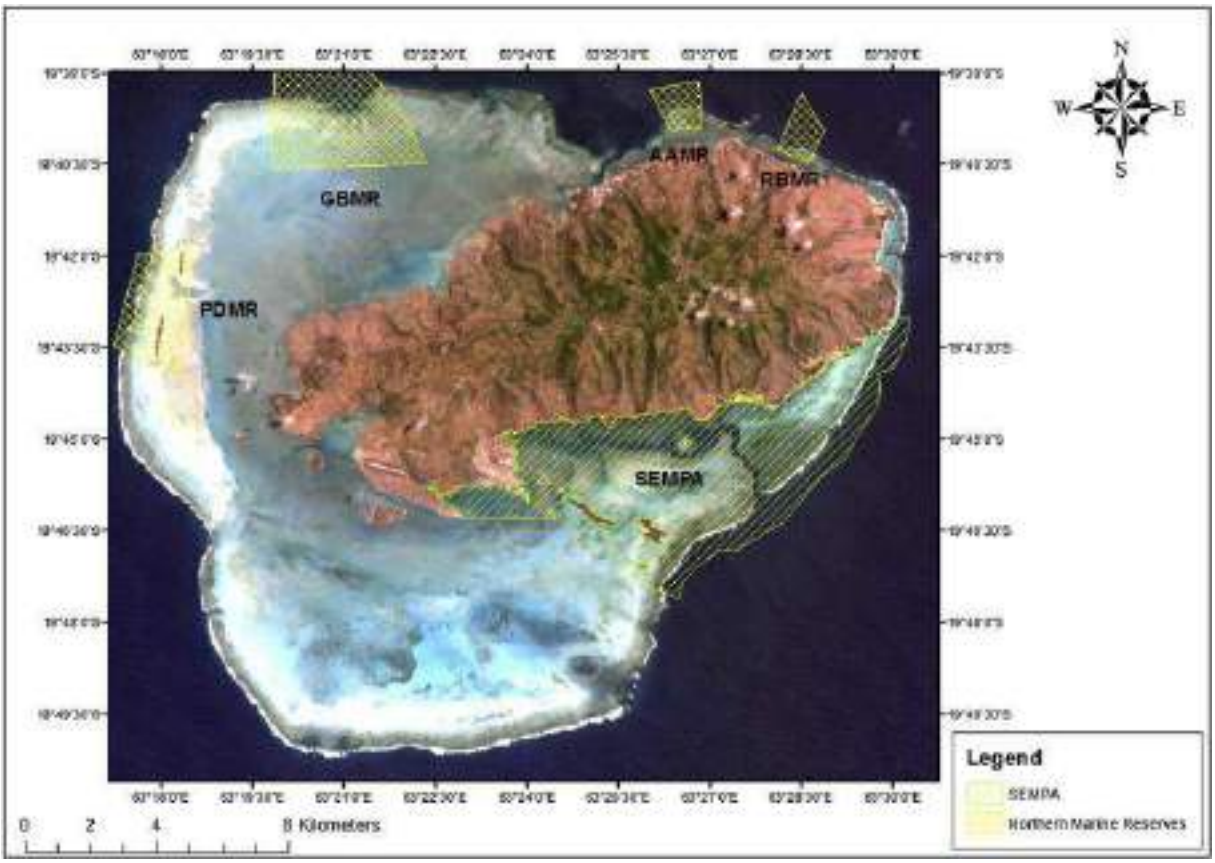


Figure 110: Marine reserves in Rodrigues (Pasnin et al., 2016)

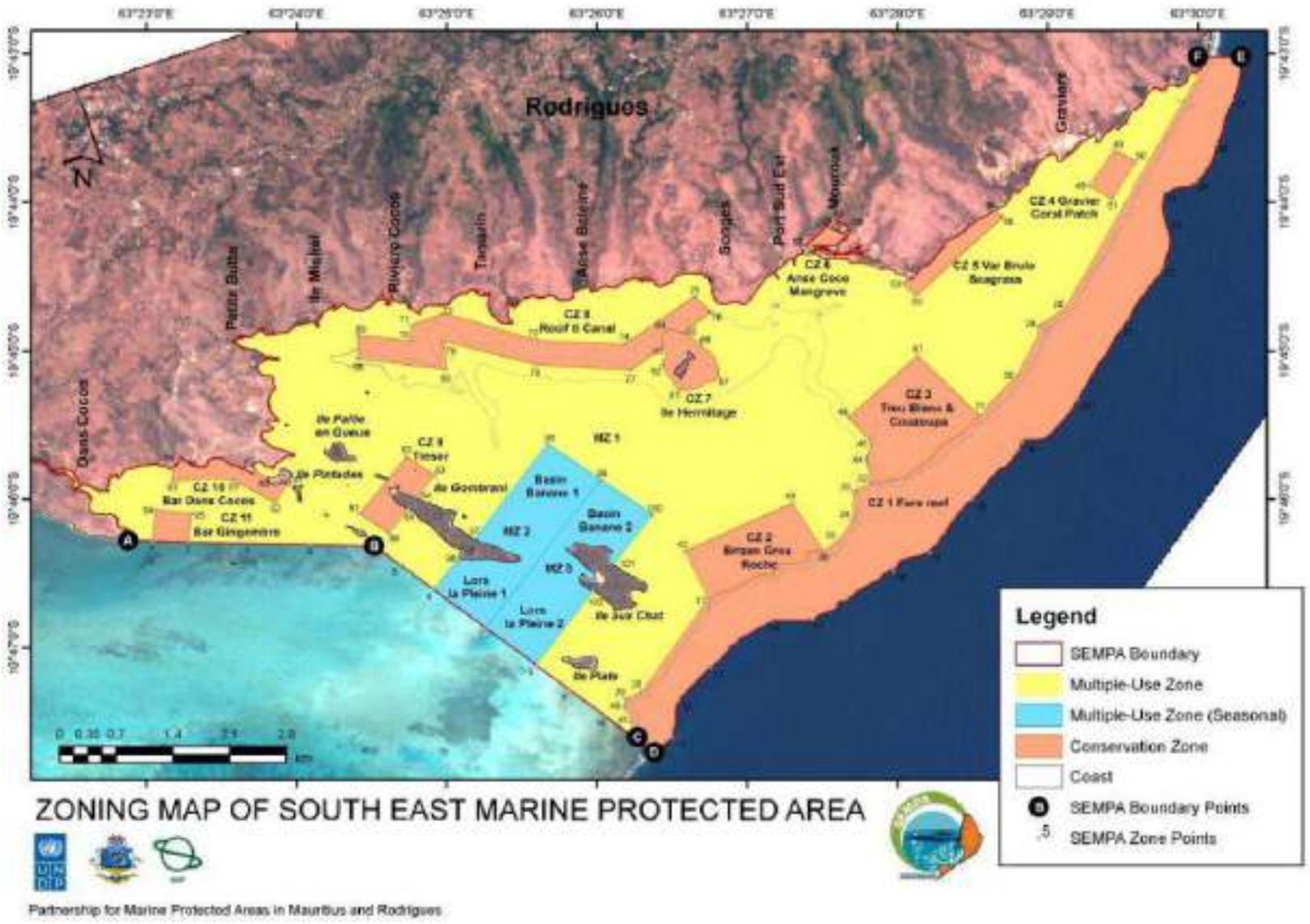


Figure 111: Perimeter of South East Marine Protected Area (Robert, 2014)

6.4.2.3 Area of influence

The area of influence for marine biodiversity is mapped on the figure below.

It includes the Topaze Bay to the north, Désirée and Frégate Islands, Crab Island to the south and the anse Patate to the east.

Figure 112: Area of influence for Marine biodiversity

6.4.2.4 Methodology

First, the charts related to the preliminary results of the turbid releases modelling were used to determine the field of influence of the turbid plume, i.e. the investigation area.

A first sea bottom charting was achieved based on available bibliographic data and on aerial photography on the project website (Google Earth Pro 2017). This charting consisted in an approach associated with the differentiation of the various sea bottom types by means of clipping the different bodies presenting similar structures and colors.

Thus, so as to confirm the different delimited facies, forty-six (46) points (or stations) were defined to verify the sea bottom nature and describe the existing habitats.

The whole stations identified were sampled on the 10th and 11th of July 2019, at depths ranging from 0.5m to 4.5m. They are located on the Figure 112.

6.4.2.5 Marine habitats

This section describes the habitats recorded in the area of influence for marine biodiversity and briefly outlines the relative ecological ranking for each. The habitats characterization was realized thanks to scuba diving surveys.

Results mention three (3) important habitats typologies sampled during this study, for which descriptions are proposed within the different parts of this section. The habitat HAM2 is divided into 5 sub-habitats.

The marine habitats are presented on the figure below.

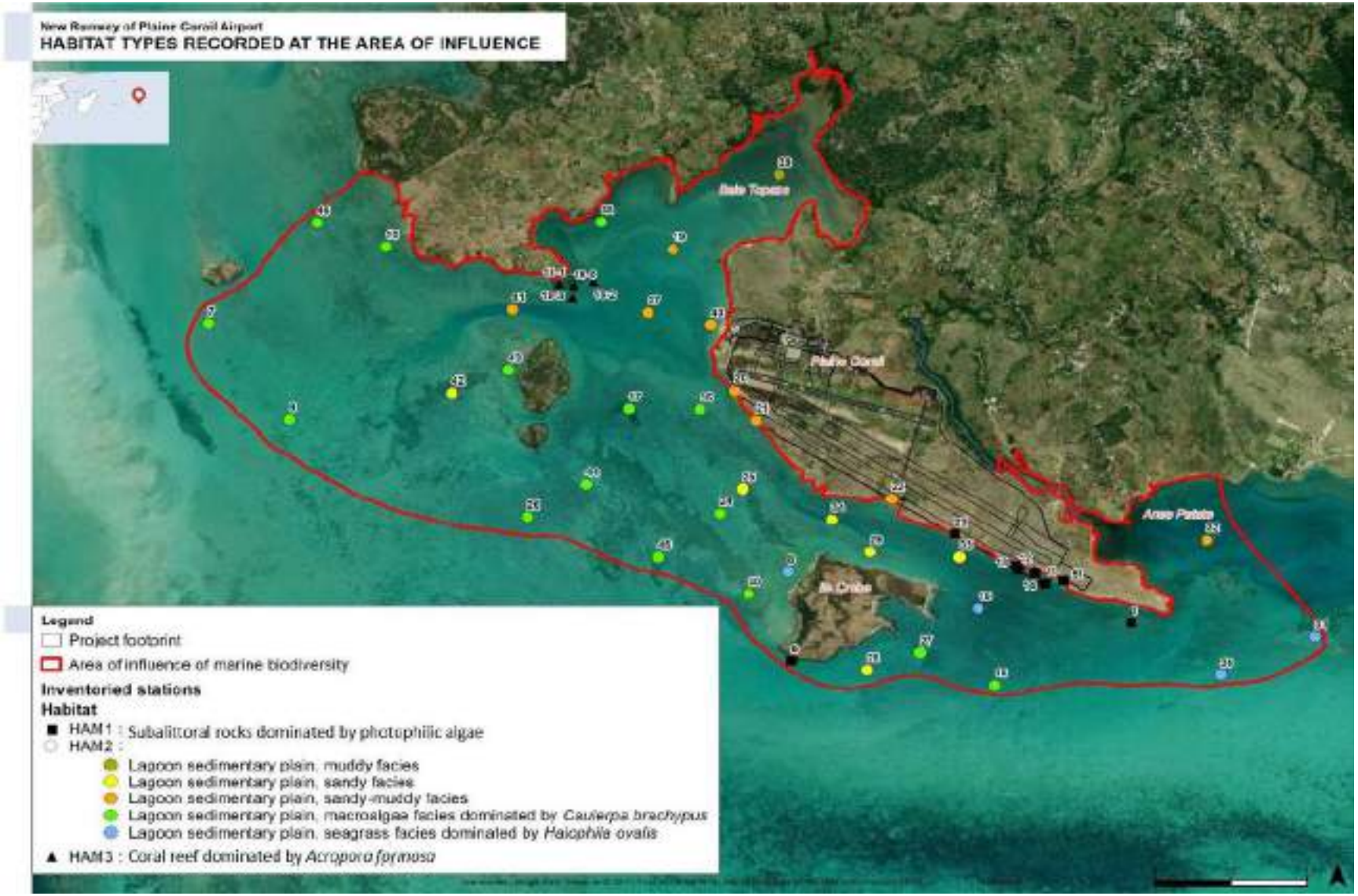


Figure 113: Marine habitat types mapping

Topaze Bay is defined as a muddy sandy intertidal area colonized by sparse to moderate marine vegetation (Chapman, 2000). Beyond the opening zone of the bay, vegetation becomes denser (meadows) and muddy areas are observed. The inner areas of Topaze Bay are dominated by fine sediments (>75%). This type of habitat is particularly occupied by mobile invertebrates, in particular holothurians (such as *Holothuria atra*) (Hardman et al., 2006a; Lynch et al., 2005).

In this sector, the bay is therefore mainly characterized by soft substrates, formed by a detrital sandy zone with coarse sediments, and covered with macroalgae (e.g. *Halimedea opuntia, Caulerpa spp., Udotea sp.*).

At "Pointe Palmiste", a coral formation developed at the entrance of the bay, with a medium coral cover (*Acropora* sp. for a coverage of 1 to 10%).

6.4.2.5.1 HAM 1: Infralittoral rocks dominated by photophilic algae

The infralittoral rocks habitat dominated by the photophilic algae correspond to the rocky shallow areas, covered by sand or not, which were investigated at eight (8) different stations (n°1, 6, 11, 12, 13, 14, 23, et 51).

Figure 114: Photophilic algae, station n° 06 (on the left) and station n°14 (on the right)

This habitat is characterized by the presence of many filamentous or encrusting green, brown and red algae, and species typically found in shallow areas: *Udotea palmetta, Padina* sp, *Turbinaria ornata, Codium spongiosum* but also *Neomeris annulata*. Long sargasso were also observed at station n°6 (southeast of Crab Island).

In addition, these shallow rocky areas facilitate the development of some isolated coral colonies in the whole stations (excepted station n°23) with many associated mobile species but with a weak species richness (*Epinephelus merra, Gymnothorax griseus, Cheilodipterus quinquelineatus, Ostracion cubicus* for fishes).

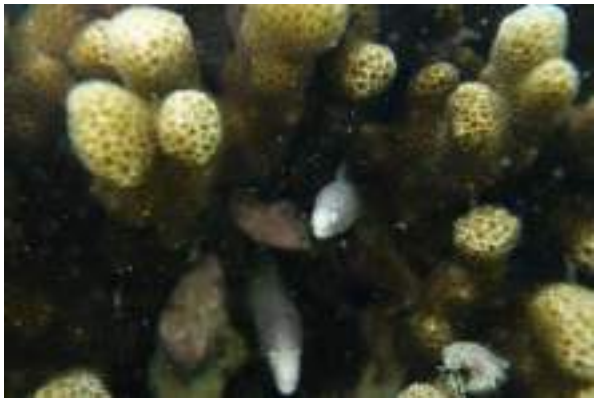


Figure 115: Gymnothorax griseus, station n° 12

The sublittoral rocks dominated by photophilic algae are of a low sensitivity.

6.4.2.5.2 HAM 2: Lagoon sedimentary plain

The most common profile of the study area is undeniably the lagoon sedimentary plain. Globally, this lagoon habitat is composed of sand, with lower proportions of coral debris and isolated cobbles of coral rocks (Orr, 2008). The soft seabed of the study area presents areas of bare substratum, intermittently covered by green macroalgae and brown algae, by seagrass, by carpets of algae, by cyanobacterias, by isolated clusters of coral colonies. Therefore, it is possible to define five (5) main facies for this habitat.

Sandy facies:

The lagoon sedimentary plain sandy facies is the main facies encountered out of the Topaze Bay. Although it is only represented here by six (6) sampled stations (n°25, 28, 29, 33, 34 and 42), it is important to understand that it corresponds to the sea bottom types mainly present out of the macroalgae and seagrass overlapping areas.

Figure 116: Station n°33 and isolated coral

Figure 117: Station n°29 and small isolated coral (Turbinaria sp.)

Figure 118: Sandy facies of station n°28 and at the interface with brown algae beds

This formation is not very original, except for the presence of numerous burrows and *tumuli*, testifying of the sediments high reworking activity and surface layers oxygenation by the seabed fauna activity (bioturbation). This fauna, living buried in the ten (10) first centimeters of the sediments, may be composed of shellfish, annelid polychaete sandworms or even bivalve molluscs. The presence of numerous burrows in the sand, a symbiotic type gobie *Amblyeleotris* living in symbiosis with pistol shrimps (*alpheus* sp.), the presence of several species of holothuriae with notably *Holothuria atra* and *H. leucospilota*, and a low density of small clusters of coral (*Porites* sp., *Turbinaria sp*.) should be noted.

Very few fishes were observed. Most of the observations were done on isolated clusters of coral (notably *Epinephelus merra*).

The sandy facies of the lagoon sedimentary plain is of a low sensitivity.

Sandy muddy facies:

The sandy muddy facies present in the sedimentary plain lagoon was observed in eight (8) sampled stations (n°19, 20, 21, 22, 32, 37, 40 and 41) with fine sediment fraction rate relatively variable according to the stations. The proportion of mud seems to be less important in the neighbourhood of the Anse Patate bay (station 32) and of the channel straight of Pointe Palmiste (station 41) which naturally presents stronger currents. The other stations are located in the three (3) embankment areas of the project (stations 20, 21 and 22), in the Topaze Bay, straight to the Port Safety area (stations 37 and 40) and in the middle of the bay (station 19).

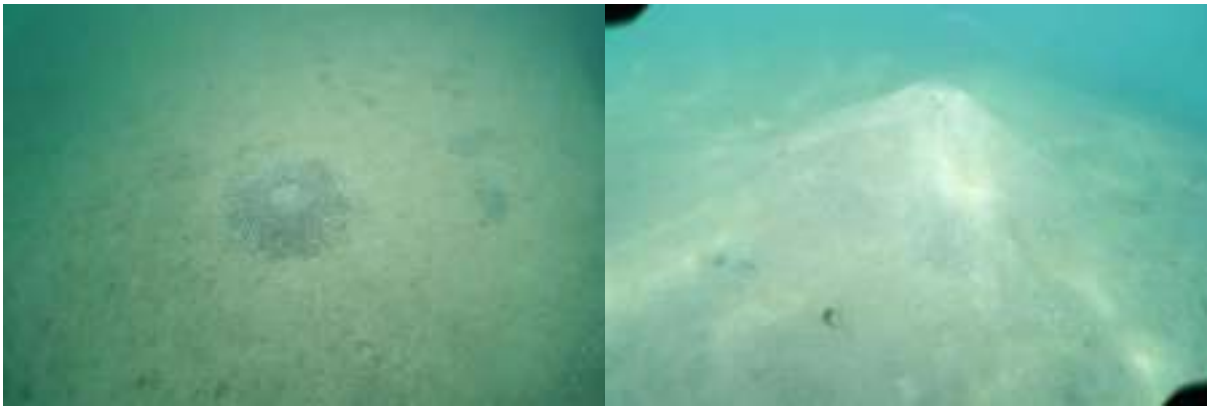


Figure 119: Burrows and tumuli at the stations n°41 (on the left) and n°32 (on the right)

Figure 120: Station n° 19 (on the left) and station n°37 (on the right)

Figure 121: Burrow, holothuriae and spot of Caulerpa brachypus at station n°22

Similarly to the previous facies, numerous burrows and *tumuli* are present, testifying of the ground fauna high activity (bioturbation). Among the whole investigated stations, only scattered holothuriae were observed, except at station n°22 which shows a higher density of this species and some spots of macroalgae dominated by *Caulerpa Brachypus* seawards. In addition, there was no coral colony and few fishes observed in these stations.

The sandy-muddy facies of the lagoon sedimentary plain are of a low sensitivity.

Muddy facies:

This facies is only observed at station n°39 on the seabed of the Topaze Bay. This station is directly influenced by terrigeneous inputs originated by gullies and rivers, and it benefits from a weaker hydrodynamism than in an open area. The ambiant turbidity is very important based on the local poor visibility, and the sedimentation rate is likely to be elevated too, knowing the high fine particle fraction in presence.

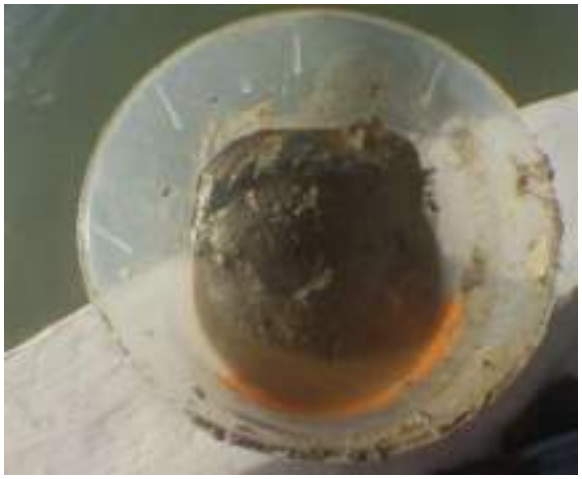


Figure 122: Sediment sample at station n°39

Macro-algae facies dominated by Caulerpa brachypus

The macro-algae facies dominated by *Caulerpa brachypus* in the lagoon sedimentary plain is one of the two (2) main facies met in the survey area, with the sandy facies. It is present here in fifteen (15) samples stations (n°7, 9, 10, 16, 17, 24, 26, 27, 30, 35, 38, 43, 44 et 45).

Figure 123: Meadows of Caulerpa brachypus, station n° 09 (on the left) and station n°17 (on the right)

It is the most frequent Caulerpa species in Rodrigues water, forming dense meadows over huge surfaces in different biotopes. Fishermen use it as bate and it is frequently collected for this purpose. Its morphology varies in size and branch shape (Coppejans et al., 2004). Its assimilators are rather fleshy. Most of the populations are single leaves (or scarcely only branched) with smooth margins, almost 5cm high. In other populations, leaves are very long (up to 20-25cm in length), repeatedly dichotomously branched, with (partly) dentate margin. All intermediates between those two forms are existing.

In the studied area, the smallest form is mainly present (between 5 and 10cm high) and it covers all types of substratum. Thus, it can be found on sandy and sandy silty seabed, but also over coral reef located at Pointe Palmiste, without being the dominating species.

As the dominating species of this facies, *Caulerpa brachypus* is visible locally with very variable overlapping rates, possibly reaching almost 90%, according to experts.

Other macroalgae species are present in this facies in more or less important amounts, such as green algae *Udotea palmetta* et *Halimeda opuntia* for example, which are two (2) calcareous algae originating sands, but also *Neomeris annulata* which is very frequent, and sporadically other types of Caulerpae.

Among the most distinctive brown algae, there is to notify the presence of *Padina* sp. and of the *Turbinaria ornata* algae from the Sargasso family. Many types of red algae, typical of infralittoral seabed, are also observed.

The phanerogame *Halophila ovalis* is also visible with a low density at the stations n°7 and 27.

Concerning the associated benthic fauna, holothuriae are the most represented with notably *Holothuria atra* and *H. leucospilota*, and the spotted Synapte called *Synapta maculata.* Some seastars are also encountered, like *Linckia sp.* and various small gastropods.

Figure 124: Linckia sp (on the left), station n°06 and Synapta maculata (on the right), station n° 33

Some corals are also visible on isolated tiny rocks, among them the Porites (probably *P*orites lobata*), a* Merulinidae (*Platygyra sp.*), a *dendrophylliidae* from gendus Turbinaria.

Few fishes were observed out of the symbiotic Gobies from genus *Amblyeleotris* in the soft sediments burrows. A weak species richness and a low species abundance were observed, with notably *Arothron stellatus* (1 ind.), *Hemiramphus far* (1 ind.) in deep water, and concerning the species associated to isolated rocks, only some wrasses, a pipefish (*Corythoichthys flavofasciatus*), several moray eels (*Gymnothorax griseus*) and a grouper (*Epinephelus merra*) were sheltering there.

A seahorse (*Hippocampus sp.)* and many sea slugs (*Oxynoe viridis*) were observed within the macroalgae.

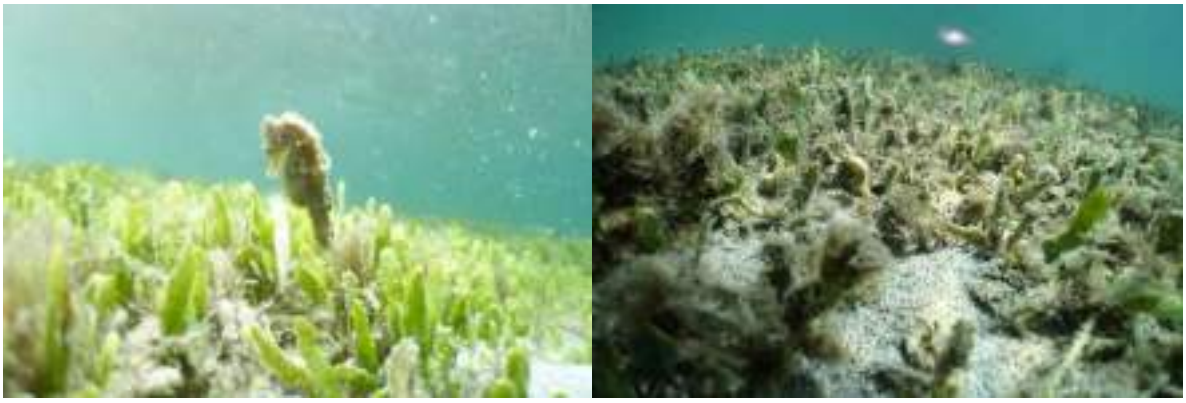


Figure 125: Hippocampus sp (on the left), station n° 45 and Oxynoe viridis (on the right), station n°16

The macroalgae facies dominated by *Caulerpa brachypus* found in the lagoon sedimentary plain are of a low sensitivity.

Seagrass facies with *Halophila ovalis* (phanerogam)

This last facies was observed in four (4) stations, on either side of the Crab Island (stations n°8 and 15) and at the easternmost part of the studied area (stations n°31 and 36). According to Coppejans et *al*. (2004), only two (2) phanerogames are present as seagrass around the island, *Halophila ovalis* (classified as "least concern" on the IUCN Red List (www.iucnredlist.org)) and *Halophila stipulacea.* However, the latter was not observed during the survey.

Despite its small size, seagrasses can play several important roles. It can be a source of food for herbivorous animals, notably the marine turtles, and it can also be used as shelter by some juvenile species. Phanerogam meadows serve as habitat and shelter for specific fauna, nursery for reef species, high primary production and protection for potential adjacent coral communities as they retain sediments and use nutrients.

The observed leaves densities are very variable, ranging from very low (isolated leaves) for station n°8 to medium for station n°31.

Figure 126: Halophila ovalis, station n° 08 (on the left) and station n°31 (on the right)

Many types of green, brown and red algae and cyanobacteriae are associated to these seagrasses. Globally, the observed seagrasses did not present a strong vitality.

The observed associated fauna is mainly represented by holothuriae, from genus Holothuria, inside the seagrass. Like previously, the fauna is concentrated in the isolated clusters of corals. *Apogon cyanosqoma*, *Epinephelus merra*, *Stethojulis bandanensis* and *Plotosus lineatus* are notably visible on a rock at station n°36.

The seagrass facies with *Halophila ovalis* found in the lagoon sedimentary plain is of a medium sensitivity.

6.4.2.5.3 HAM 3: Coral reef dominated by *Acropora formosa*

This habitat is only found at Pointe Palmiste, at stations n°18. It is a relatively large reef consisting mainly of the species *Acropora formosa* (classified as "near threatened" on the IUCN Red List. It is also protected locally[7].

It shows many signs of degradation, probably due in large part to fishing activities on foot and the passage of fishing boats or sand transport boats that use a stick to move around.

Station n°18-1 has a very degraded reef, mainly composed of dead acropora branches. Nearby station n°18-3 has a dead coral substrate colonized by brown and red algae. Stations 18-0 and 18-2 are in better condition. It should also be noted that the turbidity of the site is relatively high due to its proximity to Baie Topaze.

However, this reef also shows some vitality with the presence of many signs of growth.

Figure 127: Coral reef, station n° 18-0

[7] The Fisheries and Marine Ressources Act, 2007 and The environnement protection Act, 2002.

Figure 128: Coral reef, station n° 18-1

Figure 129: Coral reef, station n° 18-3

Within the study area, this reef is the most important, and certainly the most sensitive, area of ecological interest. Indeed, it is on this site that the highest specific richness and abundance are observed. The ecological functions provided to the environment are very important since it is the only complex habitat in the study area.

The ichthyofauna observed consists of a total of 16 species belonging to 13 families. All the species recorded were composed of bony fish (osteichthyans). The best represented species were *Sphyraena flavicauda* (yellowtail barracuda) with about 100 individuals, then Yellowfin goatfish and Yellowstripe goatfish (*Mulloidichthys vanicolensis* and *Mulloidichthys flavolineatus*) and snappers (2 species) with about 100 individuals also for each family. Then comes the *Scissortail sergeant* (*Abudefduf sexfasciatus*) with about twenty individuals and of lesser importance *Chrysiptera glauca* (damsel), *Chaetodon* sp and *Chaetodon auriga*, *Cheilodipterus quinquelineatus*, *Sargocentron diadema*, *Arothron immaculatus*, *Ephinephelus merra*, *Gnathodentex aureolineatus*, *Zanclus cornatus* and *Labridae undetermined.*

Coral reef dominated by *Acropora formosa* is of high sensitivity*.*

6.4.2.6 Mobile fauna

6.4.2.6.1 Ichtyofauna

Ichthyological populations are quite different depending on the nature of the habitats. Coral formations support the richest and most diverse populations, while meadows or soft areas, such as in the area of influence, are poorer.

A dominance of Scaridae, Siganidae and Labridae is observed, as traditionally in tropical phanerogam seagrass. On the periphery of the seagrass, at the edge of the sand, we generally find Nemipteridae, Mullidae and Dasyatidae. At the root system level, many juveniles evolve.

On the coral reef, the fish community is dominated by damselfish. Emperors, snappers, trevally and groupers are rare or absent and no triggerfish (ballistids) are observed. The lack of large fish predators suggests fishing pressure is high.

The area of influence, which consists of soft ground and grass beds, has a low diversity of fish. In Rodrigues lagoon, fishing pressure on predators is high.

Five Fish Landing Stations are present in the vicinity of the airport on coastal line.

The following table presents yearly record of catch for the post live years in metric tons.

Year	FISH	OCTOPUS	OFF LAGOON	TOTAL
2013	1750	561	293	2604
2014	1158	502	363	2023
2015	1347	503	408	2258
2016	1257	603	420	2280
2017	1347	630	440	2417
2018	1340	605	402	2347

Catches are dominated each year by fish and to a lesser extent by octopus. The common fishes and crustacean caught are:

- Parrot fish,
- Coastal Travelly,
- Shoemaker spinefoot,
- Goatfish,
- Unicorn fish,
- Honey comb grouper,
- Blue spot mullet,
- Tenpounder blue line surgeon fish,
- Trigger fish,
- Shark,
- Wrasse,
- seobream,
- Spangled emperor,
- lobster,
- Crab,
- Needle fish.

The Ichtyofauna is of a low sensitivity.

6.4.2.6.2 Marine turtles

Six species of marine turtles are present in the Indian Ocean. The green turtle (*Chelonia mydas*) and the hawksbill turtle (*Eretmochelys imbricata*) were the two species initially found in Rodrigues.

They were heavily exploited during the 18th century and became very uncommon from 1950 onwards in Rodrigues where it seemed that they were no longer landing.

In recent years, hawksbill turtles have been observed occasionally in the lagoon or on reef slopes. This species is classified as “critically endangered” on the IUCN Red List (www.iucnredlist.org). A comprehensive survey was carried out and we now know that turtles still nest in Rodrigues, but at a very low level. The survey also showed that Rodrigues still has a good number of beaches that can attract the nesting of marine turtles (figure below). There have been fairly recent yet unconfirmed reports of new-born turtles on Crab Island off the west coast of Rodrigues, turtle traces on a beach in the Saint François Bay area and turtles landing on Baladirou beach. However, poaching on these protected species is still common on the island.

No turtle was observed in the area of influence during the dives in July 2019.

Marine turtles (hawksbill turtle) occasionally visit Rodrigues. The study area does not regularly host marine turtles. Their observation in Topaze Bay remains occasional. However, the marine turtles are of a high sensitivity.

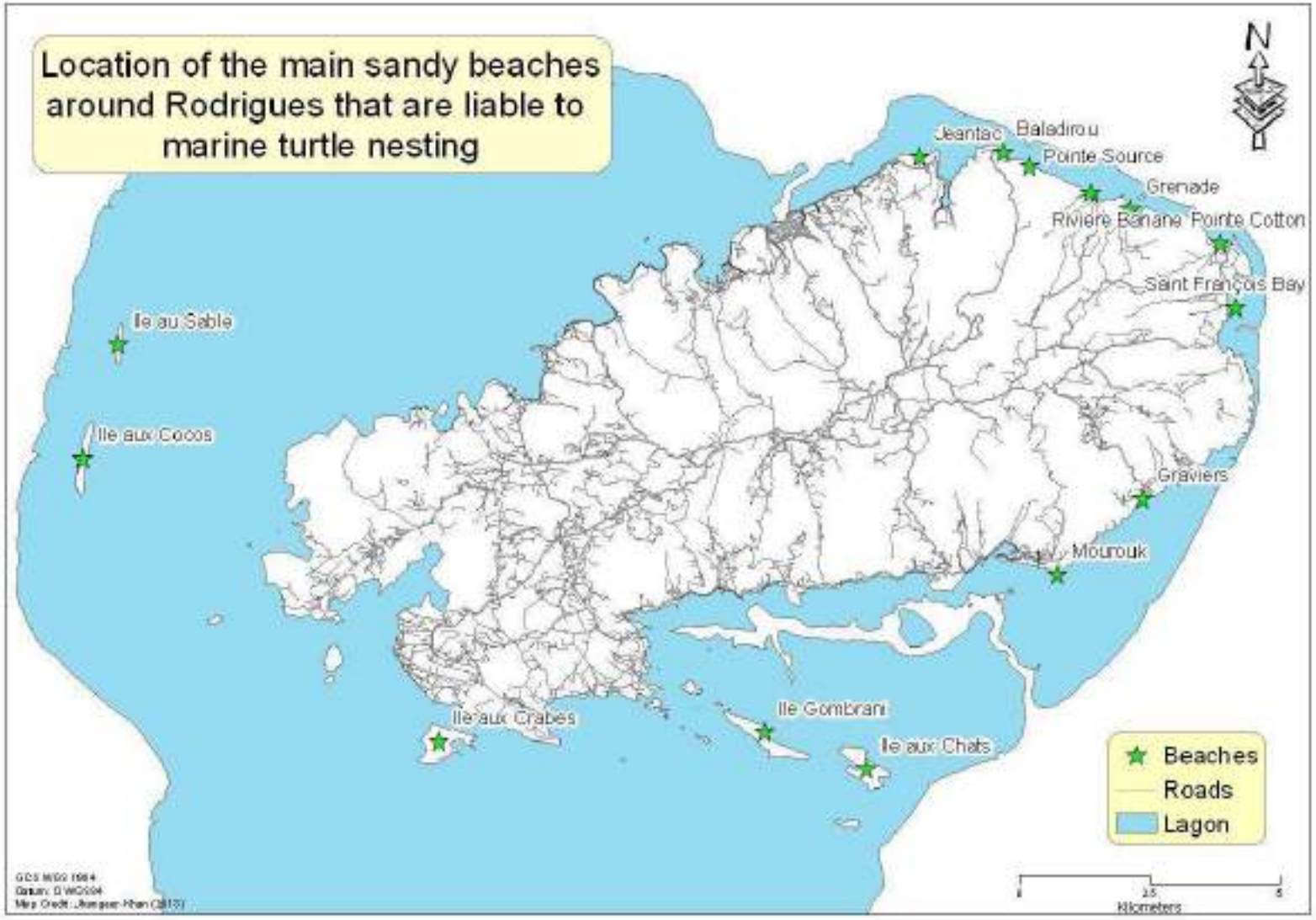


Figure 130: Location of potential egg-laying areas for marine turtles

6.4.2.6.3 Marine mammals

Five main species are observed in the coastal waters of Rodrigues:

The spinner dolphin (*Stenella longirostris*): These small dolphins (2.00 m long and 75 kg) live in groups of 25 to 100 individuals. Feeding exclusively on small fish and squid, they go hunting in the open sea at the end of the day and at night. They come close to shore in the early morning to rest and socialize. We can then see them perform spectacular jumps, which is their speciality.
The pantropical spotted dolphin (*Stenella attenuata*): Pantropical spotted dolphins are relatively small, reaching lengths of 2 m and weighing approximately 100 kg at adulthood. They usually occur in groups of several hundred to 1,000 animals. They are considered quite social, often schooling with other dolphin species. They spend most of their day in shallower water between 100 and 300 m deep.
The common bottlenose dolphin (*Tursiops truncatus*): Common bottlenose dolphins get their name from their short, thick snout (or rostrum). They are found in both offshore and coastal waters, including harbours, bays, gulfs, and estuaries.
The Indo-Pacific bottlenose dolphin (*Tursiops aduncus*): These dolphins can reach 2.50 m in adulthood and weigh up to 200 kg. Near the coast, they live in very small groups of a few individuals. Of a curious and not so shy nature, they often visit boaters.
The humpback whale (*Megaptera novaeangliae*): The humpback whale is one of the most impressive marine mammals. With a length of 12-16 meters and a weight between 25 and 33 tonnes, this baleen whale is also called a humpback. Very expressive, the humpback whale produces melodious songs in deep waters as well as jumping out of the water. Close to extinction in the early 20th century, the humpback whale is now the most studied and best-known cetacean.

In the study area, there is no data to certify the presence of cetaceans in Topaz Bay. Considering the bathymetric characteristics of this area, it seems that the Indo-Pacific bottlenose dolphin is the most likely species to frequent the area, as this cetacean frequents shallow coastal waters (between 0 and 60m). However, with a shallow lagoon, its presence is still possible and certainly occasional. Outside the lagoon, all species are potentially present.

No marine mammal was observed in the area of influence during the dives in July 2019.

Occasional presence of Indo-Pacific bottlenose dolphins in the lagoon due to the bathymetric characteristics. In the study area, there is no data to certify the presence of cetaceans in Topaz Bay. **For this reason, marine mammals are of a low sensitivity.**

Figure 131: Stenella longirostris and Megaptera novaeangliae (http://www.mmcs-ngo.org/en/marine-environment/cetaceans.aspx)

6.4.3 Summary: Biological environment sensitivity

Table 58: Biological environment sensitivity

Theme	Sub-theme	Receptor	Sensitivity
Biological environment	Terrestrial habitats	Grazing lands on basaltic resurgences	Medium
		Grazing lands on calcarenic substratum	Medium
		Coastal vegetation dominated by Ipomoea pes caprae (shore-line community)	Medium
		Dry forest	Major
		Riparian vegetation	Medium
		Estuarine habitat	Medium
		Calcarenic dry lawns of anthropogenic origin	Medium
		Coastal grasslands dominated by secondarized thickets (Lantana camara)	Low
	Terrestrial flora	*Hyophorbe verschaffeltii, Polyscias rodriguesiana*	Major
		Antirhea bifurcata, Clerodendrum laciniatum, Diospyros diversifolia, Fernelia buxifolia, Foetidia rodriguesiana, Latania verschaffeltii, Terminalia bentzoe subsp. Rodriguesensis, Zanthoxylum paniculatum	High
		Adiantum rhizophorum, Camptocarpus sphenophyllus, Cyperus iria, Mathurina penduliflora, Nephrolepis biserrata, Pandanus heterocarpus, Paspalidium geminatum, Phymatosorus scolopendria, Pleurostylia putamen, Rhizophora mucronata, Sarcanthemum coronopus, Secamone rodriguesiana, Tournefortia argentea.	Medium
		Dodonaea viscosa, Dracaena reflexa, Elaeodendron orientale, Ficus reflexa, Ficus rubra, Phyllanthus dumentosus, Premna serratifolia, Sarcostemma viminale, Thespesia populnea	Low
	Terrestrial fauna	*Pteropus rodricensis, Tropidophora articulata*	High
		Tropidophora eugeniae, Lepidodactylus lugubris	Low
	Marine habitats	Sublittoral rocks dominated by photophilic algae	Low
		Lagoon sedimentary plain, muddy facies	Low
		Lagoon sedimentary plain, sandy facies	Low
		Lagoon sedimentary plain, sandy-muddy facies	Low
		Lagoon sedimentary plain, macroalgae facies dominated by Caulerpa brachypus	Medium
		Lagoon sedimentary plain, seagrass facies with Halophila ovalis	Medium
	Marine fauna	Coral reef dominated by Acropora formosa	High
		Ichtyofauna	Low
		Marine turtles	High
		Marine mammals	Low

6.5 Transport network, electricity supply and waste management

6.5.1 Area of influence

Considering the fact that Rodrigues is an island with a volcanic topography aspect, the development of transport networks is specific.

The main way of moving is to use the road network. Roads serve cities as well as more dispersed hamlets.

Obviously, the consequence of this insular aspect is also the relative importance of the airport and the sea port infrastructures for supplying the island, allowing people transit, and easing the development of economic activities like trade, tourism, fishing, etc.

The realization of this project demonstrates the importance of the interrelationship between these different means of transport networks.

For example, the supply of materials on the island could potentially be done by air or by sea. In the second case, it will be necessary to transport them from the sea port to the construction site by road.

Therefore, it is necessary to describe the transport network of the entire island.

6.5.2 Transport network

6.5.2.1 Road

The road network is the main way of moving around the island.

The main road crosses the island along a northeast-southwest axis. In the northeast, it starts from the coastal village Pointe Coton, then, passes through Mont Lubin in the centre of the island, before serving La Fourche Corail further to the west. It is finally connecting this town to Plaine Corail airport from the north. This road is entirely paved.

The road network is completed by a secondary network which is represented in Figure 132 by “secondary roads” and “residential roads”. A road runs along the north and the south coast (it’s called Island Road), and some other ones enter deeper into the island. It serves Rodrigues’ towns and allows people to move across the island. This network also connects the various municipalities spread over the island to the main central axis. Therefore, the secondary network is mainly oriented from the north to the south. This secondary network consists of asphalt and dirt roads.

Finally, dirt roads serve small hamlets or more isolated dwellings.

Near the airport, the network consists of the Road which allows residents to reach it from La Fourche. Earthen tracks allow walking around it and reaching the nearby houses and beaches to the west, the south and the east.

These different roads allow journeys by cars, motorcycles, bikes, as well as public transport like taxis and buses.

Road transport for both passengers and goods is the sole mode of inland transport in Rodrigues. The primary and secondary networks comprise approximately 190km of track roads and paths which service towns, scattered villages and agricultural plots in river valleys.

The density of the road network is 1.06km/km2. The low number (55) of vehicles per kilometre of road makes traffic flow fluid on the entire network. The rate of traffic accidents either per 100,000 populations or per 1,000 registered vehicles is not currently monitored. Only a 50% of the Roads are un-surfaced and are mainly accessible by 4x4, mountain bike and on foot. The public bus service consists of 56 buses (with seating capacity of 20-40) that stop service at 6.30 pm. Four taxis offer a limited service ([KPMG, July 2009).

6.5.2.2 Rail

The size and the topography of the island mean that the development of railway infrastructure is not consistent. Therefore there is no railway network.

6.5.2.3 Air

Plaine Corail Airport, also known as Sir Gaëtan Duval Airport, is located in the southwest of the island. It allows the Mauritius - Rodrigues (or La Réunion – Rodrigues) link in 90 minutes with 2 to 5 daily flights.

6.5.2.4 Maritime routes

The island can be reached by sea via mixed cargo and passenger ships from Mauritius. It serves Rodrigues with an almost weekly frequency.

The port is located in the capital, Port Mathurin.

The journey takes 1 to 2 days by sea.

There are also many fishing boats, or leisure boats like catamarans, which can be used for hiking, diving, and many aquatic activities.

Ferry service operates every fortnight by MV Mauritius Pride between Rodrigues Island and Mauritius. The journey takes 24 hours and the ship has a capacity of 250 passengers.

Figure 132: Transport network of Rodrigues

6.5.3 Electricity supply

Mauritius depends on imported petroleum products to meet most of its energy requirements. There is potential to increase the use of local and renewable energy sources such as biomass, hydro, solar and wind energy (Country Strategy 2008-2013).

All households in Rodrigues are now electrified.

The cost of the provision of electricity to domestic consumers is high due to the dispersed settlement patterns in Rodrigues. Unlike Mauritius where 25% of electricity energy generated come from renewable sources, the share is less than 10% in Rodrigues.

The Island relies solely on the Central Electricity Board (CEB) to meet the current demand of around 27.1 GWh with light and heavy oil. Solar water heating has a very low penetration although there is good potential. The CEB supplies electrical energy through the combustion of heavy and light oil at the two power stations situated at Port Mathurin and Pointe Monnier, with a total capacity of 10 MW installed capacity and 9.4 MW effective capacity. The total installed capacity at Port Mathurin is of 6 MW comprised of six 500 KW and three 1 MW units; while the first phase of the Pointe Monnier development provided for the installation of two 1.9 MW internal combustion engines that run on heavy fuel oil.

The distribution network emanates from the Port Mathurin power station from where electricity is distributed through four feeders operating at a voltage of 22 kV. The shortest feeder is 5 km long and serves the Port Mathurin area.

The other three feeders average 25 km in length and provide electricity services to all parts of the Island. Each of the four feeders is secured by another feeder line to provide security in the event of faults occurring on the primary distribution network. The 22 kV network comprises a total of about 130 km of overhead lines. Underground networks exist at Roche Bon Dieu and at Songes.

6.5.4 Solid waste management

Actually an amount of 86 tons of solid wastes are produced per week in Rodrigues. Since the year 1990 an open dump has been set up at Roche Bon Dieu but same is nearing saturation and other options had to be considered thereto.

The construction of a proper landfill is still under consideration as the site has already been vested thereto. A cell of size 50 m x 50 m has already been constructed to start receiving wastes.

The construction of the proper landfill rest on availability of funds.

Since the beginning of 2022 waste segregation at household levels has started and actually the following wastes are temporarily collected at a material recovery centre at Grenade which is under construction. It will be equipped with appropriate equipment and infrastructures such as conveyors, weighbridge, bailer machines, wheelie bins. During the actual phase, a levelled and fenced platform of area 80 m x 100 m has been constructed to receive the following segregated wastes:

- PET bottles and cans (food and drinks) -

- Glass bottles

Electronic wastes are collected through regular campaigns and temporarily stored for making available to local exporters.

Scrap metals are also collected by local exporters for shipment to Mauritius.

Actually green wastes are shredded and made available to planters for agricultural purposes. The population is sensitised on the adoption of composting at household levels; composting bins have also been granted to some families as part of a National project.

Glass bottles are shredded in view of minimising spaces and preventing eyesores; RRA is now considering the application of the shredded glasses in construction work, decoration and art work.

Construction wastes are disposed at Mt Plate which is a rock quarry site. Same upon approval of the Commission for Environment view the inert nature of such wastes.

Legal measures are also in project :

- Ban on use of plastic bags in Rodrigues
- Ban on use of polyethelene containers being considered
- Regulation of waste disposal being worked out

6.5.5 Summary: Transport, electricity supply and waste management sensitivity

Table 59: Transport, electricity supply and waste management sensitivity

Theme	Receptor	Sensitivity
Transport network, electricity supply and waste management	Transport network	Low
	Electricity supply	Low
	Waste management	Low

6.6 Social environment

6.6.1 Methodology and area of influence of the socio-economic study

6.6.1.1 Objectives

Rodrigues Island is a territory of the Republic of Mauritius, autonomous since October 2012, located about 650 km east of the other two Mascarene Islands: Mauritius and Reunion. The island, small in size (110 km2), however, is tasked with developing its economy in a reasoned manner while preserving cultural values strongly linked to the sectors of agriculture, fishing and tourism. The latter sector is encouraged by local authorities to be part of a sustainable development axis in order to radiate the reputation of the island as an ecological and exemplary destination for environmental protection.

Rodrigues, in particular by its small size, rests on an economy that remains fragile and the island remains dependent on regular imports by sea. In a very small proportion, imports take place by air. As such, the Rodrigues Plaine Corail Airport is currently equipped with a fairly small landing strip of 1,280 m which can accommodate aircraft of type ATR 72. Operational and technical reasons due to the LON of the runway, mean that the airport cannot operate at full capacity. This situation inexorably leads to some pressure on the carriers during peak periods, a higher rate application for airline tickets, and an inability to promote the viability of air cargo.

In response to this situation, the Rodrigues airport, which wishes to register significantly among the development actors of Rodrigues, is now proposing the construction of a new runway of a length reaching approximately 2,100 m. This new infrastructure would allow larger carriers to also be opened to non-Mauritius routes.

It should be noted that the project to equip Rodrigues with a new and longer airstrip comes from a political will shared by the Rodrigues Regional Assembly (RRA) and the Government of Mauritius to consolidate the economy of Rodrigues in order to better accompany the island in its socio-economic development, always with the aim of making Rodrigues an exemplary island in terms of sustainable and sustained management of its scarce resources.

6.6.1.2 Methodology

6.6.1.2.1 Area of Social Influence

The extension of the airport's runway spreads over the area that runs from Pointe L'herbe to Pointe Corail. From an administrative point of view, the area straddles two village constituencies: Corail Anse Quitor and Cascade Jean-Louis.

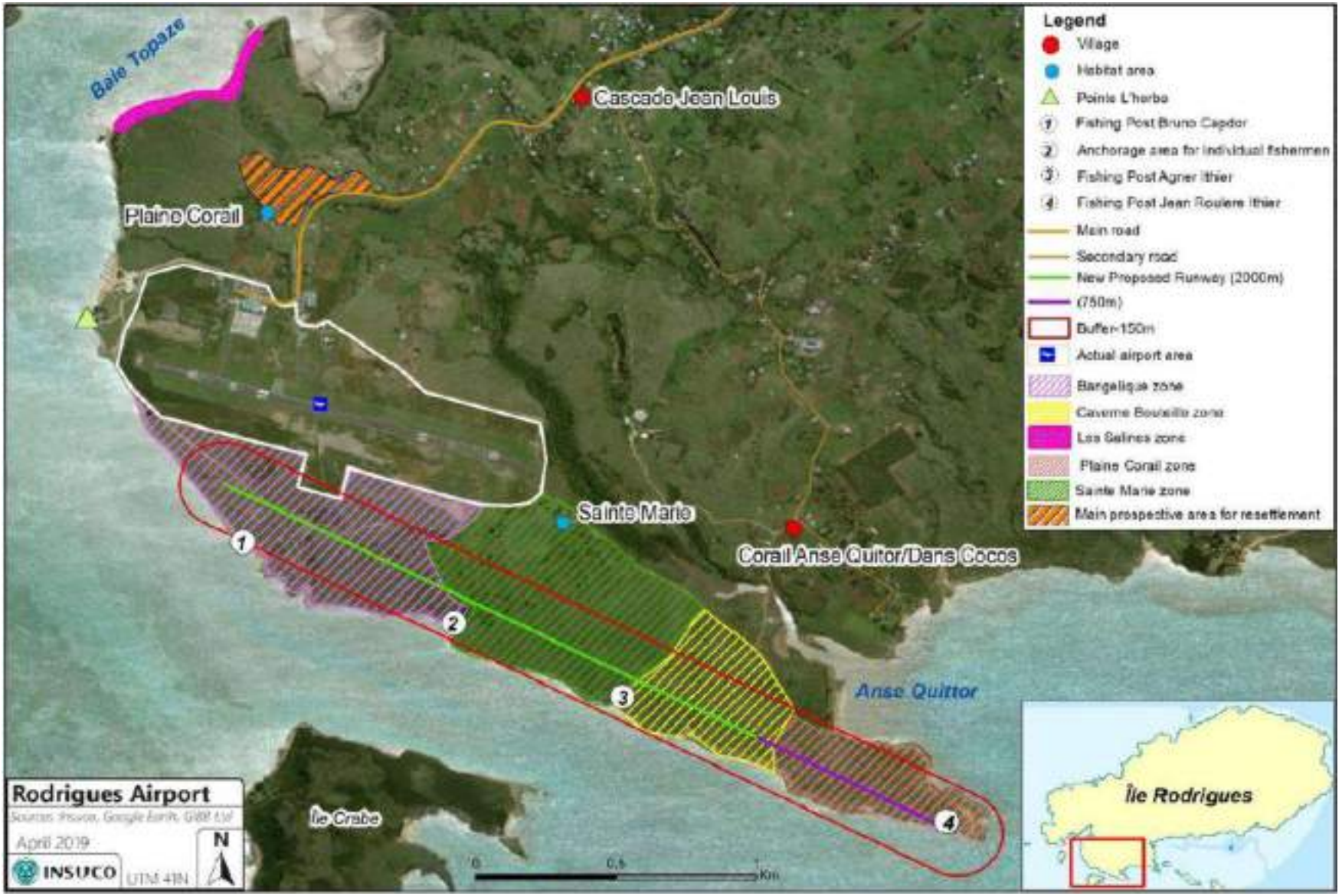


Figure 133: Area of influence of the Rodrigues Airport Extension Project

The project's social area of influence includes:

The area of direct influence;
The neighbouring areas, likely to accommodate the physical and economic relocations caused by the project.

6.6.1.2.1.1 Direct Project Control Zone

Depending on the local name, the geographical areas affected by the airport are: Pointe L'herbe, the plain of Bangélique, the Hill Sainte Marie, Caverne Bouteille and Pointe Corail.

Figure 134: Landscape of the project's direct control area

The area directly impacted by the project's right-of-way presents two typologies of space:

A residential area: the village of Sainte Marie, located on the hill locally called "Sainte Marie Hill" or sometimes “Sikolet hill”. The village has about fifteen resident families;
Spaces dedicated to productive activities.
As for the production areas, the first characteristic to emphasize is that the territory has a very strong integration between three sectors of activity: livestock, fisheries and agriculture.

Farming is practiced on the well-known band of Bangélique of Plaine Corail. Grazing is a resource subject to an open access regime. Both the residents of Sainte Marie and non-resident breeders keep their herds in the area. The herds are left in divagation, usually without guarding.

Figure 135: Bangélique breeding area

Along the Bangélique Strip, up to the Pointe Corail, are located 4 fishing infrastructures: 3 fishing posts and a mooring. Anchorage is mainly used by professional fishermen residents in the area. Fishing posts belong to non-resident fishers and are a major economic activity. The extension of the airport runway will prevent access to these 4 infrastructures.

Agriculture is practiced mainly in the vicinity of the houses of Sainte Marie. All the families in the village have access to a portion of cultivated land. The size of the plots is relatively small and has remained constant over the years.

The following are considered as directly affected areas:

The residential area of Sainte Marie and the cultural fields operated by the inhabitants of Sainte Marie;
The grazing areas of the Bangélique band and – to a lesser extent – Caverne Bouteille;
The areas of access to the stations and anchorage that are located in Bangélique and Pointe Corail.

6.6.1.2.1.2 Direct Impact Zone

Following the launch of the airport extension project, since July 2018, a discussion was opened by the Rodrigues Regional Assembly concerning resettlement plans for the affected populations and sites for the relocation of families.

The Plaine Corail area is being approached to accommodate the resettlement of affected families. In particular, the identified area corresponds in large part to the habited area known locally as the village of Plaine Corail.

From an administrative point of view, it is a small settlement of about eight houses, close to the airport road.

The coastal zone known as Les Salines, near the village of Plaine Corail, is also being approached to accommodate the relocation of fishing activities.

6.6.1.2.1.3 Population taken into account in the study

In conclusion, the basic social study takes into account:

The population of the village of Sainte Marie, directly affected, and its agricultural production area;
The fishing professionals who gravitate around Bangélique and Pointe Coral. Most of them do not reside in the impacted area, but do conduct their fishing activities there;
The users of the pastoral space of Bangélique and to a lesser extent Caverne Bouteille;
The population of the village of Plaine Corail.

6.6.1.2.2 The quantitative approach: socio-economic household survey

The collection of quantitative data is used to establish an encrypted database, in a twofold objective:

Characterizing the current socio-economic situation of households: demographic profiles, available resources, strategies for mobilizing these resources (in terms of investments, consumption, food needs coverage);
Developing a baseline database, which can be used as a basis for the design of an instrument to monitor future developments.
The quantitative component of the study was conducted through a questionnaire survey on the socio-economic situation of households.

6.6.1.2.2.1 Sample determination

The survey was administered on two sites: the most directly impacted site – the village of Sainte Marie – and the site being considered as a place of physical and economic resettlement of the people affected by the project.

Regarding the village of Sainte Marie, given the size of the population concerned, it was not appropriate to proceed with a sampling process. The objective was therefore to interrogate all resident households.

Regarding the site identified for resettlement, the following approach was followed: for the area closest to the resettlement areas, the objective was to collect socio-economic data by questionnaires from all households. As the population indirectly impacted by resettlement is not limited to this sector, the administration of some questionnaires has also been extended to other households further away from the impacted zone. The intention was thus to confirm or reverse the general trends observable at the level of the population of Plaine Corail. These few complementary interviews were administered to heads of households identified in an opportunistic manner by seeking door-to-door interviews to those who are available to answer questions.

6.6.1.2.2.2 Sample size

The size and final composition of the sample are shown in the following table:

Table 60: Summary of the number of households interviewed per site

Location	Estimated population size (number of households)	Number of households responding to the questionnaire	Population/sample ratio (%)
Sainte Marie village	15	14	93%
Plaine Corail Sector	8	7	87.5%
Area bordering Plaine Corail sector	6 to 8	2	25 to 33%

6.6.1.2.2.3 Questionnaire

A questionnaire was developed to collect quantitative data from households. The questionnaire was conceived after a first phase of field visits. This has made it possible to identify and formulate in the most appropriate manner the relevant issues for the survey and to propose significant indicators of the socio-economic situation of households, their trajectories and the parameters to consider in terms of vulnerability.

Figure 136: Household survey conducted in Sainte Marie Village

The objective was also to produce a lightweight tool, with which key data could be obtained during short interviews. The average duration of the interviews was 30 to 40 minutes, which is an important guarantee of a good level of attention of the investigator and the respondent, throughout the administration of the questionnaire.

The questionnaires were administered and registered directly on Smartphones, according to a process already tested by Insuco on many other projects. To produce the data the ONA.io/geo Open Data Kit (ODK) system has been used. This platform is used by the statistical departments of the World Health Organization (WHO) and the World Bank (WB).

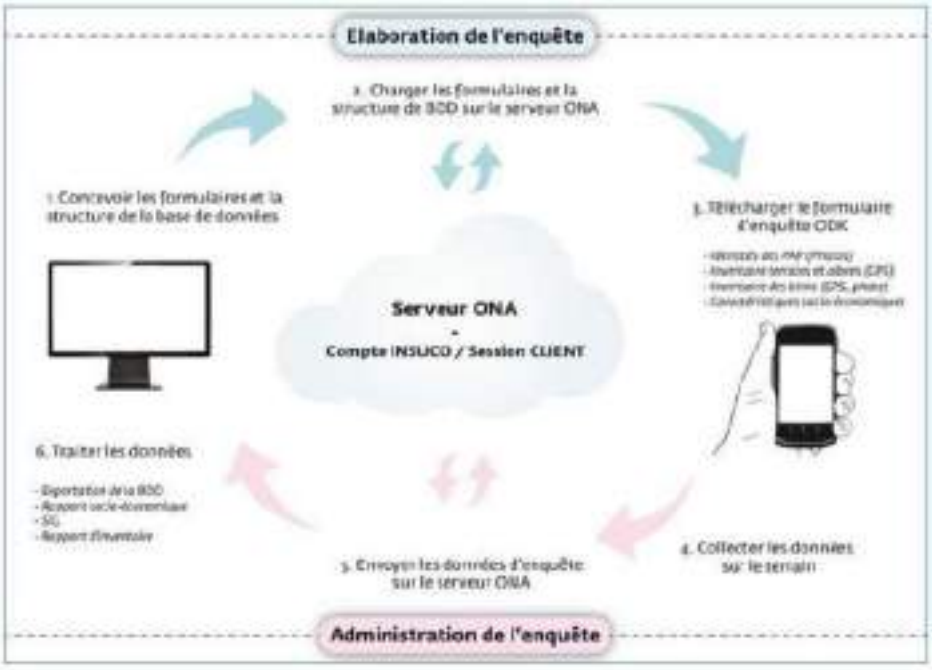


Figure 137: 2 Operational diagram of the ONA system

This system has made it possible not only to make the time of data recording and transfer faster and easier, but also to correct errors. The questionnaire is presented in Appendix 2 and is structured in three sections:

Socio-demographic characterization (including dynamics of mobility and vulnerability);
Household resources;
Resource mobilization and consumption.

6.6.1.2.3 The qualitative approach

The qualitative approach was used for the collection and analysis of data:

From the history of the local settlement, with special attention to:
kinship structures;
demographic changes and mobility phenomena;
the principles of intergenerational transmission of rights over resources (land, natural resources, real property);
Principles and practices for managing land resources and natural resources;
Deepening of household economic practices and strategies, with particular attention to the following topics:
agrarian practices;
livestock and pastoral practices;
economy and organization of fisheries;
integration between these different areas of activity;
From the presence of cultural heritage sites on the direct impact area of the project, and all the practices, uses, representations of the inhabitants in relation to these elements of the heritage.

6.6.1.2.3.1 The history of local settlement - local stories and genealogical approach

The history of the local settlement has been documented through two data collection techniques: the collection of historical narratives about site installation and landmark events in local history; and the rebuilding of genealogies of resident families since the time of the first installation.

Figure 138: Individual interview about the history of the families of Sainte Marie village

The reduced size of the study population and the relatively limited historical size of the settlement (at least in the current phase) have allowed a systematic application of the genealogical approach. It was through semi-structured interviews, usually individual, but sometimes carried out in the presence of several informants, to record the narratives of the first stage of installation. This approach has many advantages:

First, the active involvement of the interviewees. It is a technique that stimulates effective participation in the sharing (and sometimes research) of information. The informant generally appreciates the fact that the investigation is concerned with the social dimensions which he considers important: the documentation of the ancestors' deeds and the individual situations of kinship;
Secondly, it is a technique that allows, for a small community, to carry out an exhaustive census, which also relates to the situation of the absent and which allows, therefore, to quantify the dynamics of mobility (towards the village and from the village), not only for the current period but also for the periods of past generations;
Above all, the genealogical survey provides an empirical and diachronic database, which is used to analyse the principles and practices of intergenerational transmission of rights over local resources (land, real estate).
During the investigation, all the lines of the village of Sainte Marie were documented (three segments of a lineage and two segments of another lineage); as well as a Plaine Corail line (a reinstallation area).

6.6.1.2.3.2 Principles and practices of natural resource and land management

The objective was to understand the local principles that govern the distribution of rights over natural resources, particularly with regard to land resources.

The study takes into account the formal framework for the exercise of land rights. Rodrigues has a legal framework that regulates the rights of access and use of land resources. Nevertheless, each local society integrates the system of norms by attaching legitimacy to them in accordance with its own societal values: intergenerational justice, intra-family justice and inter-linear justice. In order to understand these aspects with the micro companies that are the subject of the study, two particular aspects of land management have been studied:

The conditions for the creation of land law: to understand how an investment Act (clearing, fencing, landscaping, development) creates (or has historically created) an administrative right, locally recognized as such, on a portion of space, transforming the land status of the commune resource into free, individual or even exclusive access;
The conditions for the transmission of rights to land resources, in particular from an intergenerational perspective: the principles of inheritance of land rights, inclusion and exclusion and fragmentation of land heritage between generations.
The intention was thus to understand how the organization of local rights over the resources of the territory structures the other social relations. Specifically, to understand how the system:

Encourages the maintenance of the population in the area (especially the younger generation) and the integration of other members; or, if the reverse is likely, causes expulsion dynamics;
Integrates women in access to resource management (referring to women from the lineage, as well as women integrated by alliance);
Is likely to create potential situations of marginalization or vulnerability, or, on the contrary, guarantees equitable access to resources.
To document these aspects, semi-structured interviews were conducted with key informants-heads of household (men and women)-and genealogical diagrams were used to obtain empirical data on the status history of land resources. The local status of the cultivated land has been taken into account, but also the organization of access to pastures and fish mooring.

6.6.1.2.3.3 Focus on productive activities

A qualitative approach has been applied to the study of the main economic and productive activities practiced in the area of influence. The objective was above all to complement and put into perspective the data collected through the socio-economic survey of households.

Agriculture, livestock and fishing have been taken into account. Thematic focuses have been articulated around the following areas of documentation:

The techniques mobilized (and the justification of the different technical options adopted);
The organization of the activity, particularly in the case of collective enterprises (such as net fishing) which require the implementation of a model of cooperation and contractualisation between different economic operators;
Business-related economic circuits: value creation, profit sharing mode, investment;
Possible forms of integration between different fields of activity (fisheries/livestock; livestock/agriculture).
To collect this data, semi-structured interviews were conducted with different economic actors, such as residents in the area or those operating in the area without actually being residents. Direct observations and informal conversations made it possible to complete the framework.

Figure 139: Individual interview with a fisherman in Sainte Marie village

6.6.2 Administration and Governance of Rodrigues Island

Rodrigues Island obtained its status as an autonomous territory of the Republic of Mauritius in October 2002. Its administration consists of a Parliamentary Assembly known as the Rodrigues Regional Assembly (RRA) and an Executive Council that frames and implements socio-economic policies. The Rodriguan autonomy is based on the Rodrigues Regional Assembly Act of 2001, voted in the National Assembly of the Republic of Mauritius.

Figure 140: Rodrigues Island and project zone location

6.6.2.1 Constitution of the Executive Council

The Rodrigues Regional Assembly consists of 17 members whose current distribution is 10 elected representatives of the Government and 7 elected representatives of the opposition. The Executive Board consists of 7 Commissioners who take over the management of various commissions or offices in charge of the various social, economic and environmental activities of the island.

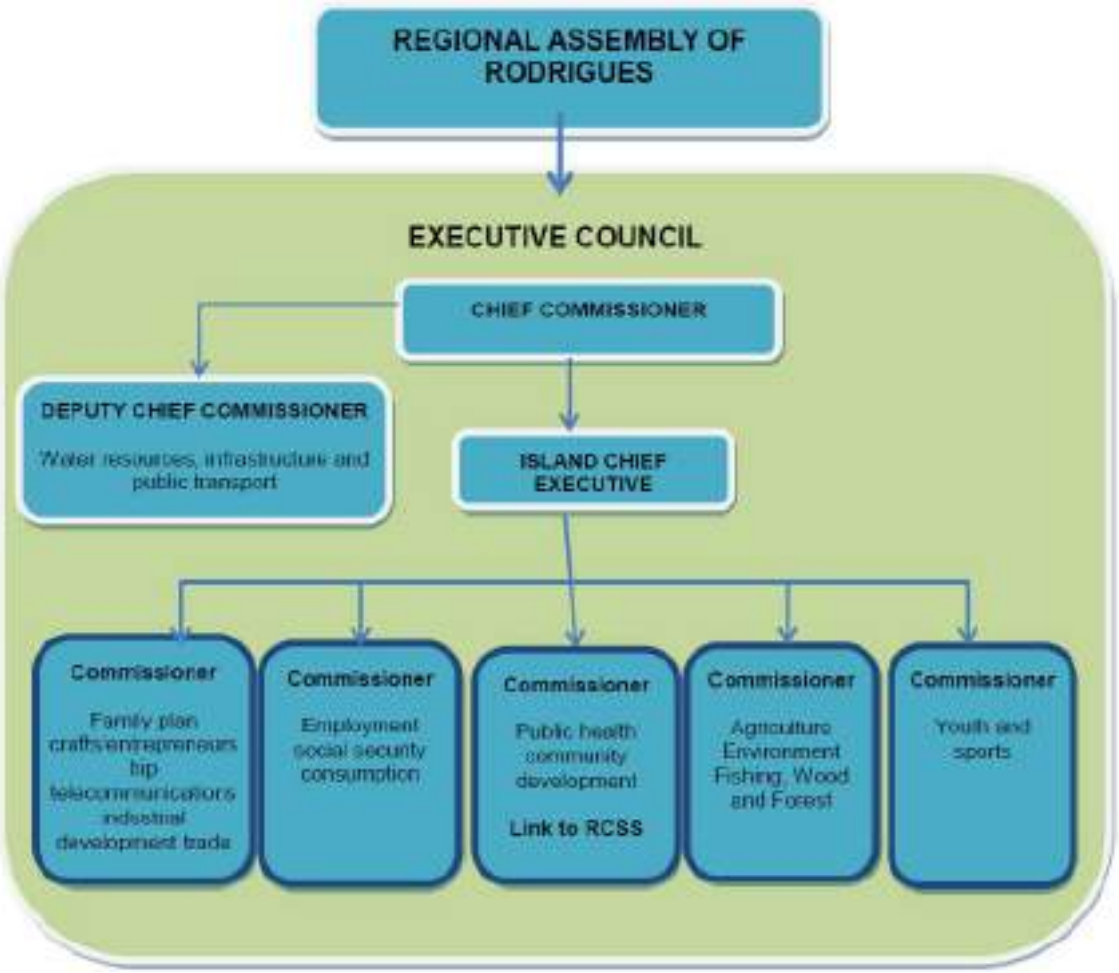


Figure 141: Rodrigues Regional Assembly (RRA) organizational chart

6.6.2.1.1.1 The Chief Commissioner

The Chief Commissioner represents the main authority of the island. He is responsible for key positions such as finance, land tenure, civil aviation, and education. 90% of the territory of Rodrigues Island belongs to the State. Thus, the Chief Commissioner governs the Cadastre Bureau and represents the ultimate signatory for the granting of residential, commercial and industrial leases after analysis by the State Lands Committee.

6.6.2.1.1.2 The Deputy Chief Commissioner

The Deputy Chief Commissioner has the primary role of acting in the absence of the Chief Commissioner but is also in charge of the island's water resources and public transport and infrastructure.

6.6.2.1.1.3 The Island Chief Executive Officer

A key position as Secretary of the Executive Committee is defined as the Island Chief Executive. Its mission is to ensure the implementation of all the measures taken at the meetings of the Executive Committee by each of the Commissioners.

6.6.2.1.1.4 The Commissioners

Five Commissioners each oversee a different committee, namely:

The Commission on the development of children, women, family plans, prison and reform institutions, crafts, industrial development, cooperatives, technology and telecommunications, trade, etc.;
The Social Security Commission, the Office of employment and consumer protection;
The Commission on health and community development. The special purpose of this Committee is to carry out the link with the Rodrigues Council of Social Services (RCSS), a parastatal organization whose role is to ensure the link with all village officials of the island;
The Committee on agriculture, environment, timber and forestry, fisheries, etc.;
The Youth and Sports Commission.

6.6.2.1.2 The Rodrigues Council of Social Services (RCSS)

The RCSS is an entity not dependent on the Regional Assembly of Rodrigues but which comprises all the villages of Rodrigues and acts as a facilitator between the different stakeholders in community projects namely the communities of the Regional Assembly, donors, private companies, etc.

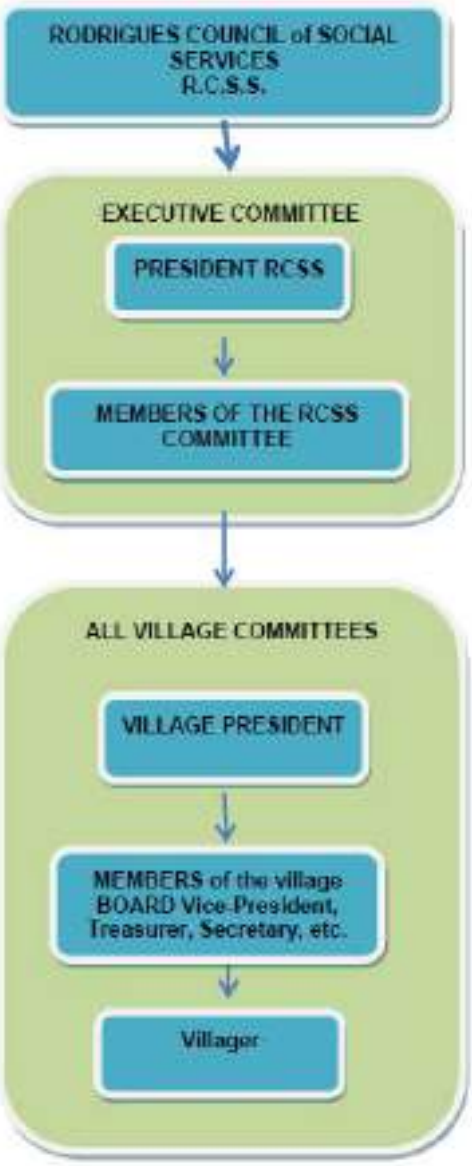


Figure 142: Rodrigues Council of Social Services (RCSS) organizational chart

The RCSS consists of an Executive Committee headed by a President and its members are responsible for the successful implementation of the various international donor-funded community development projects or development funds from private companies. The RCSS Executive Committee is responsible for the proper organization and operation of the RCSS by maintaining the communication link between the various village communities between them and the RRA.

The President of the RCSS is democratically elected by the Village Presidents following their election to the head of the Village Committees.

Each village registered and identified by the RCSS is headed by a Village Committee under the direction of a democratically elected President by the villagers every two years.

6.6.3 Demographic and local governance

In this section, the demographic characteristics and the history of the settlement of the village of Sainte Marie, which is the habited area most directly affected by the project, is first described.

It then presents the case of the village of Plaine Corail, which is in the centre of the area for the resettlement of the people affected by the project.

6.6.3.1 The village of Sainte Marie

The village of Sainte Marie is the result of two settlement histories that took place independently: the installation of two families.

6.6.3.1.1 The first family of Sainte Marie

At the origin of the settlement of Sainte Marie are three brothers. They settled in 1962 on the hill now known as the Hill of Sainte Marie, with the intention of practicing agriculture. Only one fisherman/breeder lived in the area at the time. No steps have been made locally to obtain permission to settle. On the other hand, the colonial administration demanded that the three brothers build their homes and reside in a stable way on site to grant the operating permits.

6.6.3.1.1.1 First brother's lineage

Buildings and houses transmission

The first brother, who has remained in Sainte Marie, had four sons and two daughters. The two daughters live elsewhere, while the three oldest brothers had already built their own houses when their father died. Only the youngest brother now lives in his father's house. If one of his sisters wishes to relocate to Sainte Marie, he should do his best to share the house with her or help her to relocate.

This is to underline the fact that, in generational passage, women are not a priori excluded from the inheritance of immovable property. But in practice, since the combination of the principles of exogamy and virilocality is applied in a systematic way, the case is not present.

Intergenerational transmission of agricultural land resources rights

The first brother had cleared three portions of land ("Karo"). In his lifetime, when age no longer allowed him to work the land and his sons began to form their own families, he took the initiative to share his Karo between his sons. Two of the four sons became responsible for each parcel. The elder shared the main Karo with the younger. The dwelling place of each of the four brothers is close to the exploited parcel.

With regard to the livestock, the first brother gave up, during his lifetime, his animals to each of his sons. This assignment allowed each of them to form their own individual herd.

6.6.3.1.1.2 Second brother's lineage

The second of the three brothers settled in 1962, and had a daughter and four boys.

His widow occupies the house built by her husband. Three of their sons have each built and registered their own house as cadastral. One of his grandsons has built a second floor on his father's house.

When the family house is no longer occupied, the first children of the 3rd generation will move into it.

In his lifetime, the second brother divided his only Karo into four parts and attributed one to each of his sons. The latter were married and were required to manage their productive activities autonomously. Since his last son does not live in Sainte Marie, the assigned party is operated in turn by each of his brothers, depending on the needs and abilities. The Karo license is still registered in the name of the second brother's widow.

6.6.3.1.1.3 Third brother's lineage

The youngest brother had three sons and eight daughters. None of them remained in the village. Only two of his grandsons still live in the village. There is also the wife of one of his sons who remains in the village, but her husband just works casually in Sainte Marie as a fisherman when he is not working as a mason in Mauritius.

Intergenerational transmission of rights to home and agricultural land resources

The field cleared by the youngest brother is now operated only by his daughter-in-law. Before that, two of his daughters exploited the plot. No internal divisions have been made within the parcel, which is still registered in the name of the youngest brother's widow.

In total, the group of descendants of the third brother has only three houses.

6.6.3.1.2 The second family of Sainte Marie

Two cousins were behind the installation of the second family in Sainte Marie.

6.6.3.1.2.1 The lineage of descendants of the first cousin

The installation process of the first cousin follows a trajectory independent of the first family and it is only by the neighbourhood relationship, established in the following years, that the two large families began to consider themselves as inhabitants of the same village.

During his installation (in the first half of the sixties) his intention was to get closer to his cousin's fishing post in Bangélique. His cousin ceased working in Bangélique shortly thereafter, moved to construct the first airport and relocated to the vicinity of Plaine Corail.

He had five daughters and three sons. His five daughters now live elsewhere with their respective husbands. Only his older son remained in Sainte Marie.

Of all the descendants only a 2nd generation adult man resides at this location. He built his own house, and he resides there presently. The widow of the first cousin had a house that she rebuilt after her husband's death.

He cleared a Karo and practiced agriculture. The Karo has not been exploited for a number of years. No one in the family has dedicated themselves to agriculture and the plot has become essentially a pasture area.

6.6.3.1.2.2 The lineage of descendants of the second cousin

He settled in the area of Sainte Marie in 1975, after his cousin. His paternal uncle ceded to him the house and the parcel he had cleared. After settling here, he quickly found a job at the airport, which had just been built, and abandoned fishing.

He had three daughters and one son. Today, only he, his son and his son's family reside there. His son earns a living mainly from fishing.

His cattle have suffered significant losses due to foot-and-mouth disease. He is the only operator of his father's former field.

His son built his own house nearby. These are the only two houses belonging to members of the second cousin's descendants.

6.6.3.1.3 The demographic evolution of Sainte Marie

Quantitative household surveys have established the following demographic profiles for the village of Sainte Marie.

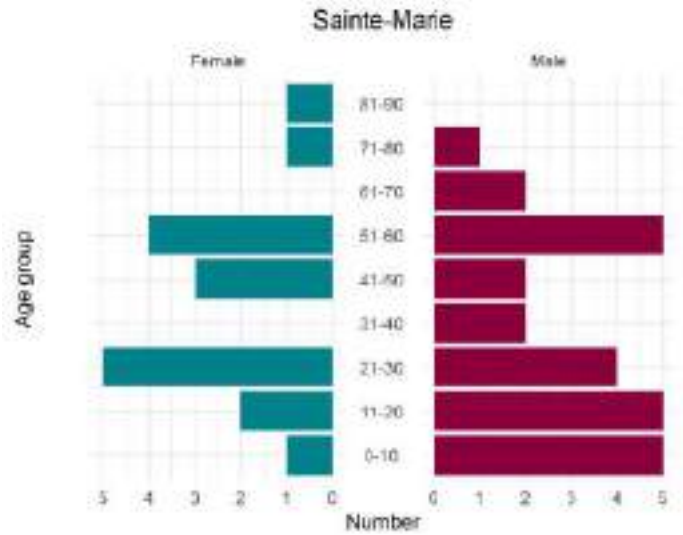


Figure 143: Age pyramid of Sainte-Marie

The total population counted is 43 persons;
Gender distribution is 17 women (39%) and 26 men (61%); and,
The average age of the inhabitants of Sainte Marie is 35 years. The average age of women is almost 40 years, while that of men just exceeds 32 years.
The genealogical analysis makes it possible to formulate some hypotheses in relation to the future demographic evolution of the village of Sainte Marie.

The first observation concerns the lines of the two first brothers of the first family.

It is noted that, at the second generation level, one of the older brother's sons is still in the village and continues to exploit the resources created and passed on by his father. We also note that, of his four sons, three remained in the village. The intergenerational transition represents, for these two lines, a significant growth in terms of number of households: from two first-generation heads of household to seven in the second generation (out of eight potential). On the other hand, the transition to the next generation corresponds to a remarkable demographic decline. Of all the descendants of the two brothers, only two young heads of household remained at this location. And a total of four young unmarried adults are still in Sainte Marie.

In the case of the last brother's lineage, the conservation of a presence has already represented a major difficulty with the passing of the first and the second generations. His three sons reside elsewhere. The lineage is conserved by matrilineality.

The second family represents a younger lineage, since no one from the 3rd generation is currently of marriageable age. Here too, the conservation of a workforce is difficult, considering that for each lineage, only one adult male of the second generation stayed with his family.

We therefore observe that the number of households has increased in the second generation, thanks to the children of the two brothers of the first family lineages. But then the situation remained, in the best of cases, stable. Observation of life in Sainte Marie demonstrates that the number of boys and girls who are younger than 15 years old is very low.

6.6.3.1.4 Local governance in Sainte Marie

Sainte Marie is a small family community. Village-related issues are settled mainly through internal family mechanisms. It should be noted that in this aspect the two families present assert themselves as one large family when important decisions concerning the village are necessary.

From an administrative point of view, Sainte Marie is not a village: it is an area of the Anse Quitor Village to which it is attached. However, the inhabitants of Sainte Marie do not participate in the public life of the connecting village: for example, they do not participate in the elections of the President of the village. De facto, they consider Sainte Marie as an autonomous socio-territorial entity. It should also be emphasized that even when the regional authorities began to discuss with the inhabitants about the airport extension project – with a first information meeting in July 2018, and then over the multiple meetings about prospects and resettlement options – they did so by communicating directly with the inhabitants of Sainte Marie. The administrative level of Corail Anse Quitor has not been associated, as a territorial institution of guardianship, with the process of concertation.

In a very pragmatic way, the inhabitants say that Sainte Marie can be considered as a village in its own right, since during the electrification work of the area, in 1993, the officials of the electrical company validated the fact that the site was called Sainte Marie, by inscribing the toponym in the documents. This is locally considered the birth certificate of the village of Sainte Marie.

A member of the first family is the spokesman who represents the village with the institutions and the administration. This is not an official charge, of course, but in practice this is the closest there is to the function of village chief. Any decision is made within the Group of Heads of households, which brings together the men of the second generation of the two families. It is an informal Council that is the central backbone of the village's governance.

6.6.3.2 Proposed area for the reception of displaced people: the village of Plaine Corail

The Group of dwellings known as Plaine Corail village is the result of a history of successive installations exclusively based on kinship relationships.

Figure 144: Dwellings in Plaine Corail village

6.6.3.2.1 The family of the village

In 1980, a couple from the village of Sainte Famille, settled in Plaine Corail. At the time, the place was very little inhabited. The families present in 1980 left the premises thereafter.

In 1985, the couple was joined by two of their daughters, with their respective husbands.

In the late 1990s, their third son settled next to his sisters, with his wife.

At the beginning of the 2000s, another brother installed nearby, with his wife. All of their children live in Mauritius.

Around 2004, the mother's sister joined the rest of the family. She lives with her disabled son. Her daughter has also moved nearby.

6.6.3.2.2 Distribution of dwellings

The inhabitants of Plaine Corail are distributed across eight dwellings.

6.6.3.2.3 Data on the demographic composition of Plaine Corail

Quantitative household surveys have established the following demographic profiles for the village of Plaine Corail. Unlike for the village of Sainte Marie, almost no households were able to be consulted. The majority of the demographic study (especially for the total population) is based on an estimate derived from field observations and data collected.

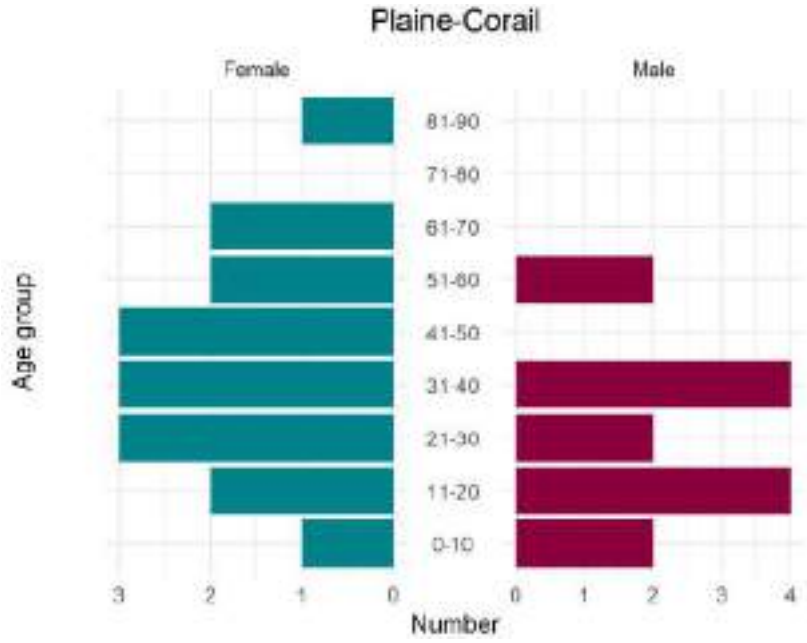


Figure 145: Age Pyramid of Plaine Corail

The estimated total population is 40 persons (31 counted);
The gender distribution of the counted population is 17 women (55%) for 14 men (45%); and,
The average age of the inhabitants of Plaine Corail is almost 34 years. The average age of women is almost 40 years, while that of males is between 26 and 27 years.

6.6.3.2.4 Social relations and governance in Plaine Corail sector

From a social point of view, one son-in-law is the leader of the group. The respect that the small family community carries is related, among other things, to its pious character and its ability to refer to biblical teachings. It is noteworthy that the community of Plaine Corail is very strongly structured around a religious affiliation. Family members refer to different churches, but they are all part of the Protestant Congregational Nebula. It is a microcosm where the fear of the Devil is very present. The son-in-law is, because of his family and personal history, considered as a protector of the community against the threats of witchcraft.

At the beginning of the 1980s, in the early days of the arrival of the couple, Plaine Corail was considered to be haunted.

6.6.3.2.5 Land use in Plaine Corail

The main economic vocation of the inhabitants of the small community of Plaine Corail is breeding livestock. Fishing also plays an important role in the household economy. The capture of octopus is practiced by women.

During his installation in 1980, the man cleared a Karo for which he had obtained an operating permit. Before his death, he divided the Karo into two parts, attributing one to each of his daughters residing in Plaine Corail.

The land heritage has not undergone any variation in terms of expansion.

6.6.3.3 Local principles of land resource management

The data collected by researching and reconstructing the history of the settlement of Sainte Marie and Plaine Corail provide a fairly precise picture of the local principles that govern the transmission of land rights, especially from an intergenerational perspective. The following sections present the analytical elements relating to rights with respect to real estate resources: cultivated land and plots for habitation.

As far as the rights to pastoral resources are concerned, as explained above, these are common free access resources (Commons). Access and use rights are not transferable, insofar as each individual is a possible user.

6.6.3.3.1 Intergenerational transmission of land rights

6.6.3.3.1.1 The case of Sainte Marie

The following principles govern land rights locally:

As a general rule, the transmission of rights to land follows a patrilineal, individual and male trajectory. The third brother of the first family of Sainte Marie lineage is a notable exception. The departure of the sons created a situation where land rights were, de facto, transmitted in two ways focused on women. In one case, user rights were transmitted to a girl, and following her death, to the girl's sons. In another case, the rights of use were acquired by the wife of a son (absent). Clearly, the principle of patrilinearity has been easily adapted to the economic situation and the demographic history of the lineage. On the other hand, in this case, the land assets do not belong to an individual but are retained as a common resource.
The transmission of land rights is not strictly linked to the change in the young man's status (for example, on the occasion of marriage). The timing of transmission is decided on the basis of two factors: the ability of the older generation to continue working; and, the need for the next generation to become self-sufficient in meeting the needs of their own households.
The transfer of rights to land is not conditional on the death of the older generation. In all the cases observed, the decision to delegate rights to cropland to members of the next generation is made during their father's lifetime. Death is therefore not a real mechanism for inheriting land rights; intra-family transfers occur inter vivos. It should be noted that in the cases observed, the widow of the first tenant holds the formal rights to the plot of land (the name on the operating permit) after the death of her husband.
From one generation to the next, the land heritage does not change in size. In no case have we observed the extension of a Karo after the intergenerational transmission process.
A land estate can change vocation in the event of non-use, but it is still recognized as the fallow land of the former owner. In fact, the undeveloped Karo is an open access resource for pastoral needs, but no member of another family could take the initiative to reclaim the fallow land and to cultivate it without the authorization of one of the former owner’s descendants.

6.6.3.3.1.2 The case of Plaine Corail

The principles of intergenerational transmission of rights to land that are observed in Plaine Corail seem different from those we have documented in Sainte Marie. In the case of Plaine Corail, the transmission of rights on the land does not follow a patrilinear trajectory by father-son route, but a patrilinear trajectory by female way (father-daughter). The father divides during his lifetime his plot between his daughters. This is probably due to the low interest of his sons for agricultural activity. This confirms that the intergenerational transmission rules are not applied rigidly. On the contrary, transmission rules adapt to the preferences and the economic requirements of the family. For this family, encouraging the installation of their daughters – and

their husbands – at Plaine Corail was a primary goal to ensure the continuation of the settlement of the site.

6.6.3.3.2 Principles of real estate transfer

In Sainte Marie, the transmission of the house is not subject to particular rules of intergenerational transmission (e.g. inheritance in primogeniture). The transmission is decided pragmatically, according to the needs of the young men of the next generation. In general, the older sons will have already built their own house, so the beneficiaries of the inheritance of the property will more likely be a younger son or even a grandson.

Women are not excluded from the rules of transmission of real estate. In practice, following the principles of exogamy and virilocality applied in a systematic way, girls settle down with their husbands in other places of residence. In case of divorce or as a result of other events that cause the return to the village, the woman will be associated with the rights to the property and the property resources administered by the father or, in the event of the death of the latter, the brothers. The uterine nephews – the sons of a sister – are in principle in the same situation as their mothers regarding access to rights to local resources.

6.6.3.4 The role of women in the management and transmission of family resources

The data collected on the internal and intergenerational functioning of the families of Sainte Marie and Plaine Corail have highlighted some interesting elements, which it is useful to summarise. Of particular interest are the principles and practices of inclusion and exclusion of women in the management and transmission of family resources and property.

The two case studies we have documented (Sainte Marie and Plaine Corail) represent two different models of family organization.

Sainte Marie, as mentioned above, is a perfect example of a virilocal exogamy system. Women from the families of Sainte Marie marry men from other villages (it could not be otherwise, since most of the inhabitants are from the same patrilineal line) and leave to reside in the village where the husband was born.
Plaine Corail, at least according to the data collected from the family, represents a different model. The settlement of the small area was made possible by the arrival of the spouses of the daughters. Plaine Corail represents, therefore, an exogamous system that is not necessarily virilocal.
An understanding of these two different models is useful if one wants to understand the principles that regulate women's access to the resources of the lineage.

In the case of the village of Sainte Marie, the transmission of goods and resources (access to land, above all) has followed – if one relies on an empirical observation – an exclusively patrilinear trajectory by male way. This would suggest that the system excludes women from the intergenerational transmission line of resource rights. However, as has already been presented above, this approach is far from being a founding and exclusive principle. In fact, the rights to resources are retained by those who remain on the land (which is rarely the case of women). A return of a woman from the lineage or one of the children of a woman born from the lineage would result in access to the same property rights (the land, the house, etc.) that the men of the lineage enjoy. To summarize, there is no specific local rule intended to exclude the women of the lineage and their sons (the uterine nephews of the resident men) from access to resources. However, in practice, as the demographic configuration of the village imposes a

very strict application of the principle of exogamy, it is very rare to register cases of the exercise of these rights.

A comparison with the case of Plaine Corail is useful to enrich and to confirm the hypothesis formulated above. In a situation of non-application of the principle of virilocality, where we find therefore women from the line who reside in Plaine Corail with their husbands, it is interesting to note that the transmission of rights to the land was made directly to the benefit of the girls. This allowed their husbands to rely on a fundamental resource to provide a stable and permanent settlement in the area. Formally, women retain land rights.

It is worth repeating, in this respect, that the principles of management and transmission of rights over family resources are made to adapt to different situations, according to the requirements and preferences of the family group members. Empirical observation enables us to assert that for all of the sites studied there exists no mechanism for internal social regulation of the family that would be likely to exclude women of the family from access to resources.

This observation can be linked to other data on the place of women in the local economy. As will be seen in the description of the sectors of economic activity and the sources of household incomes, the women of Sainte Marie and Plaine Corail have safe access to sectors of activity that allow them to manage both their work and the resulting income autonomously. Octopus fishing – practiced by the women of Plaine Corail – is the most significant case of typical female activity, whose social, economic, and also institutional status (the accreditation of professional fisherwoman) is recognized. Especially for the younger generations, the generalization of access to a good quality educational services in Rodrigues has helped to reduce the possible gaps in the distribution of opportunities between men and women.

6.6.4 Access to basic public services

6.6.4.1 State and distribution of infrastructures and services

Public infrastructure for civil status and administrative records management are mainly located in Port Mathurin, the regional capital of Rodrigues, or in the vicinity. Any request to public services must be carried out through the competent office and depends on a particular regional commission.

Access to these services requires the movement of the concerned people by private or public transport (buses). Access for the inhabitants of Sainte Marie is a little more complicated, because the village is located in an area connected to the main road by a roughly two-kilometre long trail that is in a deteriorated state. This trail leads to the bus station located right next to the airport. Access to the paved road for the inhabitants of Plaine Corail is very easy, the village lying about 200 meters away.

Figure 146: Access to basic public services (health, education) in the project area

The preceding map shows the locations of local facilities. Note that some services are represented for the entire Rodrigues territory; others refer only to the area of proximity of the project zone. The criterion chosen to draw the map is that of the attendance of users residing in the project area:

For primary schools, only proximity is to be considered as a condition of access;
For colleges and high schools, the proximate variable is not exclusive: the families of students who have a good success may decide to send their children to colleges that are commonly considered more prestigious. They are distributed throughout the territory; and,
Similarly, the dispensaries cover exclusively a pool of local users, while the hospital and health centres are intended to cover the demand of all users of the island.

6.6.4.2 Access to education services (State of supply)

The Rodrigues school system is not specific to the island; it follows the same system as that of the Republic of Mauritius, namely: the same distribution of school levels, the same school curricula and the same examination systems. All establishments are public.

6.6.4.2.1 Pre-primary schools

33 nursery schools are registered on Rodrigues, all public. Education is compulsory from the age of three years and takes place over two years. The choice of the nursery school is free, but usually the one that is closest to the dwelling is chosen.

Nursery schools still required payment of fees a few years ago. Today, parents must pay a sum of Rs 50 per month and per child to be handed over to the teacher.

About 1 450 pupils are welcomed each year in pre-primary schools. This number has remained stable over the years. The number of teachers, slightly higher in recent years reached 78 in 2017, or a ratio of 19 pupils per teacher in the same year.

With regard to the households surveyed, 3 children, approximately 4 years old, go to kindergarten: 2 from the village of Sainte Marie and one from the village of Plaine Corail.

6.6.4.2.2 Elementary Schools

There are 15 primary schools in Rodrigues, the closest to the area of Plaine Corail being those of Anse Quitor and Grand La Fouche Corail. The class distribution is done over 6 years, from grade 1 to grade 6. The curriculum concludes with an examination for obtaining the Primary School Achievement Certificate (PSAC) which is a requirement for secondary education.

The teaching staff consists of heads of department (Head Teachers), teachers (Teachers General Purpose) and sometimes assistants (School Clerks). Only teachers are the direct teachers of the pupils.

Access to primary schools is completely free and free of choice but it is usually the closest school to the dwelling that is chosen. Textbooks and school transportation are also free.

The number of pupils enrolled in primary classes went down by 11.5% over the 2013-2017 period with just over 4 600 pupils. In 2017, the number of teachers, which remained more or less stable in recent years, was 236 or a ratio of 20 pupils per teacher in the same year.

The results for the Primary School Achievement Certificate PSAC appear to be increasing in recent years, reaching almost 82% success in 2017 (against 71% in 2013 and even 55% in 2008).

For the villages of Sainte Marie and Plaine Corail, only two children go to primary school, one from each of the two villages. The young boy from Sainte Marie is in grade 6 at the Anse Quitor elementary school closest to Sainte Marie. He will take the examination for his PSAC Examination this year. The young boy from Plaine Corail attends the primary school of Grand La Fouche Corail.

6.6.4.2.3 Colleges

There are 7 colleges in Rodrigues. Secondary education is done over 5 years (grades 1 to 5) with an additional 2 years (lower 6 and upper 6). The end of the grade 5 year is marked by a review for the Cambridge School Certificate (SC) that conditions access to the last 2 years. Secondary education is completed by obtaining the Cambridge Higher School Certificate (HSC).

Access to high schools is completely free. Textbooks and school transportation are also free. However, the choice of the school is not completely free; choice is limited by the level obtained at the PSAC. A ranking of colleges has been established over the years according to the success rates obtained on the exams in the different establishments. Students who have obtained good results from the PSAC exam will not necessarily choose the institution closest to their home, but rather the one with the best reputation (for example Rodrigues College of Port Mathurin is the establishment the most coveted on the island). On the other hand, the integration of a pupil into a College may be subject to the Director's acceptance following a review of the student's academic record. Pupils who do not get the PSAC are redirected to pre-vocational education and at a later date potentially to a technical education.

The 7 colleges brought together 4 455 pupils in 2017 (+ 11% compared to 2013) for 261 teachers (also increasing), a ratio of 17 pupils per teacher.

The results for SC and HSC have remained relatively stable in recent years with success rates slightly higher than 70% for each exam.

Among the children of the villages consulted, 8 are enrolled in College, 4 from each locality. 3 of the young people of Sainte Marie are enrolled at Marechal College while only one goes to Rodrigues College in Port Mathurin. Regarding students from Plaine Corail, 3 go to the College of La Ferme (in Pistache) while only one goes to the College of Le Chou.

6.6.4.2.4 Pre-vocational schools

There are 7 establishments providing a pre-vocational educational program. These schools are not necessarily physically disconnected from institutions providing the academic curriculum.

Pre-vocational schools offer appropriate education for children who have not succeeded in obtaining their CPE. This school support often allows students to be guided towards a path of technical learning and, above all, limits early school dropout.

The number of pupils registering for this type of specialized education at the end of primary school has been declining steadily since 2013 reaching 431 pupils in 2017 (-21% compared to 2013) for 44 teachers against 28 in 2013. This led to smaller pupil/teacher ratios, with 10 pupils per teacher in 2017.

Among the children of the villages of Sainte Marie and Plaine Corail, no child has entered the pre-vocational education curriculum.

6.6.4.3 Access to health services (supply status)

The health service in Rodrigues is completely free and there are no private clinics. The hospital service is comprised of one hospital, two health centres and 14 dispensaries in villages across the island.

6.6.4.3.1 Queen Elizabeth Hospital

The Queen Elizabeth Hospital is located in Creve Coeur near Port Mathurin. This health centre is the largest and most comprehensive of the island; it also has the most modern facilities.

The hospital is the only one on the island to offer emergency, ambulance, surgical, intensive care, dialysis, gynaecological, dental and orthopaedic services. It also offers services in general medicine, maternity, post-natal care (nursery) and paediatrics.

The capacity of the hospital (all services combined) was 145 beds in 2017.

It should be noted that the Queen Elizabeth Hospital, while equipped with a panoply of medical equipment, lacks certain medical devices. Sometimes patients must go to Mauritius to receive care or further analysis.

6.6.4.3.2 Health Centres

There are two health centres in Rodrigues. They provide access to the decentralized care of Port Mathurin and allow for quicker health management for all the inhabitants of Rodrigues. These health centres are open 24 hours a day.

The health centre of Mont Lubin, in the centre of the island, is the largest of the two and thus represents the second largest health establishment of the island with 22 beds for general medicine and maternity services. It also has an emergency room and ambulance service, as well as dental care.

La Ferme health centre, further west, is smaller in terms of capacity. It offers the same services as the Mont Lubin health centre with the addition of post-natal care services and paediatrics.

6.6.4.3.3 Dispensaries

14 dispensaries (or community health centres) are scattered on the island to allow access to first aid as close as possible to the villages. The closest dispensary to the Plaine Corail area is located at Cascade Jean-Louis.

Dispensaries are not open every day; they open at specific days and times. On days when the dispensaries are open, a nurse is on call and a doctor is present (a generalist or a specialist depending on the specific appointments scheduled for that day).

The villagers visit the dispensaries for follow-ups related to chronic diseases.

6.6.5 The local economy

6.6.5.1 The production sectors

This section presents qualitative data on the organization of the main sectors of production (fishing, livestock and agriculture) in the area of social influence of the project.

6.6.5.1.1 Fishing

In the project area, different types of artisanal fishing are practiced inside the Lagoon (artisanal fishing at the bottom line or trawling that are practiced outside the lagoon are not practiced inside). Each type involves a different technique, equipment and organizational mode and is presented in the following sections. Each section presents the main characteristics and social and economic dimensions of net fishing, individual fishing in traps and fishing for octopus.

6.6.5.1.1.1 Net fishing and the Organization of fishing posts

Net fishing in the lagoon is a highly regulated fishery on Rodrigues. A fishing season is established and spreads over a period of seven months, from March to October. During this period, registered fishermen are obliged to go to the nearest fishing services office each month to sign an activity register and to obtain a stamp on their fisherman's card, which ensures the renewal of their fishing rights for the following month and allows the authorities to calculate the amount of compensation to be received during the closure period of the fishery. According to the fishermen encountered, this practice is rather restrictive because it is too frequent. At the end of the fishing season, the nets (also registered) are sealed. The breaking of seals in March is the signal of the opening of the net fishing season.

Net fishing has a relatively complex mode of organization, as the use of the net implies a system of cooperation between several boats and crews.

It is organized around a production unit called a fishing post. The fishing post is both a management mode and a physical structure. It may have a status as a private company or cooperative, but, as will be seen, in practice this does not have a great influence on the mode of management of the activity.

The fishing technique

In the ideal model, net fishing, locally called Sen, requires five boats that work in perfect coordination.

Preferably, net fishing is practiced under sail, but depending on the wind conditions, the days and the seasons, crews can use outboard engines. In general, the boats bring 2 to 3 engines and in case of necessity they moor or tow the boats without engine.

The fleet of five boats is composed as follows:

Two boats carry nets (NET boat or bato-la-Sen, in Creole);
Three boats push the fish towards the nets (bato-bater, or boat that makes the threshing).
The first two boats carry the nets. They place them at sea and moor them (marry the Sen) in order to obtain a "U" or semi-circular form. During this operation, the crews of the other three boats, positioned along the side where the net is open, hit the water with bamboo and the edge of the boat with a thick piece of wood (bataz Mayos), in order to scare the fish and push them towards the nets. The operation is repeated at least a dozen times during the day, in different

places. Caught fish are loaded into one of the drummers. In case of success and good catches, the filled beater boat can bring the fish back to the fishing post.

Figure 147: Back from fishing in Bangélique

Fishing post structure

The fishing post, as a physical structure, is the building (or small group of buildings) located at the beach and which covers several functions:

Storage of fishing equipment;
Fishermen's living space during the week (Monday to Friday evening): the fishing post works as a dormitory/refectory and kitchen;
Workshop for maintenance and repair of equipment;
Weighing point and sale of fish; and,
Mooring boats.

In Bangelic, the walls of the older structures are built out of carved coral blocks and are covered with a sheet metal roof. The more recent ones are made of cinder blocks. The biggest concern of fishermen is to prevent rats, attracted by salt, from entering the fishing post and causing damage to nets.

Figure 148: Fishermen's dormitory and canteen

Crew organization

The composition of the crews is related to a rather precisely codified role distribution system. However, depending on the availability of fishermen and weather conditions, small variations can be made, particularly in relation to the number of sailors on the drummers.

The distribution of crews and individual roles is as follows:

In each of the two boats in charge of the nets there are 4 sailors: the Grand Chef (at the bow, ensuring the right direction of the boat), the Patron or helmsman, and finally 2 sailors managing the nets in the middle.

3 sailors are positioned in each beater boat: the sail Chief (at the bow, in charge of manipulating the sail, the Patron or helmsman, and finally the bater mayos in the middle. The skipper and the sail leader beat the water with bamboo when the boat is positioned.

Thus, for the daily fishing season, the sailors are divided according to the functions of 2 Grand Chiefs, 5 Patrons (helmsman), 4 sailors managing the nets, 3 sailing chiefs and 3 bater mayos. The table below illustrates the positioning of the crews:

Table 61: Crew organization on net fishing vessels

		STERN			PROW
Net Boats	1	Patron (helmsman)	Responsible of net	Responsible of net	Top Chef
	2	Patron (helmsman)	Responsible of net	Responsible of net	Top Chef
Treshing boat	1	Patron (helmsman)	Bater mayos (batter)	Chief Sailor	
	2	Patron (helmsman)	Bater mayos (batter)	Chief Sailor	
	3	Patron (helmsman)	Bater mayos (batter)	Chief Sailor	

The Great Chiefs are the first to be responsible for the fishing strategy, for navigation decisions and for the choice of nets. They coordinate the whole operation from their respective boats. They are the most experienced sailors.

The sailor called "Patron" is not necessarily the owner of the boat (the case is possible, but rare): it is the qualification of the helmsman. The bosses of the first two boats are normally more experienced than those who sail the drummers.

Sailors in charge of nets are usually a workforce that does not yet have much experience. The same is the bater mayos charged with scaring the fish on the other three boats. Sail managers are generally more experienced and lead the drummers.

In total, such an an organization involves the mobilization of 17 people at sea, when the crews are all here. Two additional people complete the net fishing team, but they stay ashore at the fishing post:

The "meter-piece", responsible for the maintenance of boats and fishing equipment;
The stage manager, in charge of the "base-life" of fishermen and the kitchen.
At the head of the whole organization is the "boss", Director of the fishing post. Depending on the case, and according to his age, he can be at sea with the others – he will then have the position of one of the Great Chiefs – or manage the business ashore.

Fishing post direction

As explained above, the fishing post may be a private company, but in most cases, it is registered, at least formally, under the status of a cooperative. Three fishing posts are recorded on the area of influence:
The fishing post of Bruno Capdor in Bangélique;
The fishing post of Agner Ithier in Caverne Bouteille;
The fishing post of Jean-Roulere Ithier (brother of Agner) in Pointe Corail.
The fishing posts of Bruno Capdor and Jean-Roulere Ithier are both registered under the name of Rodrigues fishermen multi-purpose co-operative Society Ltd. Agner Ithier, meanwhile, is a private company simply registered as individual head fisherman. Agner Ithier holds a net fishing licence (broad net licence) like the others except that he owns all the equipment of his fishing post: the five boats, three engines and the nets. Jean-Roulere Ithier and Bruno Capdor, the managers of their fishing post, are not the owners of all the equipment of the fishing units for which they are responsible. For example, Bruno Capdor has only the nets, three boats and an engine. So other owners associated with him make their boats and engines available (if necessary) and receive in exchange a larger part in the sharing of revenue. The fishermen are not necessarily members of the cooperative.

The project to focus the organization of artisanal fishing on an exclusively cooperative model dates from the 1980s and, according to the fishermen encountered, it was not very successful.

Sale, cost recovery and revenue sharing

The principles that govern the sharing of revenues from the sale of fish are quite common to different fishing posts. However, the practices vary from one structure to another.

The fish is sold as soon as the boats return from fishing, usually every afternoon around 4 pm. The fish are weighed at the fishing post and immediately recovered by small buyers (bayan), who will immediately sell them on the squares of the urban centres of the island. The presence of wholesalers has not been ascertained. The prices are more or less fixed, as well as the margins of the bayans. The fish is purchased in cash and the money counted under the eyes of the fishermen, it is then kept by the "boss" until the day of sharing. The frequency of sharing is once per week in some cases, and in other cases once every two weeks. This frequency is adjustable according to family requirements and the period of the year (for example during the holidays).

Figure 149: Fish weighing

The amount to be shared is divided into shares. Each fisherman, according to his experience and the abilities recognized to him, is entitled to an entire share or a fraction of a share. In the different fishing posts, the principle is applied with different variants.

At Bruno Capdor, before making the division, the current costs of the week are deducted from the overall amount. These are the costs for food, fuel, candles, tea, etc. Then, a fairly complex calculation is made: knowing that each fisherman will be entitled to 4/4 per share, to 3/4 per share, or to 2/4 per share, the amount is divided into quarters of units. Then everyone gets their shares:

The "boss" is entitled to 2 whole shares. It is thanks to this more important amount that the “boss” supports the maintenance costs and the investments in the fishing post;
The great chiefs of the bato-la-Sen are entitled to one whole share each;
The patron (helmsmen) are entitled to 3/4 per share or part, depending on their experience (usually the boss of the batter earns 3/4 on the other hand);
Manoeuvers that pull nets and bater mayos are entitled to ½ part;
Sailing chefs are entitled to 3/4 in general;
The meter-piece is entitled to 1 full part;
The stage manager is usually entitled to 1/2 shares;
The one who puts his own boat and the engine at the disposal of the crews will also have a share.
This configuration is slightly different in the fishing post of Agner Ithier. Current expenses are taken care of with a regularly stocked cash register. They are not substracted from the total amount collected before sharing.

The amount is shared in whole units between the members of the crews (and personnel ashore). As at Capdor, some fishermen are entitled to a whole share and others to a fraction (3/4 share or 2/4 share). For those who are only entitled to a fraction, the difference is retained by Ithier, who uses it to supply the Fund of the company.

This Fund is used to support current costs – fuel, food – and to support expenses for maintenance and renewal of equipment.

It should be noted that this sharing system is based on the recognition of the individual expertise of fishermen (and not on their actual role in the crew, although very often the two elements overlap). This recognition is established by peers and by the most expert, including the Grand Chef. The status of the fisherman determines his part in the distribution of the winnings. This suggests that a delicate balance must be constantly maintained within the fishing post between, on the one hand, the necessity of the collective enterprise to be able to rely on the individual expertise of the members of the crew (the experience of some increases safety and the chance of success at sea), and, on the other hand, the need to provide funds for maintenance and investment in order to make the company thrive (and, therefore, all those who work there). The analysis of the sharing system shows, finally and in both cases, that the entrepreneur himself (private, or head of the cooperative) is far from maximizing the profit of his own capital. The individual’s remuneration (based on the recognition of experience) seems to be of equal value to the capitalization of the company.

6.6.5.1.1.2 Individual professional fishermen

Individual professional fishermen operate under the Individual fishermen's license, which differentiates them from net-specific fishing. It is not uncommon for net license holders to also hold this type of license in order to continue fishing during the off-season of the net fishery, because individual professional fishers are not subject to a fishing season.

The fishing technique

The fishing technique mainly used in the lagoon for individual fishermen is the fishing trap. Angling is also practiced but to a lesser extent.

Trap fishing is an individual activity. Fishermen usually own their boats and depart regularly during the week to pick up the traps they deposited at various locations in the lagoon. The boats are, as much as possible, used with a sail to limit the fuel costs (most fishermen are however equipped with a small engine). The distance between the place of anchorage and the place of deposit of the traps is economically decisive.

Locations where the traps are placed

There are two main deposit locations: in the lagoon and in the reef:

The lagoon: the lagoon represents a rather sandy area of the lagoon with some scattered coral heads. It is a less densely populated area but more frequented by large fish, which can be sold at a better price. Another advantage of the lagoon area is that the traps can be more easily recovered if they are carried away when the currents are strong, especially during cyclones;
The reef: the reef area is the part of the lagoon closer to the coral reef. Unlike the lagoon, it is much more heavily populated, but the fish are of smaller size (usually placed in the category of a lesser-rated fish known as “grade 3”). Though the catches can be better in terms of quantity, the reef remains an area at risk for the traps because of rougher seas. During high tides, episodes of strong currents or cyclonic storms, the loss of traps can be a substantial problem.

The anchoring of the impacted area

The location of the mooring of the individual fishermen of Sainte Marie lies at the edge of the village of Sainte Marie along the coastal strip of Bangélique, directly across from Crab Island.

The mooring serves as a pier for 9 professional fishermen.

Figure 150: Anchorage used by individual fishermen in Sainte Marie

Their fishing area lies behind Crab Island, one of the areas where the lagoon is the largest, and the coral reef can be up to eight kilometres from the coast. The distances travelled can therefore be large. The location of the individual fishermen of Sainte Marie can therefore be considered strategic, considering the distances related to the size of the lagoon at this location of the island.

6.6.5.1.1.3 Octopus fishing

The octopus fishery (ourite in Creole) is one of the most renowned activities in Rodrigues and is therefore a full-fledged profession. It is very often women who practice this activity and who then have a particular type of fishing license called professional fisherwomen. According to official statistics (Digest of statistics on Rodrigues, 2017), 187 octopus fishing vessels were registered in 2017. A number that has remained constant in recent years.

The amount of octopus fished each year exceeds 600 tons, a trend that seems to be increasing according to statistical data.

The octopus fishery has been regulated in Rodrigues for some years through periods of fishing closures that correspond to the breeding periods of the octopus. Closures take place twice in the year generally over a one-month period over February and March, and a two-month period over August and October. If the system of closure of the octopus fishery was delicate to put in place considering its importance to the population, it seems that today this is a success, in particular because of the increase in fishing volumes realized in recent years.

The fishing technique

Octopus fisheries are better known as “pickers ourite”. On some areas of the island where the lagoon is less deep, they walk from the coast and they harpoon the octopus in the vicinity. In other areas, they are brought by boat to favourable areas, still shallow, and walk in the lagoon, in boots, to find the marine molluscs that lurk beneath the rocks and coral.

The spike used is a simple stick at the end of which is attached a trident-shaped harpoon. The octopuses are harpooned without a mask (underwater fishing is forbidden) and then threaded one by one on a long metal hook. The amount of octopus fished per day and per person exceeds 12 kilograms on average.

The ourite are usually eaten fresh on the spot but can also be dried, placed in a fan on wooden frames installed above the waterfront water to be preserved and subsequently exported to Mauritius. Nearly six tons of dry ourite were exported to Mauritius in 2017.

6.6.5.1.2 Breeding

Breeding, alongside fishing, is known to be one of the economic pillars of the island. Until 2016, more than 90% of bovine, ovine and caprine production was exported by boat to Mauritius (Digest of statistics on Rodrigues, 2017). Swine and avian production remains local, due to the lack of a sufficiently large market in Mauritius.

In addition, breeding is heavily represented in society and even has a cultural dimension in Rodrigues. It is very common for families to have one or more types of livestock which, while providing a portion of the household's annual incomes, also provide a significant food resource.

While there are few forms of intensive rearing of laying hens on the island, it should be noted that breeding in Rodrigues remains extensive. Breeding is particularly common in the project area.

6.6.5.1.2.1 Cattle breeding

The very extensive form of livestock farming in the village of Sainte Marie

In the village of Sainte Marie, cattle breeders have been very rare since the outbreak of foot-and-mouth disease in Rodrigues in 2016, during which a large part of the cattle herd had to be eliminated. According to the village spokesman, one breeder still possesses any cows.

The rearing of cows (and other animals, in general) in Sainte Marie remains very extensive. Cows graze freely in the village area. There is no particular delineation of grazing areas; the cows go where they want. In the evening, the breeders go looking for them and attach them for the night to the place where they find them or move them if they are too close to a dwelling or a cultivated field. The animals are released the next morning for a new day of free grazing (divagation).

Cows freely drink in the afternoon from a water-desalination unit located at the mouth of the Anse Quitor River.

The water was previously pumped into a cavern of this karstic formation region that bears the name of Caverne Bouteille. "Caverne Bouteille" is the name given by the inhabitants to the area located between the village of Sainte Marie and the village of Point Corail.

For the villagers of Sainte Marie, there is no specific interest in the sex of the animal. Females are considered to be genitor and are kept for up to 15-20 years. Males are kept for 2 ½ to 3 years and then sold according to their mass. There is no specific planning or agreement between breeders on breeding. The animals being free during the days, the couplings occur naturally and are not guided.

The sale of animals is constantly carried out on site with the regular passage of buyers (always Mauritian) possessing a vehicle suitable for their transport. The sales system is usually "old fashioned" by estimating the weight of the animal and agreement on the price between breeder and buyer. However, since the outbreak of foot-and-mouth disease in 2016, a specific animal weighing system for the meat sector has been set up in Port Mathurin. At that time and until the end of 2018, a form of embargo remained in Rodrigues concerning beef. While a large proportion of the Rodriguan cattle herd was slaughtered at the height of the crisis, only one sales circuit was authorized through the Rodrigues Trading & Marketing Company (RTMC) and the Mauritius meat authority (MMA).

A similar breeding method for Bangélique breeders

The breeders of the so-called Bangélique zone, unlike those of the village of Sainte Marie, do not reside on site but in the surrounding villages of Cascade Jean-Louis, Anse Quitor or Grand Lafouche coral. They use abandoned fishing stations as shelter and rallying point for their animals.

All told, these non-resident breeders come in the morning to Bangélique to release their cows that they attached to the rope the previous evening.

As with the breeders of Sainte Marie, cows circulate freely throughout the area. There is also no grazing sequencing, and even if a new breeder wishes to bring his herd, there would be no objection. A newcomer would not even have the obligation or the need to warn other breeders of his arrival in the area:

Bangélique breeders are more distant from the desalination unit and the watering trough than the Sainte Marie breeders. Equipped with “pick-up” vehicles, they themselves carry the drinking water to the cattle at the end of the day. Knowing the ritual, the cows go to the fishing station by themselves in order to drink, which allows the breeders to tie them for the night.

Breeding in the village of Plaine Corail

Unlike the areas of Sainte Marie and Bangélique, Plaine Corail is an area closer to the main road that joins the airport. The houses are also more numerous, and the agricultural plots are not all protected.

Thus, the mode of rearing cattle is significantly different in Plaine Corail, as the animals do not circulate freely. The pasture requires guarding and therefore a person is required to prevent the animals from approaching too close to the road axis, plots of vegetable production or even dwellings.

6.6.5.1.2.2 Goat and sheep breeding

The breeding in Sainte Marie

In general, as with cows, the inhabitants of Sainte Marie let their sheep and goats circulate freely throughout the area. In the evening, the animals return by themselves to the dwelling of the breeder to be kept there for the night. If it happens that some heads are missing, the breeder searches for the missing animals, knowing full well that other inhabitants of the village will soon have pointed out the position of the stray beasts.

Goats and sheep are penned up at night in order to protect them against stray dogs that regularly attack herds during the night.

Figure 151: Herds gathering in Sainte Marie village at sunset

Part of the livestock relocated to Eau Vert

Some breeders have more substantial herds of sheep and goats. The majority of their livestock is located in Eau Vert, a large area dedicated to livestock and recognized as such by the Regional Assembly of Rodrigues (RRA). This pasture area is located on the north side of the island's west coast, overlooking the Bay of the Lascars. It is necessary for the village spokesman to go there several times a week on a motorbike.

The zone of Eau Vert brings together a large number of breeders who leave their animals to graze freely but who also possess a pasture if they want to gather their herds for observation or when it is necessary to provide care. There are no permits specifically issued by the authorities for land use.

The breeder has between 30 and 40 goats and more than 40 sheep. The animals are destined for the export of meat to Mauritius. Potential buyers contact the breeder regularly to inquire about the availability of the animals. The breeder then transfers the desired number of animals to the village of Sainte Marie and keeps them there to allow their fattening using specific foods produced in Mauritius. This practice occurs particularly during the dry period at the end of the calendar year. Otherwise, the fattening is carried out by distribution of cut grasses.

The breeder noted, that, according to him, the Eau Vert breeding area would no longer be viable within 3 to 5 years because of the growing invasion of acacia nilotica, locally called “Pikan Loulou", an extremely invasive plant that poses real environmental problems on the island. This is a major concern because this breeding area remains a strategic place in

Rodrigues, and, according to him, the RRA will never have sufficient means to eradicate the "Pikan Loulou", given the level of invasion achieved to date.

Bangélique breeders' practice

Just like the inhabitants of the village of Sainte Marie, the breeders of the Bangélique area, which lies between the runway of the airport and the coast, let their sheep and their goats circulate freely. The mode of rearing is thus the same as the only difference that they have made use of the abandoned fishing stations by creating a pen that allows them to leave their animals during the night.

The Bangélique breeders come in the morning to their breeding area to release their animals from night parks. Then return at the end of the day to bring them water and to secure them by penning them up.

Figure 152: Goat breeding in an old fishing station

Breeding in Plaine Corail

Outside the areas of Sainte Marie and Bangélique, a different rearing method was found in the village of Plaine Corail. This major difference is reflected in the fact that animals are constantly penned.

The perimeter of a breeding area is delimited by a fence (fencing). This area is then separated into two parts. The first, the smallest, is used to keep animals. The second is maintained so as to regularly remove the shoots from "Pikan Loulou" and allow the grass to grow properly to mow and supply the herd with fodder.

Moreover, this demarcated area is the subject of a farm permit and a resident of Plaine Corail, this method is encouraged by the authorities because they subsidise the supply of the fence for breeders without parallel employment.

6.6.5.1.2.3 Pig farming

Unlike cattle, sheep and goats, pork is the only animal bred, slaughtered and consumed on the island, due to a lack of a major market on Mauritius for cultural reasons. In Rodrigues, pork is a non-negligible source of protein and various processed products (hams, sausages...).

When it is destined for self-consumption, the pig is slaughtered on the spot. A portion of the meat or some of the cuts are then sold by the owner of the animal.

When the pork is purchased by a third party, it is sold to the purchaser following an agreement on the price and brought by the purchaser to his area to be slaughtered in the nearest slaughterhouse. As such, the slaughter of 3 127 pigs was registered by the authorities in the year 2017 (Digest of statistics on Rodrigues, 2017).

6.6.5.1.2.4 Poultry breeding

Poultry farming is still unreliable in Rodrigues in general and specifically on the areas of Sainte Marie and Plaine Corail. Animals (hens, geese, Guinea fowl, ducks, etc.) are left to roam freely around the houses. They represent an intake of eggs and a little white meat. If it plays a role in the small local economy, this type of breeding seems to be more recreational than subsistence.

To feed their poultry, the locals give their leftover food or cooked rice mixed with the bran they buy from the neighbouring villages of Cascade Jean-Louis or la Fourche Corail. While some locals use industrially manufactured foods, the majority refuses to buy them, citing doubts about the ingredients used.

6.6.5.1.3 Agriculture

Agriculture in Rodrigues is extensive and provides for part of the island's subsistence needs in terms of vegetable production. While produce from Rodrigues exists, a large part of agricultural products are imported by boat from Mauritius.

Unlike in Mauritius, synthetic chemical inputs or pesticides are not widely used in agriculture, which is one of the arguments made by the local Government when it claims the island of Rodrigues is exemplary in terms of sustainable development and eco-responsibility.

It is to be noted that at the time of the drafting of the report, the threat of the fall army worm was prevailing on the island affecting mainly Maize plantations. The phenomenon was noticed in the month of March and since then is being monitored by the Rodrigues Regional Assembly.

6.6.5.1.3.1 Main food crops in Rodrigues

Food production remains very varied, but the largest and most widespread products are:

Table 62: Main food production in Rodrigues in 2017 and shares of agricultural land

Food crops	Production (tons)	Share of total agricultural food producing area (%)
Corns	523	44
Onion	397	8
Red bean (dry)	85	36
Shooting*	318.5	5
Peanuts	14.5	2.5

* The shooting represents all the creeping plants such as Bitter gourd, calabash, Chayotte, Zucchini, cucumber, pastry, Pumpkin, melon, watermelon, etc.

6.6.5.1.3.2 The specific agricultural products of the island

Among all the agricultural products of Rodrigues, some have a reputation not only locally but also regionally (Mauritius and Reunion), namely:

The lime or the silt of Rodrigues (Limon);
The little chili pepper or Ti-Pima in Creole;
The red bean; and,
Honey.
These agricultural products are now being studied for the establishment of original certifications.

6.6.5.1.3.3 Agricultural production in the airport area

Agricultural production in the village of Sainte Marie

In the village of Sainte Marie, the economic and social stakes are rather high for farming activities, which are an indispensable element of agricultural production. The inhabitants of Sainte Marie have no land other than those available next to their dwelling.

Agricultural production is only a small part of their incomes, but this production allows villagers to achieve some form of autonomy. This practice is probably also related to the geographical isolation of the village of Sainte Marie.

The crops are varied (maize, bean, peanut, watermelon, tomato, cucumber, etc.) and the use of the cultivation space is very diversified with associations allowing sufficient production for households despite the agro-climatic conditions, which are rather unfavourable in this area (water stress, clean vegetation, saline air, shallow and rocky soils, etc.).

The integration of livestock in the agricultural system, therefore, makes sense: the contribution of organic matter (manure, slurry) is an essential element for the formation of the soil and the maintenance of its fertility. Livestock, thus, ensures the viability of agricultural production.

It should be noted that the inhabitants of Sainte Marie do not use and do not want to utilize synthetic chemicals such as pesticides or nitrogenous and phosphatic fertilizers. This is a very good example of the viability of an agro-pastoral system.

Agricultural production in the village of Plaine Corail

The plant production of Plaine Corail is also very diversified, although the plantations present a sequence of cultivars that is a little more pronounced within the parcel.

Another difference is that the agricultural production of Plaine Corail is more of an income crop because only a minimal part is kept for household consumption.

Also it was reported by an inhabitant that the younger generation is not interested in the work of the earth anymore.

6.6.5.1.3.4 Land rights on farmland

90% of Rodrigues's land belongs to the Rodrigues Regional Assembly. Land management and the granting of land on Rodrigues are governed by the State Lands Act, voted for in Mauritius in October 1982 and amended in 1991.

This law was passed in order to protect and to optimize the management of State lands. The State lands include "defensive grounds", geometric steps and all lands owned or possessed by the Mauritian State.

This law contains the legal provisions and in some cases the obligations of the various actors directly or indirectly involved in the project to enlarge the runway of the Plaine Corail airport. In Rodrigues, the grant of leasehold is defined in section 6 (1B): leases on State lands.

The lease on State land

In Rodrigues, all leases on State lands must be subject to the following minimum conditions:

the leased land shall not be used for purposes for which it is not allocated without the approval of the authority concerned,
the leasehold shall not be used in such a way as to constitute a nuisance, to harm natural resources or the environment, including sea, beach, freshwater, adjacent canals or rivers,
the lease agreement may be terminated after the service of a notice indicating the reason for the cancellation, if subparagraphs (i) or (ii) are not duly observed.
A State land lease cannot be assigned for a period exceeding 60 years. The rent must be paid annually and in advance. An activity must be carried out in connection with the application for a lease. If the activity does not match the prerequisites or if it proves to be non-existent, the contract will be cancelled and may be forwarded to a third party.

Agricultural permit on State lands

The agricultural permit is specific to Rodrigues and the procedure for the application of agricultural land was established by the Committee on agriculture.

The lease on agricultural land is not directly granted to applicants. It is an agricultural permit that is granted so that the applicant can start or continue his farming and/or livestock activities. The agricultural permit corresponds to a contract which stipulates the area, the duration, the provisions and conditions of use of the land.

After a period of five to ten years of effective agricultural activity, the applicant may apply to the Agriculture Commission for an agricultural lease on the same land. After field investigations by agricultural technicians, recommendations are sent to the cadastre office for the precise delineation of the land with terminals. Finally, a Government evaluator visits the field to assess it to determine the annual lease amount. From there, the lease is granted for a professional agricultural activity where hard infrastructure can be built. Unlike the farm permit, the farm lease is paid and depends on the size of the land.

In the project area, all land situations are formally recognized.

6.6.5.2 Household economic activities

The economic activities of the villagers at the Sainte Marie and Plaine Corail sites are recorded through the analysis of the household surveys conducted. The main activities identified are livestock, agriculture and fisheries.

6.6.5.2.1 Breeding

91% of households surveyed practice livestock breeding.

Poultry farming comes first in terms of number of heads per capita. However, sheep farms (62%) and goats (62%), which are the most represented for the two localities, are significantly more important than pig or cow farms.

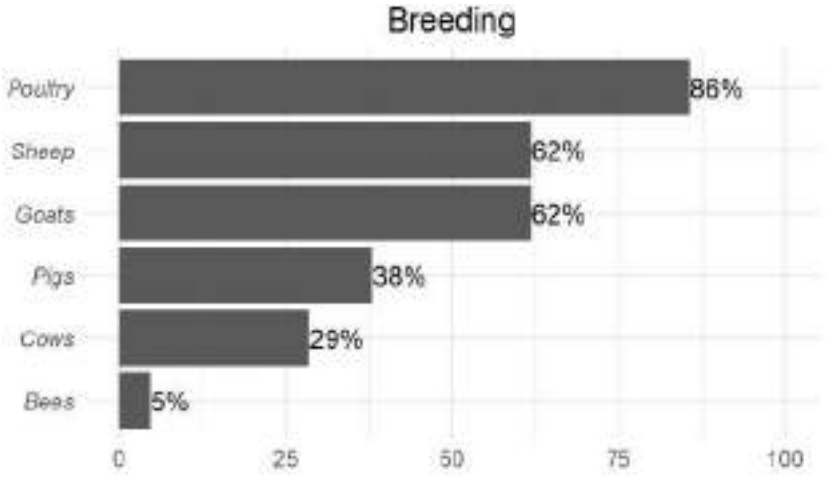


Figure 153: Proportion of animals raised among households in Sainte Marie and Plaine Corail villages

By comparing the villages of Sainte Marie and Plaine Corail, we can see that the types of livestock and associated quantities are substantially equivalent, with the exception of sheep farming, which seems more developed among the breeders of Sainte Marie.

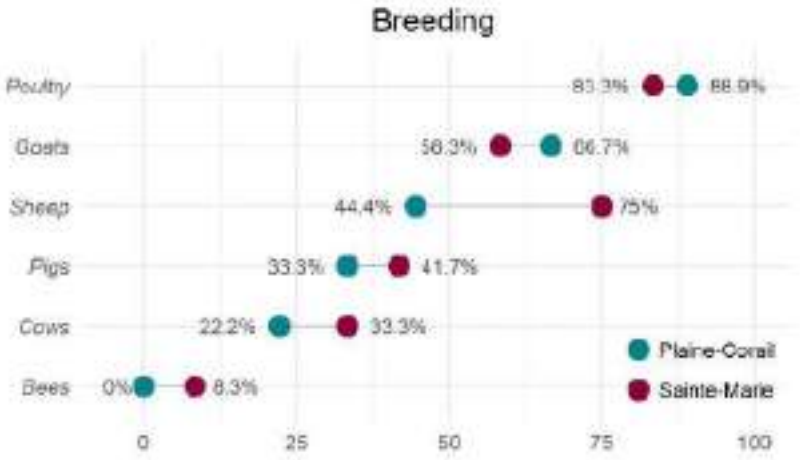


Figure 154: Share of livestock types by locality

6.6.5.2.2 Fishing

In the village of Sainte Marie, half of the households have a fishing activity recognized by the head of household. Women do not practice fishing, unlike in Plaine Corail where the female fishing activity is present.

We will then see the importance of this activity in terms of household incomes.

6.6.5.2.3 Agriculture

83% of households surveyed have an agricultural activity and 84% of them earn income.

The most cultivated plants are the shootings, such as the pumpkin, the calabash, the chayotte or even the watermelon. Then come corn, beans and solanaceous, such as eggplant and tomato.

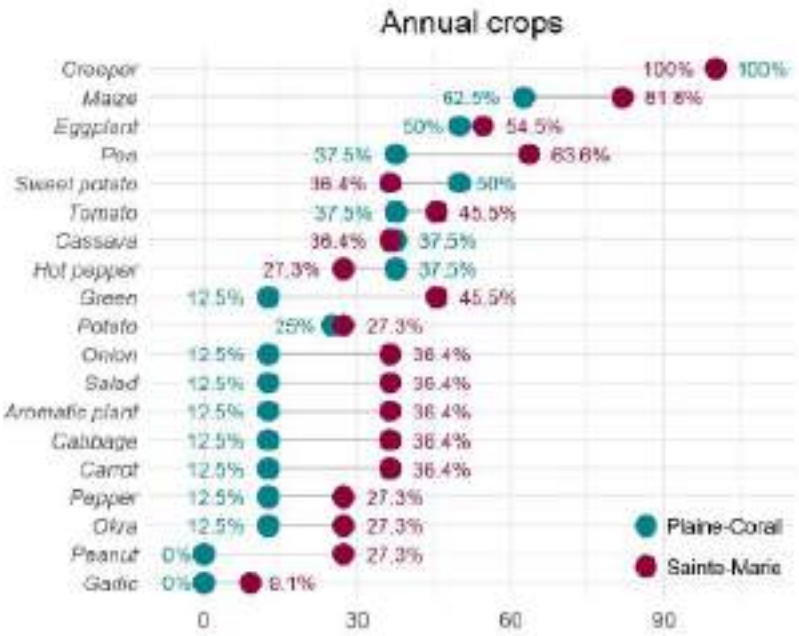


Figure 155: Distribution of annual crops by locality

Apart from a lesser proportion of beans cultivated on the Plaine Corail side, it is interesting to note that the same cultivars are present in both Sainte Marie and Plaine Corail.

More or less the same tendency is found with perennial (or fruit farm) crops. Only citrus fruits are noticeably more cultivated on the Plaine Corail side, whereas it is rather the Annona (Custard apple and Atemoya) that are more represented in the agricultural plots of Sainte Marie.

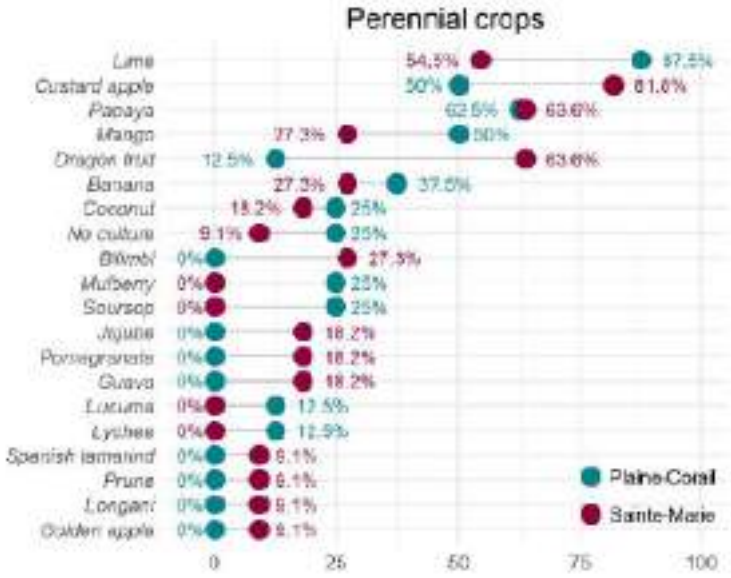


Figure 156: Distribution of fruit production by locality

6.6.5.3 Composition of household incomes

The analysis of the composition of the income derived from the activities carried out by the households of Sainte Marie and Plaine Corail shows that, despite the similarity in the types of

activities practiced in each locality, there seems to be a significant difference in income derived from those activities.

Revenu par habitant			*Revenu par ménage*		
Activite	**Plaine-Corail**	**Sainte-Marie**	**Activite**	**Plaine-Corail**	**Sainte-Marie**
Aide	13 051,61	13 109,77	**Aide**	44 955,56	40 265,71
Annual	5 935,48	8 325,58	**Annual**	20 444,44	25 571,43
Artisanat	161,29	2 930,23	**Artisanat**	555,56	9 000,00
Autre	10 838,71	5 930,23	**Autre**	37 333,33	18 214,29
Commerc	11 612,90	-	**Commerc**	40 000,00	-
Elevage	5 645,16	19 116,28	**Elevage**	19 444,44	58 714,29
Fonction	4 193,55	19 553,49	**Fonction**	14 444,44	60 057,14
Peche	7 032,26	14 232,56	**Peche**	24 222,22	43 714,29
Perenne	548,39	441,86	**Perenne**	1 888,89	1 357,14

Figure 157 Income per inhabitant / Income per household

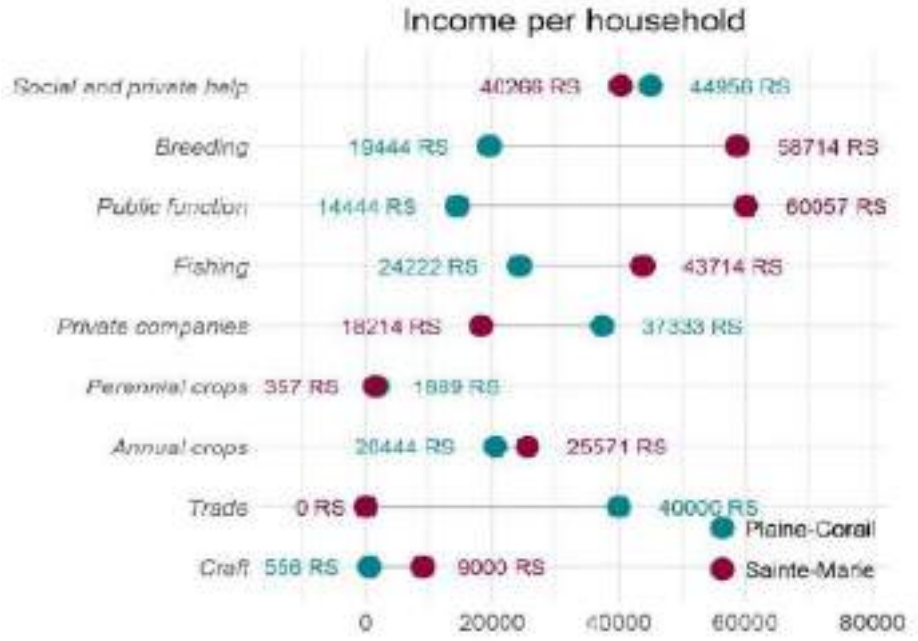


Figure 158: Distribution of household incomes in Plaine Corail and Sainte Marie villages by type of activity

The incomes from the main activities of livestock, fisheries and agriculture seem to appear much more substantial for the villagers of Sainte Marie than for those of Plaine Corail.

Conversely, some incomes, such as those derived from commercial or salaried activities of the private sector, represent a greater proportion of the incomes of the villagers of Plaine Corail compared to those of Sainte Marie.

6.6.5.4 Analysis points of the quantitative study

The demographic configurations described above indicate that the population of Plaine Corail is significantly more feminine than that of Sainte Marie. The male population of Plaine Corail

is younger on average than in Sainte Marie, with 86% of the men in the households surveyed under 40 years (compared with 61% among the inhabitants of Sainte Marie).

In terms of activities, the two communities have undeniable similarities. The most represented activities are livestock, fisheries and agriculture. But it seems that the income from these activities is much higher in Sainte Marie than in Plaine Corail. The inhabitants of Plaine Corail benefit from other sources of income, such as commercial activities.

It should also be noted that the fishing activity of women is only present in Plaine Corail.

Thus, while community configurations might be thought to be similar at first glance between the villages of Sainte Marie and Plaine Corail, there are certain specific traits that differentiate the current functioning of the two village entities. The village of Sainte Marie, with its isolation constraint, was able to find the means necessary to acquire a viable mode of economic functioning from the almost unique activities of livestock, fishing and agriculture.

On the other hand, for the inhabitants of Plaine Corail the activities of livestock, fishing and agriculture are less solicited, in favour of access (at least desired by the younger generations) to other income-generating activities.

6.6.6 Summary: Social environment sensitivity

Table 63: Social environment sensitivity

Sub-theme	Receptor	Sensitivity
Social environment	Demographic and social dynamics	High
	Power, governance and civil society	High
	Land	Major
	Agriculture	Major
	Sainte Marie and Plaine Corail inhabitants	Major
	Bangelique breeders	Major
	Fishermen of the impacted zone	Major

6.7 Air quality and noise environment

This chapter deals with noise and air quality. It aims to state the current air quality and noise level around the airport, and to identify how the airport activity contributes to the ambient pollution and noise.

It aims to base the assessment of the project impact on noise and air. During the construction, impacts might be due to work activities and road traffic for supplying the works. During the operational phase, air and noise pollution are due to the changes of air traffic.

To assess the consequences on human health, the population exposed is first analysed.

6.7.1 Area of influence

The area of influence is drawn from the large area that was modified to consider the planes' landing and taking off directions, and the exposed population distribution. It is mapped on next page's figure.

6.7.2 Demography and exposed population

The following map shows the location of the population living near Plaine Corail airport. It was based on field visits and analysis of aerial photographs. As residential buildings are sparse, the populations exposed to noise and pollution are limited. Yet, it should be noted that a school is located to the east of the airport and requires special attention. In general terms, the buildings and sites sensitive to noise and pollution are homes, schools, hospitals, and areas dedicated to sports.

Figure 159: Building location map and area of influence

6.7.3 Air quality and carbon footprint

6.7.3.1 General information about air pollution

Air pollution can be defined as an alteration of air quality that can be harmful to human health, living things, the climate, or material goods. Below is a description of the main air pollutants.

Table 64: Description of main air pollutants

Carbon Monoxide (CO)

Origin	CO is produced by incomplete burning of carbon in fuels. Most of emissions are from transportation sources, especially road traffic. Industrial sources or incinerators might also produce CO.
Pollution mechanism	CO is involved in reactions creating ozone in the lower atmosphere. When transformed into carbon dioxide, it also contributes to greenhouse effect.
Effects on health and environment	CO is colourless and odourless. Carbon monoxide attaches itself instead of oxygen to the haemoglobin and causes a lack of oxygenation that can lead to death.

Hydrocarbons (HCs)

Origin	HCs are part of VOCs (volatile organic compounds), which is a large group of pollutants that come from industrial processes, incomplete combustion, solvents, agriculture or natural sources. Hydrocarbons are compounds of carbon among VOCs (except methane, ethane, and non-reactive compounds).
Pollution mechanism	HCs promote the formation of compounds contributing to the greenhouse effect and the formation of ozone in the lower atmosphere.
Effects on health and environment	The effects are very diverse depending on the pollutants, and range from respiratory effects to mutagenic and carcinogenic risks.

Nitrogen Oxides (NOx)

Origin	NO and NO_2 form during combustion process. Main sources are motor vehicles, stationary fuel combustion installations and aviation activities.
Pollution mechanism	NOx are involved in reactions creating ozone in the lower atmosphere and contribute to acid rain.
Effects on health and environment	NO_2 irritates the respiratory tract. Acid rain leads to soil degradation and forest dieback.

Carbon Dioxide (CO_2)

Origin	CO_2 comes from any combustion reaction of carbonaceous products.
Pollution mechanism	CO_2 is one of the main greenhouse gases.
Effects on health and environment	It is not harmful to humans but it contributes to the increase of greenhouse effect.

Sulphur Dioxide (SO_2)

Origin	Sulphur dioxide mainly comes from the combustion of fossil fuels containing sulphur (fuel oil, coal).
Pollution mechanism	In the presence of moisture, SO_2 forms sulfuric acid.
Effects on health and environment	SO_2 contributes to acid rain and also irritates the respiratory tract.

Suspended particulates

Origin	Particulates result from many different sources, such as industrial or household combustion, fuel consumption, vehicles, or are formed by an interaction of various gazes with other compounds in the air.
Pollution mechanism	Toxic compounds are transported by particulates into the respiratory tract. Particulate matter is classified according to the maximum diameter in micrometres: PM2,5 and PM10 are the inhalable and respirable classes.
Effects on health and environment	Depending on their size, particulates penetrate more or less deeply into the lungs. The finest can impair respiratory function; some are carcinogenic. Particulates also affect soil, buildings and monuments.

Local standards about air quality are set in the Environment Protection Act (1998) and are presented below.

Table 65: Air Quality regulations

First Schedule ***(regulation 3)***

Emission Standards

The following standards are maximum limits for the corresponding pollutant.

Pollutant	*Applicable to*	*Standard*	Applies to project (construction / operational phase)
(i) Smoke	All stationary fuel burning source	Ringelmann No. 2 or equivalent opacity (not to exceed more that 5 minutes in any period of one hour)	X
(ii) Solid particles	(a) Any trade, industry, process, industrial plant or fuel-burning equipment	200 mg/m^3	X
	(b) Any existing trade, industry process or industrial plant using bagasse as fuel	400 mg/m^3	
(iii) Sulphuric acid mist or sulphur trioxide	(a) Any trade, industry or process (other than combustion processes and plants for the manufacture of sulphuric acid)	120 mg/m^3 as sulphur trioxide	X
	(b) Any trade, industry or process in which sulphuric acid is manufactured	30 000 mg/m^3 as sulphur trioxide	
(iv) Fluorine compounds	Any trade, industry or process in the operation of which fluorine, hydrofluoric acid or any inorganic fluorine compounds are emitted	100 mg/m^3 as hydrofluoric acid	X
(v) Hydrogen Chloride	Any trade, industry or process	200 mg/m^3 as hydrogen chloride	X
(vi) Chlorine	Any trade, industry or process	100 mg/m^3 as chlorine	X
(vii) Hydrogen sulphide	Any trade, industry or process	5 ppm as hydrogen sulphide gas	X
(viii) Nitric acid or oxides of nitrogen	Any trade, industry or process in which the manufacture of nitric acid is carried out	2 000 mg/m^3 as nitrogen dioxide	
(ix) Nitric acid or oxides of nitrogen	Any trade, industry or process other than nitric acid plant	1 000 mg/m^3 as nitrogen dioxide	X
(x) Carbon monoxide	Any trade, industry or process	1 000 mg/m^3 as carbon monoxide	X

SECOND SCHEDULE **(***regulation 5)*

Ambient Air Quality Standards and Measurement Methods

Ambient Pollutant	*Standard (ug/m3) maximum*	*Averaging Time*	*Measurement Method**
Total suspended particles	150 50	24-hour Annual average	Hi-volume Sampler
PM10	100	24-hour	Hi-volume Sampler
Sulphur Dioxide	350 200 50	1-hour 24-hour Annual average	Fluorescence SO_2 Analyser, Colorimetry
Nitrogen Dioxide	200	24-hour	Sodium Arsenite, Chemiluminescence
Carbon Monoxide	25 10	1-hour 8-hour	Nondispersive Infrared Photometry
Lead	1.5	3-month average	Hi-volume Sampler with Atomic Absorption
Ozone	100	1-hour	Ozone Analyzer, Chemiluminescence

*the measurement methods are those indicated or other methods acceptable to the enforcing agency.

In addition to that, WHO provides guidelines for ambient air quality, expressed in concentration for the main atmospheric pollutants.

Table 66: WHO Ambiant air quality guidelines (2005)

	Averaging Period	Guideline value in µg/m³
Sulfur dioxide (SO_2)	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minute	500 (guideline)
Nitrogen dioxide (NO_2)	1-year	40 (guideline)
	1-hour	200 (guideline)
Particulate Matter PM_{10}	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $PM_{2.5}$	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Note 1: PM 24-hour value is the 99th percentile

Note 2: interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

6.7.3.2 Ambient air quality around Plaine Corail Airport

As there is no polluting industry and no significant agglomeration around Plaine Corail Airport, local sources of atmospheric pollutants are:

Road traffic, and
Air traffic and airport activities.

6.7.3.2.1 Polluting activities at an airport

6.7.3.2.1.1 Aircrafts: daily activities

Final approach, taxi in, taxi out, take-off and climb-out are the main polluting phases. The use of APU before the start-up and aircraft refuelling also contribute to air pollution.

6.7.3.2.1.2 Aircrafts: one-off activities

Aircraft, service vehicles and buildings are cleaned regularly and are subject to maintenance operations emitting air pollutants.

6.7.3.2.1.3 Stationary sources

Various sources related to the operation of the airport can produce pollution: fuel storage, petrol station, power plant, auxiliary generators.

6.7.3.2.1.4 Mobile sources

Road traffic in connection with passenger and cargo transportation emits air pollutants. Airport activities also require the use of special equipment, such as pushback tractors, and various service vehicles. The use of GPUs is to be noted.

As road traffic is considered low near Plaine Corail Airport, ambient air quality is assessed by considering only airport traffic, which is preponderant over the other sources of pollution.

Indeed, the results of studies, particularly at Toulouse Blagnac airport in France, show that aircraft emissions are significantly higher than other sources (ACNUSA, *Rapport de synthèse des travaux du groupe de travail sur les activités aéroportuaires et la gestion de la qualité de l'air,* July 2016).

6.7.3.3 Air quality measurement campaign

6.7.3.3.1 Measurement protocol

6.7.3.3.1.1 Location

Four sites representative of the site's environment were selected for measurements. They are located on the following map.

Figure 160 Air quality measurements location

6.7.3.3.1.2 Typology

Two different types of measurements were performed:

Active measures
These measurements were carried out using a continuous "Ecomsmart" device to analyze in real time the concentrations of PM10, PM2.5, CO, Ozone and NO2, each measure lasting 24 hours.
The analyzer was placed near the homes affected by aircraft overflights on a larger perimeter around the airport. The device allows the concentration of the above-mentioned pollutants to be recorded every minute. The equipment is CE class B and FCC class A certified.
The EcomSmart was moved every day to obtain a dynamic result in each of the 4 fixed points.
Measure 1 Pointe Palmiste: from 28/09/19 to 29/09/19
Measure 2 Plaine Corail: from 27/09/19 to 28/09/19
Measure 3 Ecole des Canetons: from 25/09/19 to 26/09/19
Measure 4 Plaine Caverne: from 26/09/19 to 27/09/19
A first measurement was carried out from 24/09 to 25/09 at point 1 but a power failure did not allow Ecomsmart to operate, so the measurement was repeated from 28/09 to 29/09.
Concerning measuring point 2 at Le Caneton school, the measurement stopped at around 4pm, probably due to a power failure.
Passive measures
The dynamic measurement was completed by passive tube measurements at each of the 4 measurement points over a 5-day period, from 24/09/19 to 29/09/19. Benzene and nitrogen dioxide were measured by Radiello tube and analyzed by the TERA Environnement laboratory.

6.7.3.3.1.3 Wheather conditions

Weather conditions were recorded at the airport station.

Table 67: Meteorological Data , Plaine Corail

Weather conditions	Day				
	24/09/2019	25/09/2019	26/09/2019	27/09/2019	28/09/2019
Wind speed m/s (2m high)	5,1	4,7	4,6	5,0	4,4
Temperature °C	23,4	23,9	24,8	23,7	24,3
Rainfall mm	0,8	3,3	0,0	0,1	0,0
Nebulosity octas	5,2 / 8	3,8 / 8	3,6 / 8	5,8 / 8	3,2 / 8
Humidity %	85,8%	84,9%	83,8%	85,3%	76,6%

6.7.3.3.1.4 Aircraft overflights

The table below shows the aircraft movements recorded during the air quality measurement campaign. All aircraft are Air Mauritius ATR-72.

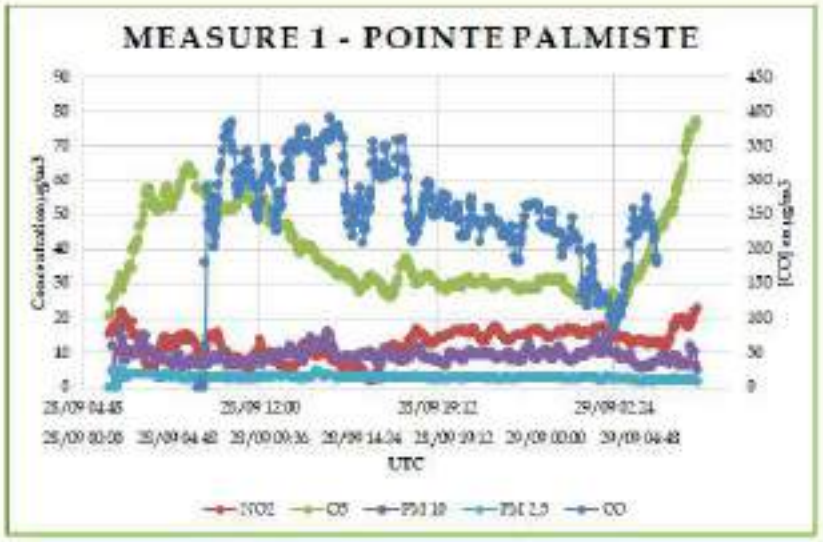
Table 68: aircraft movements recorded during the air quality measurement

Aircraft movement at Plaine Corail Airport for the period 24- 28 September 2019

SN	DATE	23-Sep-19	24-Sep-19	25-Sep-19	26-Sep-19	27-Sep-19	28-Sep-19
1	MK 120						
	Arrival	10:06 hrs	10.15 hrs	10.19 hrs	10.14 hrs	10:12	10:16
	Departure	10:50 hrs	10.55 hrs	10.53 hrs	10.54 hrs	10:38	10:45
2	MK 126/7						
	Arrival	13.06 hrs	no flight	no flight	no flight	13:30	no flight
	Departure	13.51 hrs				14:02	
3	MK 130/1						
	Arrival	14:31 hrs	14.49 hrs	14.40 hrs	14:59	14:36	14:26
	Departure	15.12 hrs	15.28 hrs	15.10 hrs	15:39	15:07	15:15
4	MK 140/1						
	Arrival	19.00 hrs	19.11 hrs	19.07 hrs	18:56	18:55	19:13
	Departure	19.32 hrs	19.38 hrs	19.32 hrs	19:25	19:29	19:50

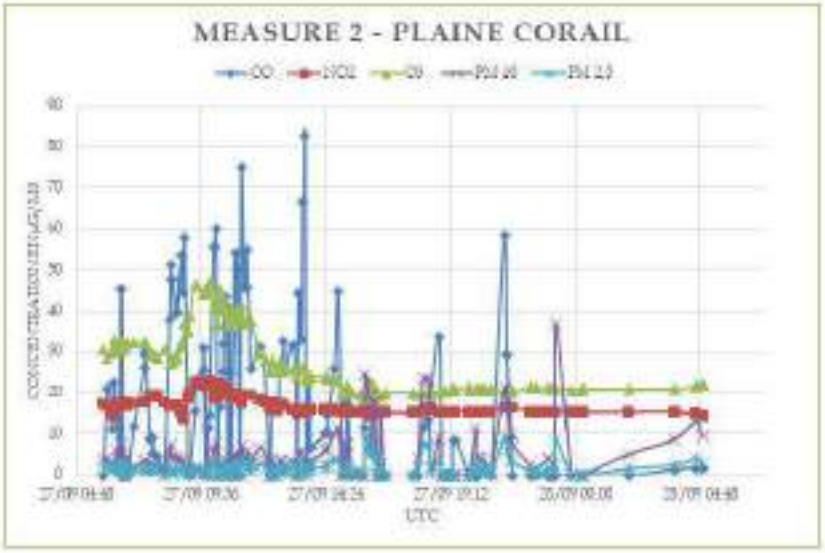
6.7.3.3.2 Results

MEASURE 1 – POINTE PALMISTE
28/09/2019 to 29/09/2019



Measure 1 – Pointe palmiste – 28/09/19 to 29/09/19				
1-hour average	**CO µg/m³**	**NO_2 µg/m³**	**O_3 µg/m³**	**PM 10 µg/m³**
10h-11h	150,17	17,01	31,29	5,05
11h-12h	343,79	8,43	51,75	10,83
12h-13h	309,38	13,34	56,10	7,59
13h-14h	284,12	12,88	59,50	6,99
14h-15h	305,25	11,32	51,65	5,09
15h-16h	356,12	7,37	54,50	7,08
16h-17h	352,21	8,86	49,68	8,65
17-18h	320,23	8,25	42,75	9,71
18h-19h	256,09	9,69	37,00	12,99
19h-20h	320,77	5,92	32,11	8,66
20h-21h	323,50	4,02	30,31	8,82
21h-22h	249,00	10,80	28,95	5,70
22h-23h	204,53	14,15	32,40	9,41
23h-00h	236,36	14,48	29,49	8,10
00h-01h	243,15	15,96	30,19	9,07
01h-02h	237,22	15,28	29,89	9,08
02h-03h	213,64	14,74	29,02	8,94
03h-04h	256,49	15,65	29,91	9,47
04h-05h	227,97	16,03	29,20	9,26
05h-06h	206,89	16,10	25,78	10,69
06h-07h	150,19	15,21	25,54	10,38
07h-08h	112,38	13,02	33,26	6,84
08h-09h	201,76	13,55	48,05	8,00
09h-10h	231,34	19,53	65,27	7,52
8-hour average	**CO µg/m³**	**NO_2 µg/m³**	**O_3 µg/m³**	**PM 10 µg/m³**
8h	302,66	11,01	49,65	8,38
8h	266,33	11,29	31,43	9,35
8h	200,05	15,48	36,13	8,89
24-hour average	**CO µg/m³**	**NO_2 µg/m³**	**O_3 µg/m³**	**PM 10 µg/m³**
	250,6	12,5	38,9	8,7

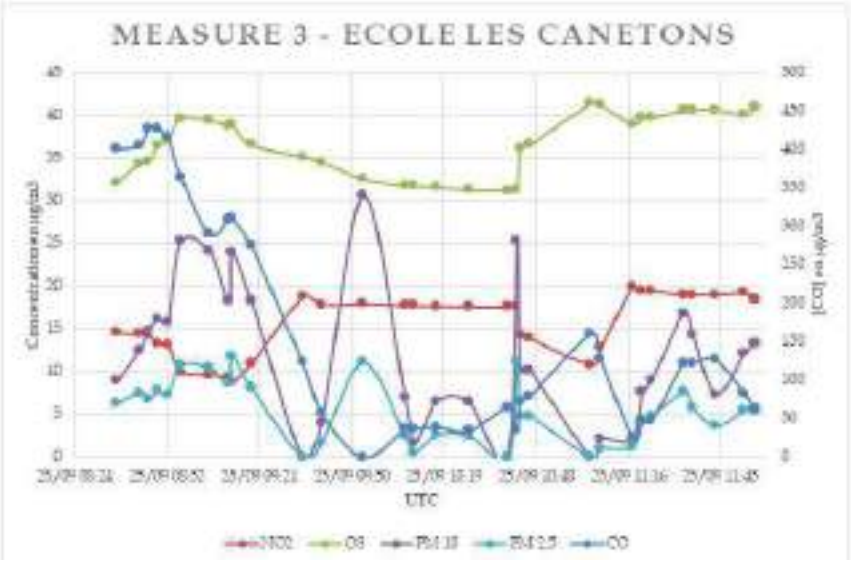
MEASURE 2 - PLAINE CORAIL
27/09/2019 to 28/09/2019



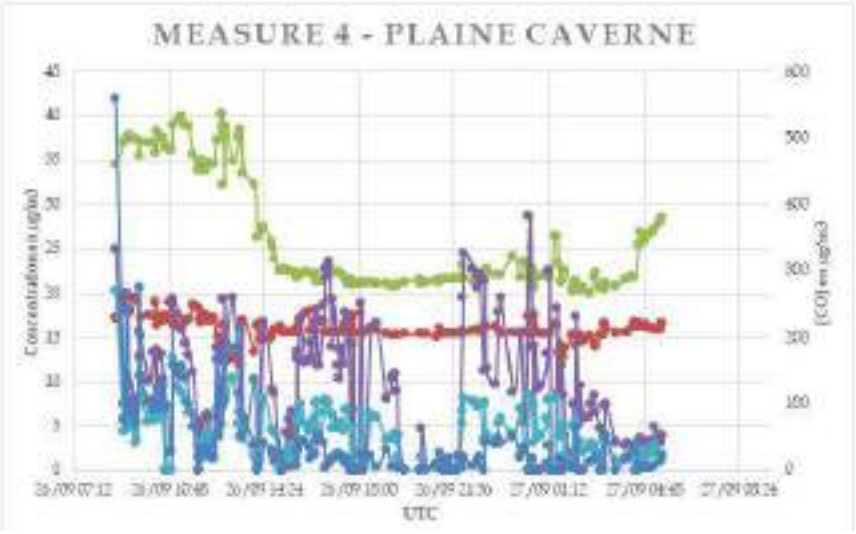
Measure 2 – Plaine Corail - 27/09/19 to 28/09/19				
1-hour average	**CO** µg/m³	**NO_2** µg/m³	**O_3** µg/m³	**PM 10** µg/m³
10h-11h	13,0	16,0	31,2	3,1
11h-12h	15,5	18,4	30,7	2,6
12h-13h	42,1	16,2	29,9	3,9
13h-14h	13,5	21,6	43,7	0,9
14h-15h	33,0	19,9	40,2	3,1
15h-16h	39,3	19,0	36,9	4,1
16h-17h	15,0	16,9	26,5	2,2
17h-18h	33,2	15,7	24,9	2,7
18h-19h	21,1	15,8	23,5	8,1
19h-20h	6,9	15,3	20,3	5,9
20h-21h	5,0	15,0	20,4	8,4
21h-22h	0,0	15,1	19,8	1,9
22h-23h	7,9	15,5	20,4	5,2
23h-00h				
00h-01h	0,4	15,3	20,8	4,3
01h-02h	24,1	16,4	20,2	13,5
02h-03h	0,0	15,4	21,2	2,9
03h-04h	0,0	15,3	21,1	10,5
04h-05h	0,0	15,3	20,9	0,0
05h-06h	0,0	15,3	20,9	5,0
06h-07h				
07h-08h	1,3	15,3	21,0	8,8
08h-09h	1,7	14,0	22,0	11,3
8-hour average	**CO** µg/m³	**NO_2** µg/m³	**O_3** µg/m³	**PM 10** µg/m³
8h	26,0	18,1	33,0	2,6
8h	9,4	15,5	20,8	6,8
8h	0,4	13,0	18,2	3,5
24-hour average	**CO** µg/m³	**NO_2** µg/m³	**O_3** µg/m³	**PM 10** µg/m³
	18,5	17,0	28,3	4,5

MEASURE 3 - ECOLE DES CANETONS
25/09/2019 to 26/09/2019

Measure 3 – Ecole des Canetons – 25/09/19 to 26/09/19				
1-hour average	**CO** µg/m³	**NO_2** µg/m³	**O_3** µg/m³	**PM 10** µg/m³
12h-13h	405,9	13,3	35,7	15,6
13h14h	194,8	13,3	36,5	17,0
14h-15h	50,0	16,7	32,6	8,4
15h-16h	90,0	17,8	40,3	8,9
24-hour average	**CO** µg/m³	**NO_2** µg/m³	**O_3** µg/m³	**PM 10** µg/m³
	102,2	15,7	30,7	11,8



MEASURE 4 – PLAINE CAVERNE
26/09/2019 to 27/09/2019



Measure 4 – Plaine Caverne – 26/09/19 to 27/09/19				
1-hour average	**CO µg/m³**	**NO_2 µg/m³**	**O_3 µg/m³**	**PM 10 µg/m³**
11h-12h	4235,6	15,1	37,4	362,4
12h-13h	4537,7	11,5	41,4	389,3
13h14h	140,5	18,2	**37,1**	11,8
14h-15h	96,8	17,6	37,0	8,4
15h-16h	86,3	17,3	37,2	11,0
16h-17h	65,1	15,8	35,6	7,8
17h-18h	159,2	13,6	**36,1**	10,1
18h-19h	**40,4**	15,1	26,8	8,0
19h-20h	20,3	16,2	22,3	7,7
20h-21h	27,0	16,2	22,0	10,5
21h-22h	12,5	15,9	21,7	10,8
22h-23h	12,2	16,2	21,1	12,8
23h-00h	7,8	15,3	20,9	7,0
00h-01h	2,0	15,3	21,3	1,3
01h-02h	6,1	15,5	21,7	3,1
02h-03h	19,8	15,8	22,0	19,5
03h-04h	**44,2**	15,8	22,5	**14,0**
04h-05h	8,2	15,9	21,9	12,6
05h-06h	7,9	14,9	23,4	8,7
06h-07h	**11,5**	14,9	20,5	7,1
07h-08h	15,4	15,4	20,9	4,9
08h-09h	13,3	16,2	24,1	2,3
10h-11h	8,3	16,1	27,4	3,6
8-hour average	**CO µg/m³**	**NO_2 µg/m³**	**O_3 µg/m³**	**PM 10 µg/m³**
8h	1170,0	15,5	**36,1**	101,1
8h	15,4	15,8	21,6	9,8
8h	16,0	15,6	23,0	7,6
24-hour average	**CO µg/m³**	**NO_2 µg/m³**	**O_3 µg/m³**	**PM 10 µg/m³**
	268,37	15,81	26,90	28,44

6.7.3.3.2.1 Analysis

Active measurements

- CO
  - The regulatory values for CO concentrations are 25 mg/m^3 over 1 hour and 10 mg/m^3 over 8 hours.
  - CO concentrations are respected at all measurement points and are well below the threshold concentrations. There is a high concentration of CO in point 4 over a few hours, which may be due to a fire near the measurement point.
- PM10
  - The threshold value for PM10 is 100 µg/m^3 over 24 hours.
  - The daily concentrations at each point are well below this threshold concentration.
- Ozone
  - The regulatory value for ozone is 100 µg/m^3 over 1 hour.
  - None of the hourly values exceed 100µg/m^3 over 1h. Ozone concentrations therefore comply with regulatory thresholds. It should also be noted that graphically we can see the evolution of concentrations during the day with a peak concentration in the middle of the day. It should be remembered that ozone is a secondary pollutant formed by photochemical reaction, in particular from NO2.
- NO2
  - The regulatory value for NO2 is 200 µg/m^3 over 24 hours.
  - No measurement points exceed local requirements. Nitrogen dioxide concentrations measured on site are low.

No influence of the aircraft overflight could be observed on the dynamic measurement results. Indeed, no significant variation is observed on the results as they approach or leave. Thus, the low influx of aircraft is not currently noticeable on Rodrigues Island air quality.

Passive measurements

PF 1

PF 2

PF 3

PF 4

Measure	Date	Location	NO_2	Benzène
PF1	24/09/2019 to 29/09/2019	Pointe Palmiste	0,73 µg/m³	0,84 µg/m³
PF2		Plaine Corail	1,40 µg/m³	1,16 µg/m3
PF3		Ecole les Canetons	0,77 µg/m³	1,17 µg/m³
PF4		Plaine Caverne	0,91 µg/m³	1,72 µg/m³

The NO2 concentrations measured by passive tubes are extremely low and are almost 10 times lower than the dynamic measurements. In both passive and active cases, nitrogen dioxide concentrations are extremely low, reflecting very good air quality.

Concerning the benzene concentration, the measures using radiello tubes are also very low. No exceedance of the regulatory thresholds was found on these measures.

It should be noted, however, that the passive tubes were exposed to fairly heavy weather conditions (short rains over time but abundant with a strong wind throughout the week). The tubes may have been "washed" by showers, resulting in extremely low concentrations.

6.7.3.3.2.2 Conclusion

Despite unfavourable conditions (wind, rain) and electrical incidents, the measures still allow positive conclusions to be drawn about air quality on Rodrigues Island. No measurements exceed regulatory thresholds wich apply to O3, CO, PM10, NO2 and Benzene.

The concentrations measured are very low, reflecting very good air quality on Rodrigues Island.

Concerning aircraft overflight, no influence is observed on concentrations for the current 4 daily overflights.

6.7.3.3.3 Emissions inventory

6.7.3.3.3.1 Definition

An emissions inventory is based on the theoretical calculation of the pollutants emitted into the atmosphere. A simplified method that helps to establish orders of magnitude of polluting emissions consists of calculating the product of the activity and the emission factors:

$$E(X) = \sum_{\text{type d'aéronef Y}} N(\text{cycle LTO})_{\text{aéronef Y}} * FE_X$$

E (X), emissions of pollutant X (kg)
N (cycle LTO) $_{\text{aeronef Y}}$, the number of LTO cycles for the aircraft type Y
FE_X the emission factor, for the pollutant X, by LTO cycle.

This method is compliant with the French guide “Guide de calcul des émissions dues aux aéronefs” (DGAC - STAC, 2015).

It does not directly estimate the concentration of pollutants in the air, which requires a complex dispersion model, yet an emissions inventory is a useful tool for managing air quality and its impact, and for informing the public. Based on the results of an emissions inventory, the gain from an emissions reduction policy can be assessed, and air quality modelling tools (concentrations) can be fed.

6.7.3.3.3.2 Inputs

The calculations take into account the overall annual commercial aircraft traffic (year 2017) and the type of aircraft.

6.7.3.3.3.3 Study area and pollutants investigated

Calculations are based on a standard "Landing-Take-Off" (LTO) cycle per aircraft, as defined by OACI vol II, appendix 16. This cycle includes all aircraft operations from the ground to a height of 3000 feet, as only emissions below this height have a direct impact on local air quality.

Aircraft engine emissions are calculated from the emission factors established for the "ICAO" LTO cycle. An ICAO database lists fuel consumption and emission factors for the four phases of movement in the atmospheric layer between 0 and 3000 ft: taxi, take-off, cruise and approach. Each phase is associated with an engine speed and its duration (see table and image below).

Table 69: Duration and engine speed associated with the different phases of LTO cycle

Phases of the LTO cycle	Duration (minutes)	Engine speed (%)
Approach	4	30
Taxi	26	7
Takeoff	0,7	100
Climb-out	2,2	85

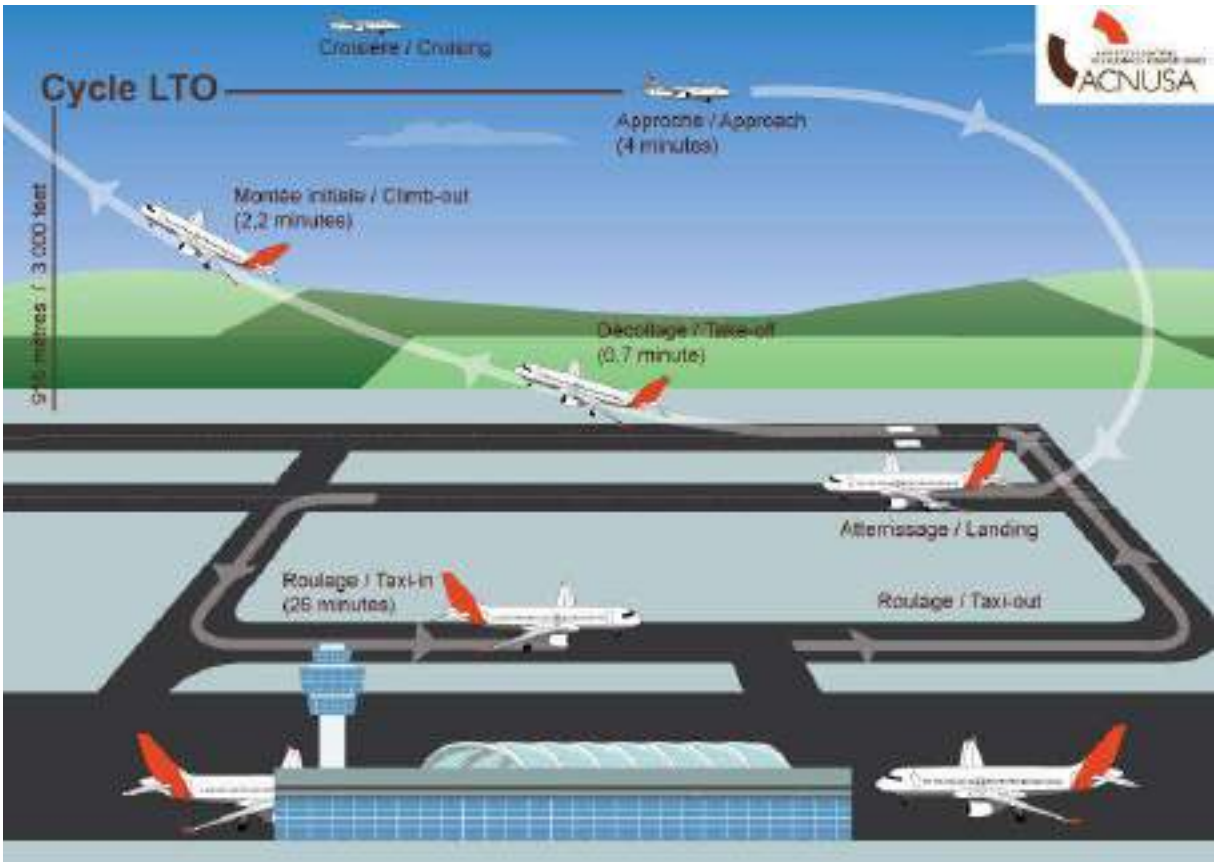


Figure 161: LTO cycle (Source: Acnusa)

The European Environment Agency (EEA) offers a tool called "Aviation LTO emissions calculator", which makes it possible to quantify pollutant emissions from aircraft, based on the standard LTO cycle.

Using this tool, calculations were made for Plaine Corail Airport, for emissions of nitrogen oxides, carbon monoxide, unburned hydrocarbons and also fuel consumption. Carbon dioxide emissions are calculated in order to assess the carbon footprint.

NMVOC will not be processed because their emissions are currently poorly known. Kerosene contains very few heavy metals, so they are not included in the calculations.

In regard to PM emissions, as the quantification of PM emitted by aviation has not been completed, it is not included in the study either. Indeed, in the absence of certified ICAO data, the available emission factors are based on obsolete studies (1997 and 2001) and insufficient in number to validate their results. Several working groups are underway, including the Particulate Matter Tasking Group, under the aegis of ICAO. Pending a better knowledge of PM emissions, it was decided not to carry out a calculation with too much inaccuracy.

The results of the current situation, based on the default LTO cycle (see Table 69Table 69: Duration and engine speed associated with the different phases of LTO cycle) expressed in kg per year, are presented in the following table.

Table 70: Gas emissions and fuel consumption per year

	CO emitted	**HC emitted**	**NOx emitted**	**SO_2 emitted**	**CO_2 emitted**	**Fuel consumption (kg/year)**
Emissions (kg/year)	3 777	470	2 950	324	1 005 020	324 200

Calculations take into account 1612 movements per year (traffic in 2017); these results will have to be compared with the forecast emission balances, taking into account the traffic linked to the new runway.

This baseline emissions inventory were supplemented by an air quality measurement campaign carried out by ARL in 2019 (see above).

The measurement campaign will be representative of the week in which it took place (including weather conditions and nomber of aircraft movements). By comparing the weather readings with the annual data, and the number of movements with the annual traffic, we will try to extrapolate the results to the average conditions of the whole year. However, this operation might not be reliable.

In the absence of a permanent air quality monitoring system, the assessment of the initial annual air quality requires to carry out measurement campaigns lasting several months, spread over the island's two seasons. ESIA's planning was not compatible with such a campaign, yet ARL could implement a monitoring program to this end.

6.7.3.3.4 Air quality issues

The air quality issue is due to the presence of sensitive populations living nearby and of the pre-primary school Le Caneton. The presence of agricultural parcels is also to be taken into account.

The aircraft traffic growth will lead to a significant increase in pollutant emissions; thus, the receptor sensitivity to the project is considered high.

6.7.4 Noise

6.7.4.1 General information about noise

Sound is a wave that travels through the air and makes it vibrate, from the sound source to the receiver: the ears. The vibration of air molecules causes a vibration of the eardrums, which results in an auditory sensation. Noise is used to describe the generally unpleasant perception associated with an unbalanced set of sounds.

A noise can be characterized by several objective criteria, such as level (or volume: low, high), frequency (or pitch: low, high) and duration of occurrence.

The usual scale for measuring noise is a logarithmic scale, which reflects the sensitivity of the human ear to pressure variations associated with the vibration of air molecules. Noise levels are thus expressed in decibels (dB). As low and high frequencies are not perceived in the same way by the human ear, a filter is applied to the decibel value to take this feature into account. This is referred to as "A" decibels, noted dB(A).

The diagram below shows some examples of sound levels associated with everyday noise and the associated auditory sensation.

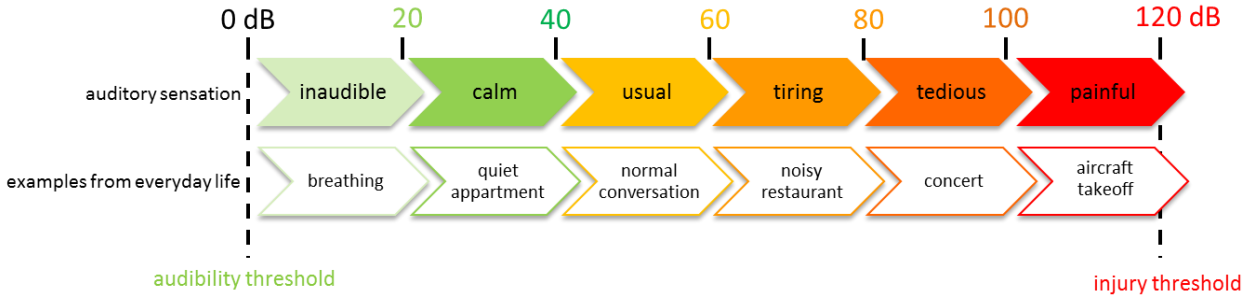


Figure 162: Diagram of sound levels

The propagation of noise in a given site depends on the conditions of the surrounding environment and in particular on the distance travelled, the ground effect (reflection or absorption of sound), the presence of obstacles and meteorology (temperature, wind, and/or humidity).

6.7.4.1.1 Noise indicators

*6.7.4.1.1.1 **LAeq:** equivalent sound pressure level (A-weighted)*

Noise is an essentially fluctuating phenomenon. It is the accumulation of sound energy received by an individual that is the most representative indicator of the effects of noise on humans.

This accumulation is reflected by the equivalent energy level noted LAeq. The LAeq is expressed in dB(A) and is defined as follows: "the equivalent LAeq level of a variable noise is equal to the level of a constant noise that would have been produced with the same energy as

the noise perceived during the same period. It represents the average acoustic energy perceived during the observation period".

The following diagram illustrates this definition.

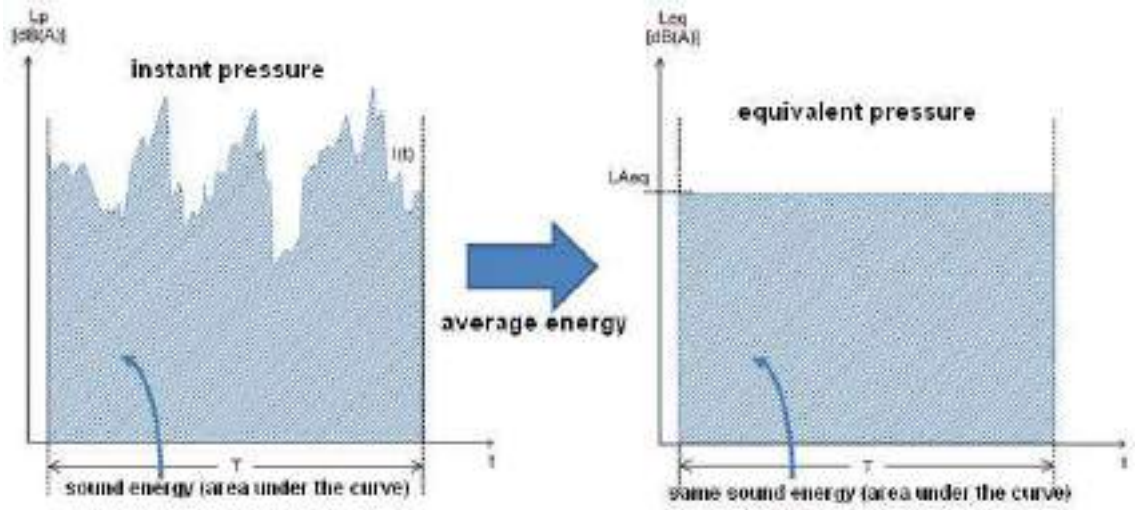


Figure 163: Illustration of the definition of the LAeq

*6.7.4.1.1.2 **DNL** "Day Night Level"*

This noise indicator is a LAeq noise level with a 10 dB weighting for the night-time period (22:00 to 7:00). This means a penalty of 10 dB is taken into account for noise caused by any aircraft movement at night (considered more annoying than during day-time).

*6.7.4.1.1.3 **Lden** "Level Day Evening Night"*

This noise indicator is a LAeq noise level with a 5 dB weighting for the evening period (18:00 to 22:00) and a 10 dB weighting for the night-time period (22:00 to 7:00). This means a penalty of 5 dB is taken into account for noise caused by any aircraft movement in the evening and 10 dB at night (movements during these periods are considered more annoying than during day-time).

6.7.4.1.2 Noise contours

A noise contour is a line on a map that represents equal levels of noise exposure. The contours for airport noise are usually shown in 5-decibel increments, for noise values from 50 to 75 and more.

Figure 164: Example of noise contours – French aerodrome Aix Les Milles

6.7.4.2 Noise guidelines

The environmental noise standards in Rodrigues are described in the Environment Protection Act. The regulations are:

Noise exposure limits to industrial noise
07.00 – 21.00 hrs 60 dB(A) LAeq

21.00 – 07.00 hrs 55 dB(A) LAeq

Noise exposure limits to neighbourhood noise
07.00 – 18.00 hrs 60 dB(A) LAeq

18.00 – 21.00 hrs 55 dB(A) LAeq

21.00 – 07.00 hrs 50 dB(A) LAeq

No specific regulation applies to airport noise.

In the “Environmental noise guidelines for the European Region”, published in 2018, the Wold Health Organisation (WHO) recommends limiting the exposure value to airborne noise to Lden 45 dB (40 dB for night-time noise), in order to avoid health impacts.

6.7.4.3 Ambient noise around Plaine Corail Airport

Noise sources around Plaine Corail Airport are mainly:

- Road traffic,
- Air traffic, and
- Airport activities.

As the local road network is sparsely used, except to serve the airport and the houses nearby, the ambient noise is mostly due to the activity of Plaine Corail Airport: aircraft movements, ground support vehicles and heavy vehicles used to transport goods and supplies.

6.7.4.4 Noise measurements campaign

6.7.4.4.1 Measurement protocol

The acoustic measurement campaign was carried out from 24/09/2019 to 29/09/2019.

6.7.4.4.1.1 Location

In total, 4 long-term measurements over 5 days points were distributed over the study area. They are located on the map shown below (see § results).

6.7.4.4.1.2 Typology

The measurements include a weekend during which air traffic could have been be higher (in practice there were systematically 4 aircraft per day).

The positions of the measurement points were defined from the 4 existing residential areas to the east, north and west of the airport. These are the most immediate sectors on which the project can potentially have an impact.

Noise measurements were performed with Class 1 equipment in accordance with French standard NFS 31-009 for precision sound level meters. Each measuring instrument was equipped with a rainproof kit and large windproof equipment to limit its effects.

These measurements are used to define the regulatory indices LAeq (07.00 – 18.00 hrs), LAeq (18.00 – 21.00 hrs) and LAeq (21.00 – 07.00 hrs).

6.7.4.4.1.3 Weather conditions

Weather conditions were recorded at the airport station.

Table 71: Meteorological Data at Plaine Corail

Weather conditions	Day				
	24/09/2019	25/09/2019	26/09/2019	27/09/2019	28/09/2019
Wind speed m/s (2m high)	5,1	4,7	4,6	5,0	4,4
Temperature °C	23,4	23,9	24,8	23,7	24,3
Rainfall mm	0,8	3,3	0,0	0,1	0,0
Nebulosity octas	5,2 / 8	3,8 / 8	3,6 / 8	5,8 / 8	3,2 / 8
Humidity %	85,8%	84,9%	83,8%	85,3%	76,6%

These results can be interpreted as follows.

Weather conditions	Day				
	24/09/2019	25/09/2019	26/09/2019	27/09/2019	28/09/2019
Wind speed m/s (2m high)	Vent fort	Vent fort	Vent fort	Vent fort	Vent fort
Wind direction	East	East	East	East	East
Temperature °C	from 21,9 to 24,5°	From 22,6 to 25,7°	from 23,2 to 27,0°	from 22,2 to 26,1°	from 22,4 to 26,5°
Rainfall mm	Very low	Low	None	None	None
Nebulosity octas	Cloudy	Covered weather	Covered weather	Cloudy	Covered weather
Humidity %	High	High	High	High	High

Day 1: The weather conditions were very windy and humid throughout the day, the measurement was disrupted.

Day 2: The weather conditions were very windy throughout the day and at times accompanied by showers, the measurement was very disturbed.

Day 3: Weather conditions were more stable, there was much less wind and the sky was clear, the weather impact was moderate.

Day 4: The weather conditions were very windy and the sky was clear, the measurement was very disturbed by the wind.

Day 5: The weather conditions were very windy and the sky was clear, the measurement was very disturbed by the wind.

In this area, conditions contributed to a slight decrease in measured noise levels.

It is always difficult when taking noise measurements in a windy place to ensure the validity of the measured data. Therefore, the microphones have been positioned close to the facades or roof in order to avoid the effects of gusts which could disrupt measurements.

A marked rainfall during the first 2 days is to be noted.

6.7.4.4.1.4 Aircraft overflights

The table below shows the aircraft movements recorded during the air quality measurement campaign. All aircraft are Air Mauritius ATR-72.

Table 72: aircraft movements recorded during the air quality measurement

Aircraft movement at Plaine Corail Airport for the period 24- 28 September 2019

SN	DATE	23-Sep-19	24-Sep-19	25-Sep-19	26-Sep-19	27-Sep-19	28-Sep-19
1	MK 120						
	Arrival	10:06 hrs	10.15 hrs	10.19 hrs	10.14 hrs	10:12	10:16
	Departure	10:50 hrs	10.55 hrs	10.53 hrs	10.54 hrs	10:38	10:45
2	MK 126/7						
	Arrival	13.06 hrs	no flight	no flight	no flight	13:30	no flight
	Departure	13.51 hrs				14:02	
3	MK 130/1						
	Arrival	14:31 hrs	14.49 hrs	14.40 hrs	14:59	14:36	14:26
	Departure	15.12 hrs	15.28 hrs	15.10 hrs	15:39	15:07	15:15
4	MK 140/1						
	Arrival	19.00 hrs	19.11 hrs	19.07 hrs	18:56	18:55	19:13
	Departure	19.32 hrs	19.38 hrs	19.32 hrs	19:25	19:29	19:50

6.7.4.4.2 Results

The table and map below show the overall noise levels measured by regulatory period.

Note: the 4 aircraft per day are divided into 3 of them over the period 07h00-18h00, only one over the period 18h00-21h00 and none during the night. The planes systematically land and take off in front of the wind, either on Rodrigues Island, from west to east.

Each measurement was treated separately in order to highlight the contribution of each aircraft to the overall level measured. This contribution is not always detectable depending on the specific environment at each point: ambient noise, wind gust, rain....

Table 73: overall noise levels measured

Measure	Date	Location	LAeq 7h-18h dB(A)	LAeq 18h-21h dB(A)	LAeq 21h-07h en dB(A)
PF1	from 24/09/2019 to 28/09/2019	Pointe Palmiste, Ile Rodrigues	59.5	55.0	50.5
PF2	from 24/09/2019 to 28/09/2019	Plaine Corail, Ile Rodrigues	55.5	53.0	50.0
PF3	from 24/09/2019 to 28/09/2019	Ecole les Canetons, Ile Rodrigues	66.0	47.0	45.5
PF4	from 24/09/2019 to 28/09/2019	Plaine Caverne, Ile Rodrigues	56.0	55.5	50.5

Figure 165 Noise measurements - location and results

6.7.4.4.2.1 Analysis

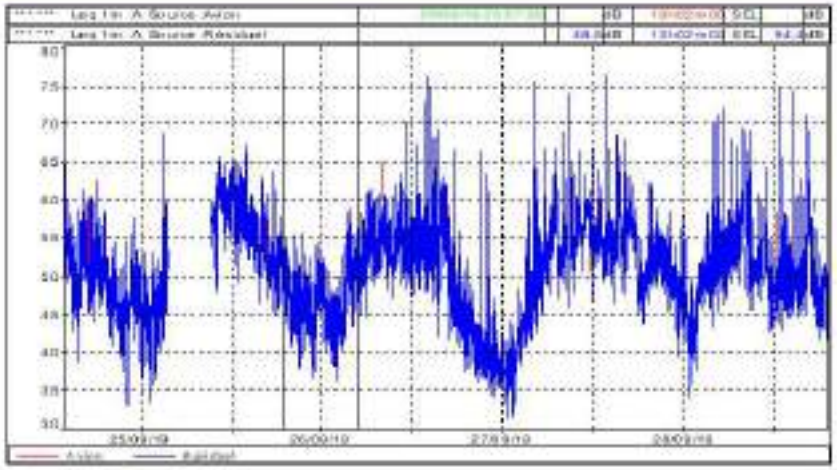
The detailed results of the noise measurements are shown below :

The measured noise levels (LAeq and L50);
The location (Name, Address, Location...) ;
The noise level;
A photo showing the position of the microphone on the front panel;
A photo showing the vision from the microphone;
The equipment used;
The temporal evolution of the recorded signal;
The main and secondary noise sources recorded;
The impact of meteorology.

PF1

Pictures & location

Temporal evolution



Details

Measure	PF1
Date et duration	From 24/09/2019 to 29/09/2019 (5 days)
Name & adress	M. Allas - Pointe Palmiste - Île Rodrigues
Device	Svan 971 – Svantek
Height	ground floor
Main noise source	Wind
Secondary noise source	Environment & household
Distance to airport	#1800m
Disturbance	Punctually wind & rain

Comments

The measurement was disrupted by weather conditions during part of the recording. Despite these disruptions, we tried to detect the landing peaks (western area of the airport) on the time evolution below. The presence of aircraft is not really noticeable at this measurement point. The red coding on the signal corresponds to the theoretical coding of aerial overflights. This makes it possible to establish the contribution of aerial overflights to the measured noise levels. Note: on the first day the measurement was interrupted due to a power failure

Conclusion

PF1	LAeq 7h-18h dB(A)*	LAeq 18h-21h dB(A)*	LAeq 21h-07h dB(A)*
Regulatory threshold	60.0	55.0	50.0
Aerial overflight contribution	33.5	37.0	0.0

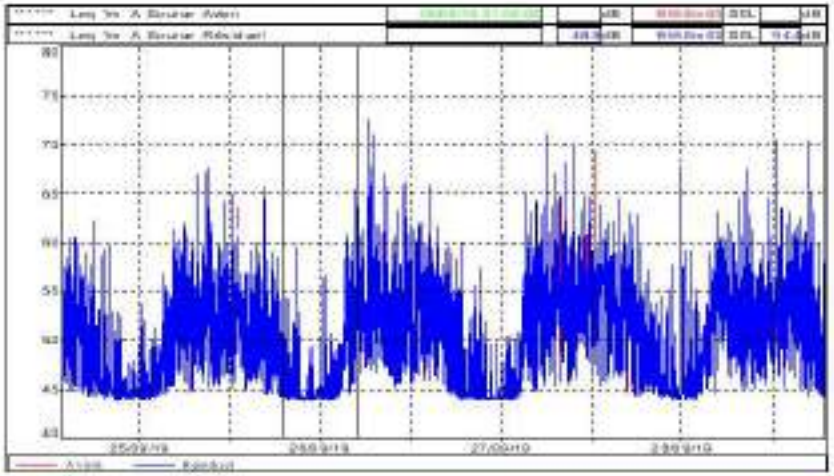
(*) rounded to the nearest 0.5 dB(A)

In conclusion, despite the disturbances due to climatic contingencies, the measured levels are below the regulatory acceptable thresholds (more than 25 dB(A) below the thresholds during the day and in the evening).

PF2

Pictures & location

Temporal evolution



Details

Measure	PF2
Date et duration	From 24/09/2019 to 29/09/2019 (5 days)
Name & adress	Mr. Prudence - Plaine Corail - Île Rodrigues
Device	Svan 971 - Svantek
Height	Ground floor
Main noise source	Noise
Secondary noise source	Plaine Corail road
Distance to airport	≠1200m
Disturbance	Punctually wind & rain

Comments

The measurement was disrupted by weather conditions during part of the recording. Despite these disruptions, we tried to detect landing or take-off peaks (area north of the airport) on the time evolution shown opposite. The presence of aircraft is not really noticeable at this measurement point. The red coding on the signal corresponds to the theoretical coding of aerial overflights. The latter makes it possible to establish the contribution of aerial overflights to the measured noise levels.

Note: The presence of the airport road in front of this measurement point is noted.

Conclusion

PF2	LAeq 7h-18h dB(A)*	LAeq 18h-21h dB(A)*	LAeq 21h-07h dB(A)*
Regulatory threshold	60.0	55.0	50.0
Aerial overflight contribution	39.5	34.5	0.0

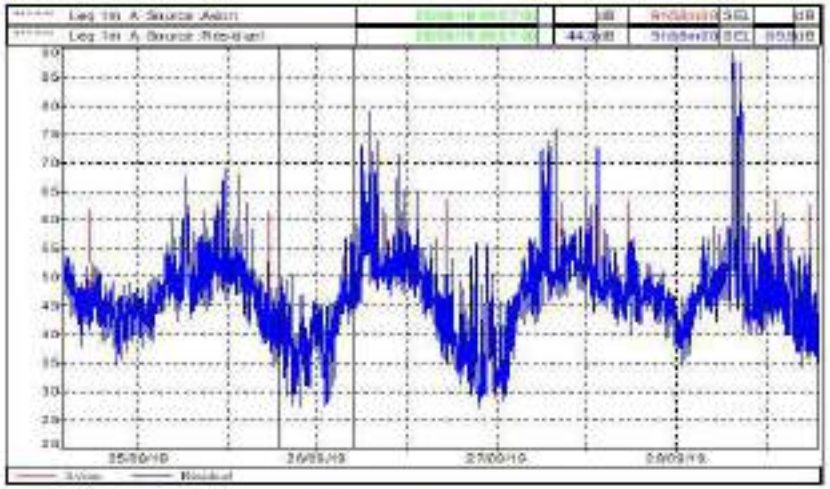
(*) rounded to the nearest 0.5 dB(A)

In conclusion, despite the disturbances due to climatic contingencies, the measured levels are below the regulatory acceptable thresholds (more than 20 dB(A) below the thresholds during the day and in the evening).

PF3

Pictures & location

Temporal evolution



Details

Measure	PF3
Date et duration	From 24/09/2019 to 29/09/2019 (5 days)
Name & adress	Pre primary school les Canetons
Device	Svan 971 – Svantek
Height	Ground floor
Main noise source	School and weather conditions
Secondary noise source	Cutting of a tree with a chainsaw
Distance to airport	#1000m
Disturbance	Punctually wind, rain, children...

Conclusion

PF3	LAeq 7h-18h dB(A)*	LAeq 18h-21h dB(A)*	LAeq 21h-07h dB(A)*
Regulatory threshold	60.0	55.0	50.0
Aerial overflight contribution	36.0	39.0	0.0

(*) rounded to the nearest 0.5 dB(A)

Comments

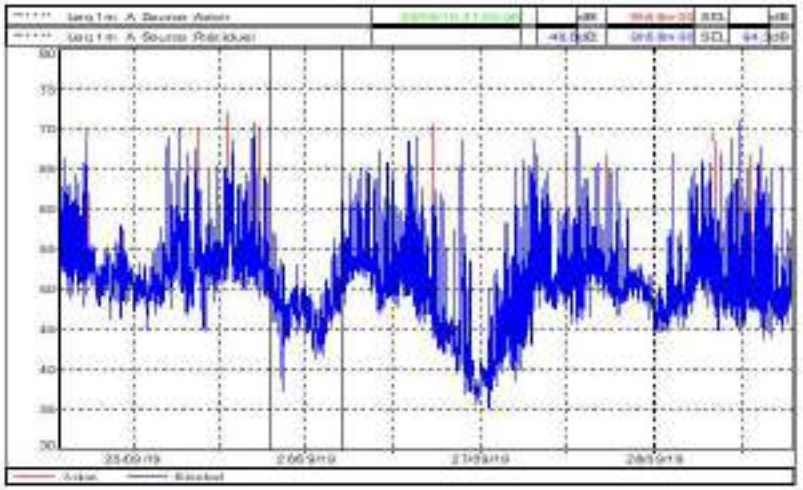
The measurement was disrupted by school recess periods, weather conditions during part of the recording and by brushing (very noisy - see peaks opposite) of the school garden. Despite these disruptions, we detect many takeoff peaks (area east of the airport) on the time evolution opposite. The presence of aircraft is perceptible at this measurement point. The red code on the signal corresponds to the code for aerial overflights. The latter makes it possible to establish the contribution of aerial overflights to the measured noise levels.

In conclusion, despite the disturbances due to climatic contingencies, the measured levels are below the regulatory acceptable thresholds (nearly 25 dB(A) below the thresholds during the day and only 15 in the evening because of parasitic noise).

PF4

Pictures & location

Temporal evolution



Details

Measure	PF4
Date et duration	From 24/09/2019 to 28/09/2019 (5 days)
Name & adress	Mrs Larcher - Plaine Caverne - Île Rodrigues
Device	Svan 971 - Svantek
Height	Ground floor
Main noise source	Road
Secondary noise source	Environnement (noise from humain activities)
Distance to airport	≠900m
Disturbance	Punctually rain, noise, children...

Results

The measurement was disrupted by weather conditions during part of the recording. Despite these disruptions, we detected the takeoff peaks (area east of the airport) on the time evolution shown opposite. The presence of aircraft is perceptible at this measurement point. The red code on the signal corresponds to the code for aerial overflights. The latter makes it possible to establish the contribution of aerial overflights to the measured noise levels.

Conclusion

PF4	LAeq 7h-18h dB(A)*	LAeq 18h-21h dB(A)*	LAeq 21h-07h dB(A)*
Regulatory threshold	60.0	55.0	50.0
Aerial overflight contribution	42.0	46.0	0.0

(*) rounded to the nearest 0.5 dB(A)

In conclusion, despite the disturbances due to climatic contingencies, the measured levels are below the regulatory thresholds (just under 20 dB(A) below the thresholds).

6.7.4.4.2.2 Conclusion

The noise measurements present the pre-existing sound environment. In each of the sectors studied, there is a strong impact of the elements (rain & wind) on the "sound" feeling of the site as well as significant human activity.

The measurements highlight more clearly a greater impact due to aircraft take-offs (on the west side of the airport) while landings are less noticeable to the east of the site (the proximity of the building to the airport in the west also explains this perception).

However, the measurements show that the permissible thresholds for neighbourhood noise are not exceeded by considering the contribution of airport flights alone: overall, air traffic generates noise levels that are nearly 20 dB(A) lower than the permissible thresholds during the day and evening (not at night when there is no overflight).

6.7.4.5 Aircraft noise emissions

The baseline noise levels in the area are assessed with a calculation tool compliant with ICAO recommendations (the Integrated Noise Model software, 7.0d). The calculations take into account:

Aircraft movements,
Aircraft types,
Flight paths,
Runway alignment, and
Annual average weather conditions.
Other noise sources from airport activities are assumed to be limited compared to aircraft noise.

The resulting noise contours around the airport are represented on the map below indicating the presence of population; thus, this map illustrates the exposure of populations to current aircraft noise. The scale representing sound levels range from Lden 45 dB(A) (very low noise exposure) to 85 dB(A) (very high noise exposure). The noise indicator Lden, used in European noise directives and French noise expoisure plans, has been chosen because it takes into account the nuisances felt during evening and night periods.

Figure 166: Airport noise contours

As few airplanes land on Plaine Corail Airport, and they are quite quiet, the noise curves are small. No dwelling or noise-sensitive building has been identified in the footprint of the lowest noise curves that define noise exposure down to 45 dB. This confirms that populations are currently almost not exposed to airport noise.

6.7.4.6 Issues

The noise issue is due to the presence of sensitive populations living nearby and of the pre-primary school Le Caneton.

The aircraft traffic growth will lead to a significant increase in noise; **thus, the receptor sensitivity to the project is considered high**.

6.7.5 Summary: air and noise sensitivity

The area around the airport is sparsely populated, yet it should be noted that a school is located to the east of the airport and requires special attention. In the south of the island, ambient air quality and sound environment are directly linked to the airport's activities.

The commissioning of an additional runway will increase noise and pollutant emissions from the airport platform; the impact of the project will be assessed by comparing the noise curves and pollutant quantities calculated for the baseline.

Table 74: air and noise sensitivity

Theme	Sub-theme	Receptor	Sensitivity
Air quality and noise	Air quality	Population exposed	High
	Noise	Population exposed	High

6.8 Heritage resources and visual environment

The purpose of this chapter is to identify elements of historical heritage, cultural heritage, but also places of worship or of a religious nature.

The presence or potential presence of archaeological remains and the palaeontological richness of the site are assessed.

Finally, the landscape characteristics of the site are described.

This baseline will provide a basis for assessing the impacts of the project, including building demolitions, land use changes, earthwork and general changes in topography.

6.8.1 Area of influence

The relevant area of influence is the restricted area, except for the visual environment, which is addressed on the large area level.

6.8.2 Cultural heritage resources

The island's interest lies mainly in the environmental heritage it possesses, constituted by its landscapes, beaches, caves, or by the different species of fauna and flora.

The **National Heritage Fund (NHF)** is mandated to identify, protect, manage and promote the Mauritius National heritage and so to develop a sense of belongingness in all Mauritians by caring for the past and bequeathing it to the future.

The Republic of Mauritius ratified the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Convention on the Safeguarding of Intangible Cultural Heritage on June 4th 2004. The Convention's General Provisions acknowledges "the importance of intangible cultural heritage as a mainspring of cultural diversity and a guarantee of sustainable development" and yet observes that globalisation and other detrimental forces are a grave threat to the future of this unique kind of heritage.

To honour this commitment and endeavour the safeguarding of intangible cultural heritage, Mauritius has undertaken several measures to research, inventory and document its intangible heritage. In June 2010, the Government of Mauritius designated the National Heritage Fund as a National Repository of Intangible Cultural Heritage. The National Heritage Fund has undertaken an inventory of intangible cultural heritage. In 2013, the Traditional Mauritian Sega and Bhojpuri Geet-Gawai files were sent to UNESCO for possible inscription on the UNESCO Representative List of Intangible Cultural Heritage of Humanity. In 2014, the Traditional Mauritian Sega was inscribed on the UNESCO Representative List of Intangible Cultural Heritage of Humanity.

There are also six National Heritage Sites in Rodrigues, none of which are located within the project area of influence

- Cannon (Pointe Canon),
- Ex-Administration Block (Port Mathurin),
- Garde Post (Mont Venus),
- Ben Gontron House (Barclay Street, Port Mathurin),
- Lieu de Mémoire, L'Union, Rodrigues, and
- Residency Buildings (Port Mathurin)

6.8.2.1 Information collected during the field interviews

Interviews carried out throughout the project's area of social influence have systematically integrated questions on the presence and possible nature of cultural heritage sites in the direct impact area (Bangélique, Sainte Marie Hill, Corail Point). Not having obtained information in relation to this type of heritage, no documentation and geo-referencing of the sites could be applied.

In no case, neither during the interviews nor during the visits carried out in the company of the inhabitants, was the presence or the possible nature of cultural heritage sites mentioned in the direct impact zone (Bangélique, Sainte Marie Hill, Pointe coral). In the discussions, interesting suggestions were made by some inhabitants of Sainte Marie, in relation to the attendance of caves and other natural places particularly conducive to meditation and spiritual activities. None of these places are located in the project area, and the project will not prevent access in any way.

It is thus possible to conclude that the area does not present any type of site or material object associated with any identity, religious, historical value collectively recognized as structuring the local society.

6.8.3 Archaeology and palaeontology

In the restricted area, several sites have been identified as having a paleontological interest.

Indeed, the underground hydrographic network has formed karst structures like cracks and caves throughout Plaine Corail.

These Karst formations in Plaine Corail are ancient (up to 500,000 years) and are particularly interesting under the point of view of sedimentology and fossil conservation.

The Grotte Fougère cave contains more than 3000 years of sediment filled with a lot of fossils in an excellent state of conservation. This cave is in a direct alignment with the new runway route. These sediments probably contain an important heritage: the DNA from extirpated species. So, the Grotte Fougère must be considered as an important site which has to be protected. A little further to the north, there are other interesting cavities, which are important for the paleoclimate study, especially climatic variations in the Indian Ocean between 6000 and 3000 years BC. This includes Grotte Gastonia, the hydrological system of which is potentially vulnerable, or Grotte Cabris, which is threatened by its proximity to the new runway.

These formations also contain fossils and concretions (stalactites/stalagmites).

6.8.4 Landscape and visual environment

The role of landscape is to understand the dialogue which exists between man and nature. A reading of the landscape of this territory was made and has been translated into a social interpretation of nature.

The main question is to know what makes up the landscape near the airport of Rodrigues. Beyond the simple appearance, the issue is to identify the wealth of components and the landscape characteristics of this territory.

In other words, this section seeks to understand how the new runway project involves the landscape components.

Field observation is a first step in responding to the problem. A step back on the territory then makes it possible to place the airport of Rodrigues in a historical and geographical context, rather than confining it within its boundaries.

By reviewing all the existing documents relating to the area of influence and the project, but also all topographical data, it is possible to place the airport in its context.

6.8.4.1 Area of influence

From a visual and landscape perspective, the area of influence exceeds the large area of influence defined in the introduction.

For the purposes of assessment, visual and landscape impact assessment, the study area is defined as the area in which the project can be seen by the human eye. This is called the Zone of Theoretical Visibility or Zone of Visual Influence.

ZTV or ZVI analysis is the process of determining the visibility of an object in the surrounding landscape. The process is objective in which areas of visibility or non-visibility are determined by computer software using a digital elevation dataset. The output from the analysis is used to create a map of visibility.

The ZTV/ZVI map below illustrates the potential (or theoretical) visibility in the landscape of the Mount Saint-Mary. The phrase "potential visibility" is used to describe the result because the analysis does not take into account any landscape artefacts such as trees, woodland or buildings etc. The analysis is made on the basis of topography alone.

The results are not intended to show the actual visibility of the Mount Saint-Mary, they are intended to indicate where it may be visible from. Therefore, it gives an indication about the project area of influence in the existing landscape.

Actual visibility can only accurately be determined by site survey since there are a multitude of local variables that may affect lines of sight. On the other hand, the ZTV/ZVI map does show where an object definitely cannot be seen.

6.8.4.2 Main landscape features

The airport area, like the entire territory of Rodrigues, presents a rugged relief, which is found everywhere except near the coastal fringe.

This relief presents a challenge with regard to the integration of the project into the landscape and the stability of the land crossed. Natural hazards are a major constraint: sinkholes, cyclones, storm surges, etc. The climate is therefore also a major challenge.

Rodrigues' silhouette is one of a picturesque "green island".

A forest mantle covers the tops of the main mountains and parts of the hill sides (but there is no mangrove swamp to underline the coast). This relatively homogeneous and systematic coverage on the landform is explained by the climate. It testifies to an ancient tropical woodland that once covered the entire island.

The contrasts are not very well marked from one sector of the island to another; due to patches of shrubby vegetation and thickets on hill sides that make large and seamless transitions. It is possible to consider three large landscape units:

The mountains covered with forest mantle,
The vast expanses of grassland on hill sides and plains, and
The lagoon islands.
The island has very few urban areas and artificial spaces.

6.8.4.3 Landscape components

To the southwest of Rodrigues Island, the airport stands amid a large plain (Pointe l'Herbe, Plaine Corail, Plaine Coco) backed with forested mountains with secondary landform (hills) in the mid distance, and faces a steep shore with lagoon islands.

Figure 167: Locally, the only built visual reference points are the airport buildings

Figure 168: The large plain backed with forested mountains and hills in the mid distance

6.8.4.3.1 Large plain

The area surrounding the airport is mainly a pastoral land characterized by alternating grassland and thickets, far from urban or inhabited areas destined to be urbanized in the near future. Locally, the only visible reference points are the airport buildings. Structuring elements, such as hedgerows or infrastructures, are rare.

The plain area is marked by open landscapes of large and flat grassland and retains a countryside atmosphere. The development of urbanisation, and thus the change of (rural) character do not appear to threaten this area.

Figure 169: The plain area is marked by open landscapes of large grassland

6.8.4.3.2 Field crop areas

These spaces are open spaces, of geometric shapes, often characterized by monoculture and representing small plots. A few hedges surround these areas.

6.8.4.3.3 Urbanized spaces

Urbanised areas are made up of buildings that are not quite typical of the local culture, surrounded by hedges or green areas. These buildings have roofs made of corrugated sheet metal or flat concrete roof. The urbanized areas of the area of influence are removed from the airport and almost not visible from the project area.

6.8.4.3.4 Artificial or semi-artificialized spaces

The existing airport is already quite well integrated into the landscape: large areas are grassland within the airport's footprint, thus retaining the landscape character of large plain.

6.8.4.3.5 Rivers

The Quitor stream flows into the Anse Quitor just outside the airport. Cut valleys and high gradient slopes are the main characteristics of Rodrigues' rivers.

6.8.4.4 Landscape issues and landscape impacts

Overall, the project is part of a context of anthropogenic pressure on already fragile natural environments and landscapes.

Regardless of the alternative chosen, the expected impacts on the landscape will be significant. The total volume of excavation is estimated at 3 million m^3 and will entail the cutting of Sainte Marie Hill as per the Preliminary design Report. The construction of the new infrastructure will require a particular intention in order to limit the inevitable consequences on the environment and the landscape.

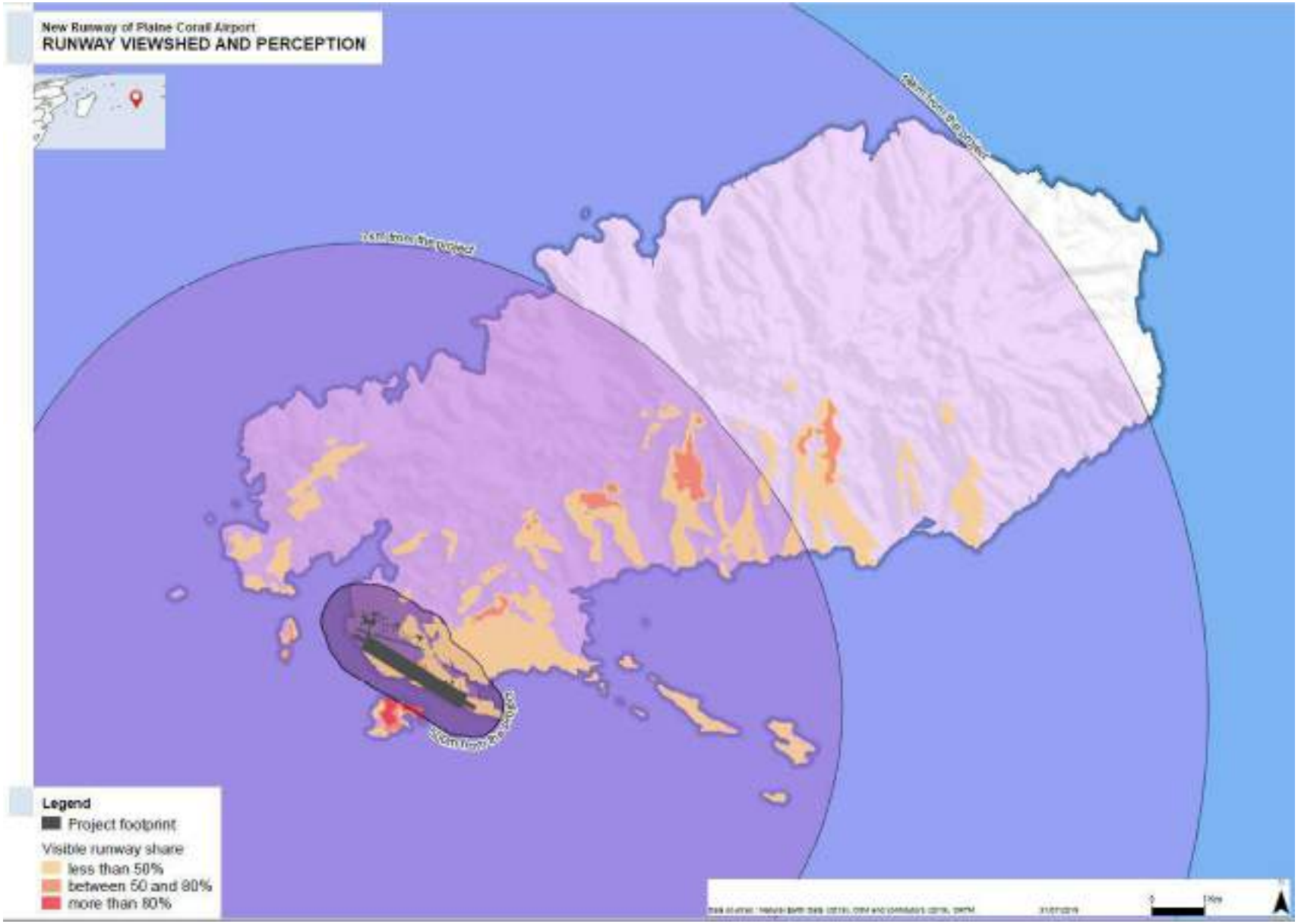
The landscape impacts and challenges are very diverse. They are of two kinds: immediate and medium-term.

Figure 170: Grazing is the most common form of anthropogenic pressure on landscape and environment

6.8.5 Summary: cultural and visual environment sensitivity

Table 75: cultural and visual environment sensitivity

Theme	Sub-theme	Receptor	Sensitivity
Heritage resources and visual environment	Cultural heritage resources	Presence of cultural site	Low
	Archeology and paleonthology	Presence of cultural site of archaelogical or palaeonthological interest	High
	Landscape end visual environment	Living environment and site visibility	High


New Runway of Plaine Corail Airport
RUNWAY VIEWSHED AND PERCEPTION
Legend
Project footprint
Visible runway share
less than 50%
between 50 and 80%
more than 80%


New Runway of Plaine Corail Airport
RUNWAY VIEWSHED
Page 1 sur 12
Legend
Project Footprint
Visible runway share
less than 50%
Roads
Footway
Residential
Secondary
Landscape impact around airport
Landscaped impact 0-500m
Landscaped impact 500m-7km


New Runway of Plaine Corail Airport
RUNWAY VIEWSHED
Page 2 sur 12
0-500m
Legend
Project Footprint
Visible runway share
less than 50%
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Roads
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New Runway of Plaine Corail Airport
RUNWAY VIEWSHED
0-500m
Legend
Project Footprint
Visible runway share
less than 50%
between 50 and 80%
more than 80%
Roads
Footway
Residential
Secondary
Landscape impact around airport
Landscaped impact 0-500m
Landscaped impact 500m-7km


New Runway of Plaine Corail Airport
RUNWAY VIEWSHED
Page 4 sur 12
0-500m
Legend
Project Footprint
Visible runway share
less than 50%
between 50 and 80%
Roads
Footway
Residential
Secondary
Landscape impact around airport
Landscaped impact 0-500m
Landscaped impact 500m-7km


New Runway of Plaine Corail Airport
RUNWAY VIEWSHED
Page 6 sur 12
Legend
Project Footprint
Visible runway share
less than 50%
Roads
Footway
Residential
Secondary
Landscape impact around airport
Landscaped impact 0-500m
Landscaped impact 500m-7km


New Runway of Plaine Corail Airport
RUNWAY VIEWSHED
Page 1 sur 12
Legend
Project Footprint
Visible runway share
less than 50%
between 50 and 80%
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Residential
Secondary
Landscape impact around airport
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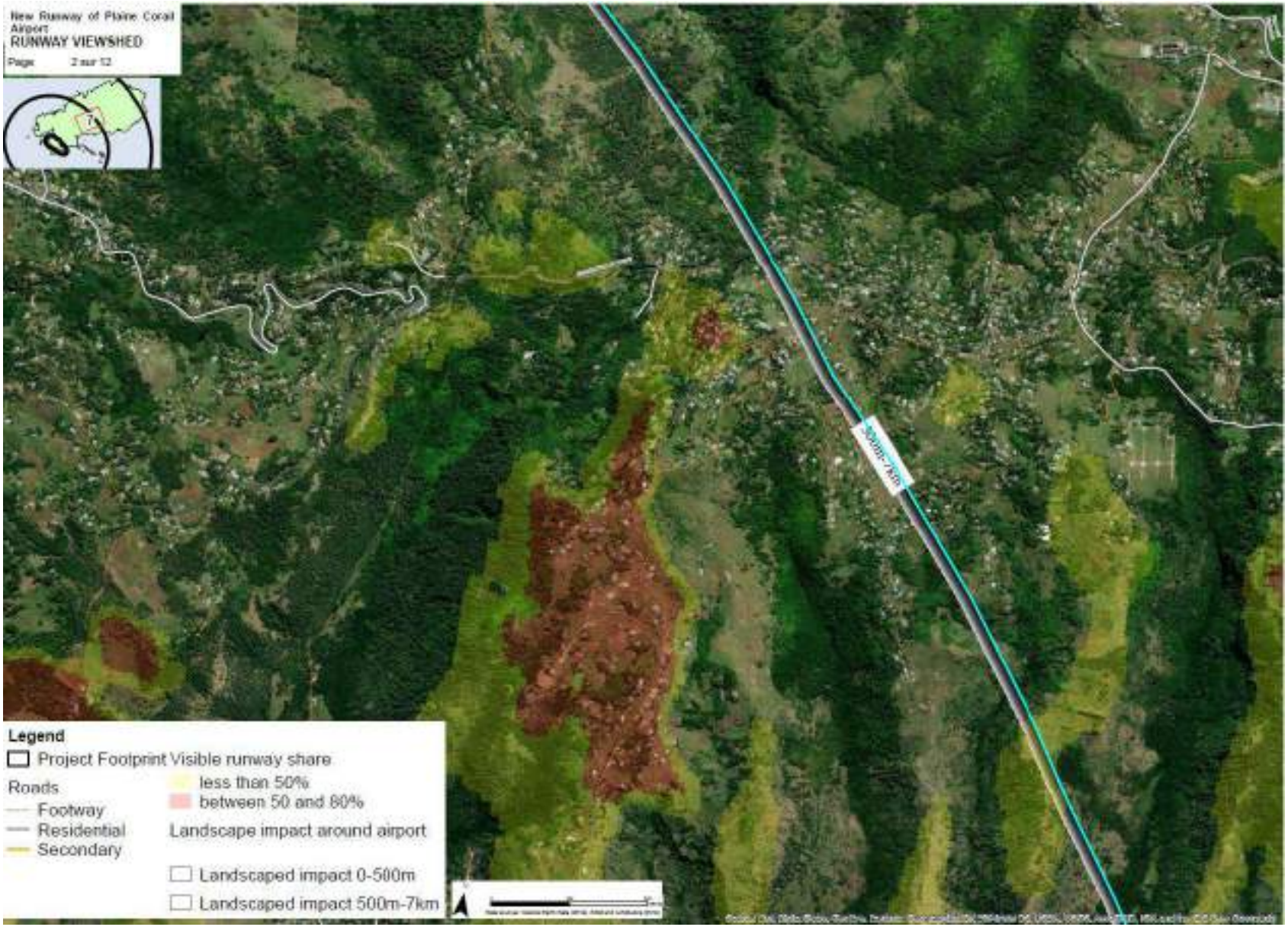
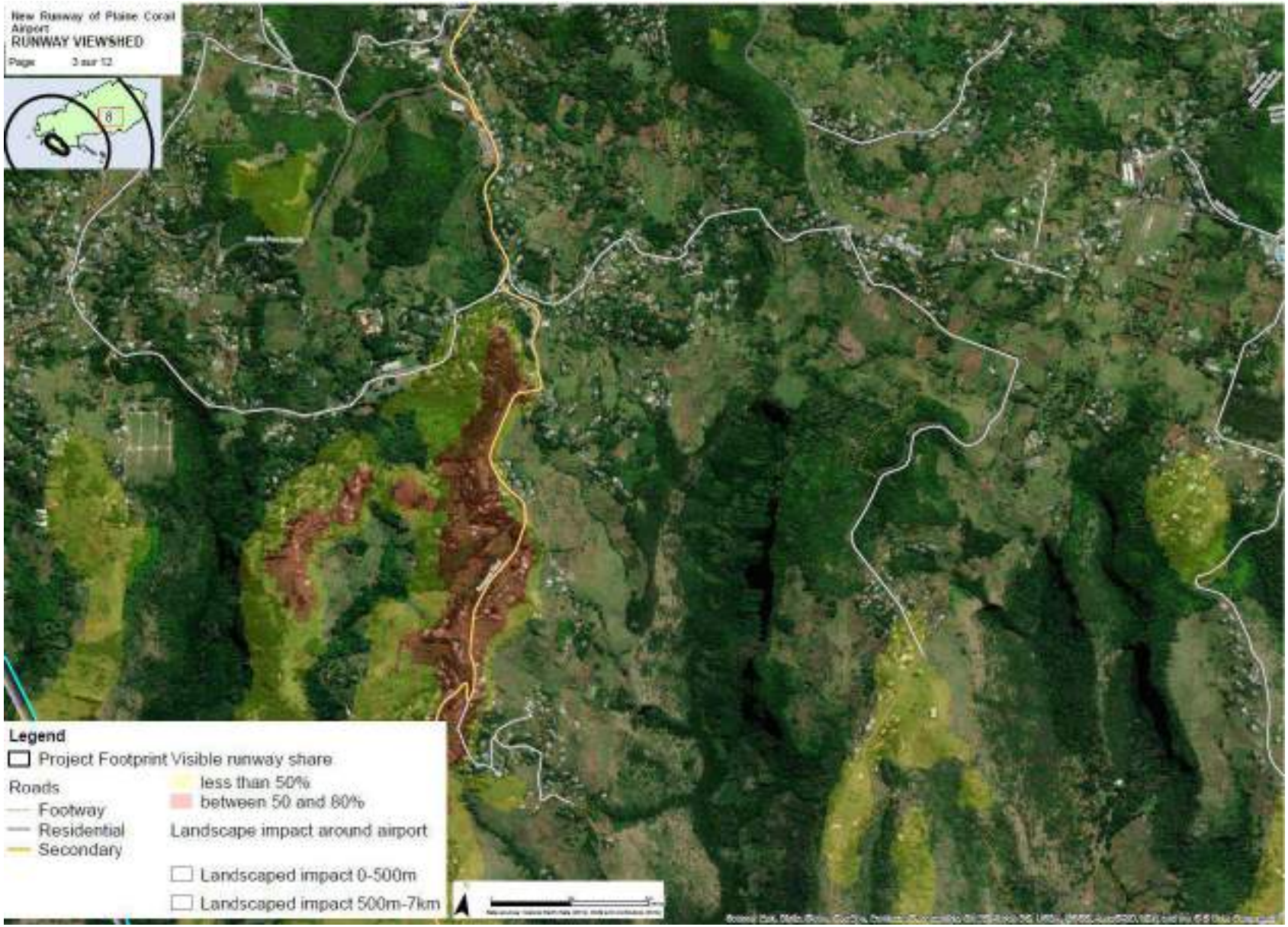
Landscaped impact 500m-7km


New Runway of Plaine Corail Airport
RUNWAY VIEWSHED
Page 2 sur 12
Legend
Project Footprint
Visible runway share
less than 50%
between 50 and 80%
Roads
Footway
Residential
Secondary
Landscape impact around airport
Landscaped impact 0-500m
Landscaped impact 500m-7km


New Runway of Plaine Corail Airport
RUNWAY VIEWSHED
Page 3 sur 12
Legend
Project Footprint
Visible runway share
less than 50%
between 50 and 80%
Roads
Footway
Residential
Secondary
Landscape impact around airport
Landscaped impact 0-500m
Landscaped impact 500m-7km


New Runway of Plaine Corail Airport
RUNWAY VIEWSHED
Page 4 sur 12
Legend
Project Footprint
Visible runway share
less than 50%
between 50 and 80%
Roads
Footway
Residential
Secondary
Landscape impact around airport
Landscaped impact 0-500m
Landscaped impact 500m-7km


New Runway of Plaine Corail Airport
RUNWAY VIEWSHED
Page 5 sur 12
Legend
Project Footprint
Roads
Footway
Residential
Secondary
Visible runway share
less than 50%
between 50 and 80%
Landscape impact around airport
Landscaped impact 0-500m
Landscaped impact 500m-7km


New Runway of Plaine Corail Airport
RUNWAY VIEWSHED
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11
Legend
Project Footprint
Visible runway share
less than 50%
between 50 and 80%
Roads
Footway
Residential
Secondary
Landscape impact around airport
Landscaped impact 0-500m
Landscaped impact 500m-7km


New Runway of Plaine Corail Airport
RUNWAY VIEWSHED
Page 7 sur 12
0-500m
0-500m
Legend
Project Footprint
Visible runway share
less than 50%
between 50 and 80%
more than 80%
Roads
Footway
Residential
Secondary
Landscape impact around airport
Landscaped impact 0-500m
Landscaped impact 500m-7km

6.9 Conclusion: main issues of the baseline

The main issues identified in the baseline assessment are:

The karstic system, involving a risky geology and a high sensitivity of groundwater, to be put into perspective of the scarcity of fresh water,
The paleontological value of Grotte Fougère located next to the proposed runway alignment
Many protected species, especially floristic ones such as *Foetidia Rodriguesiana*, and the vicinity of the Anse Quitor reserve and the François Leguat reserve, and of dry forest habitat,
Marine reserves and habitats, and marine species such as *Acropora Formosa* and marine turtles,
The expected change in the landscape resulting from the development due to the massive volumes of earthwork involving the cutting of the St Marie Hill, and
Inhabited villages in the project area, and agricultural and fishing activities.
Two particularly important risks must be considered in this inventory:

Presence of a critical habitat inside of which is located the control tower in the preliminary design. However, the control tower can be moved as part of the detailed design, thus avoiding any impact on the habitat.
The need to move villages in which approximately 30 families live. The resettlement of these families is the subject of a concerted approach that is already well advanced locally. This impact should also be reduced.
As is the case for any project, other predictable impacts can already be numbered; (noise, air pollution, impact on fauna and flora, impact on the socio-economic development, etc.). These shall be mitigated by avoiding or compensating measures.

7 Preliminary environmental, social impacts and mitigation measures

7.1 Definitions and methodology

7.1.1 Project's phase considered in this study

This study is based on the preliminary design stage. During this first design phase, there is still a possibility to study several options. Therefore, the project is not confirmed, and some elements can be modified. However, all required field investigations have been carried out at this time and confirm that the project is feasible.

The next design step will be the detailed design, which consists of the final production detailed architectural and engineering drawings of the project's physical components. The detailed design also aims to ensure of the financial viability.

In order to consider all the potential consequences of the project, the impacts were studied with a broad vision. So, it is necessary to note that certain of these impacts will be avoided when the project is finalized.

For example, an impact of the project has been studied on the caves 'Grotte Fougère' and 'Grotte Petit Lac' which are in proximity of the new runway, even if the detailled design will avoid them.

7.1.2 Methodology for impact assessment and rating

In previous aspects of this study, receptors were defined and evaluated.

The chapter below aims to evaluate the consequences of the project (impacts), on all the receptors identified in the baseline.

For each theme, the impacts are defined and classified according to whether they are:

Temporary work impacts. These impacts are intended to appear during the project implementation phase, but to disappear once the works phase is completed (e.g. noise caused by the work equipment);
Definitive work impacts. These impacts are intended to appear during the works phase, and to continue once the work is completed (e.g. destruction of habitat located in the project footprint);
Operational impacts. These impacts are linked to the very existence and operation of the project (e.g. noise caused by the planes landing and taking off).
Each identified impact was numbered, then the following protocol was carried out:

For each of these three types of large impacts, an assessment of the intensity was first conducted and rated on the basis of their severity (impact severity) as : 1 - not significant, 2 - low, 3 - medium, 4 - high, 5 - major.

Table 76: Impact severity

Impact severity	Not significant	Low	Medium	High	Major

The severity impacts were confronted with the sensitivity of the issues they affect. The evaluation of impact severity and receptors sensitivity is done regarding the previously described social impact assessment process and according to the various consultations and meetings with stakeholders during the field study. This provides the level of impact (impact magnitude). The severity of the social impacts and sensitivity of the receptors are then combined through a matrix to obtain the magnitude of the impact. This matrix applies both to adverse and positive impacts. The specific criteria used to assess the magnitude of each type of social impact are those defined in the assessment of impacts. The table below illustrates the magnitude matrix of social impacts:

Table 77: Magnitude matrix of social impacts

Impact severity	Not significant	Low	Medium	High	Major
Receptor sensitivity					
Low	Negligible	Low	Low	Low	Medium
Medium	Negligible	Low	Low	Medium	High
High	Negligible	Low	Medium	High	Major
Major	Low	Medium	High	Major	Major

Following the identification and assessment of impacts, avoidance, reduction and impact compensation measures have been defined and numbered. The same measure can correspond to avoiding or mitigating several impacts.
Finally, to correct previously identified impacts, these measures made it possible to carry out a new assessment of the impacts intensity. This is the mitigated impact or residual impact.

7.1.3 Methodological specificities for certain themes

7.1.3.1 Social impacts assessment

7.1.3.1.1 Identification of the social impacts and principal categories of impacts

Before considering the assessment of social impacts, it is necessary to clearly identify them. To do this, it is necessary to determine the sources of these impacts, which amounts to distinguishing all the factors that could have an effect, positive or adverse, on the socio-economic environment.

These sources of impact are therefore linked to the work and activities needed and established during works and operational phases of the project.

The identification of impacts continues through their categorisation through the socio-economic variables that characterize the communities studied.

Impacts on local governance and social dynamics
The aim is to understand to what extent the presence of the project will contribute to the modification of the balances and social relations within the communities.

Impacts on demography and migration

The aim is to measure the impact of the project on the demographic evolution of the villages by focusing on the number, origin and motivation of the newcomers.

Impacts on land
The aim here is to assess the relocation impacts induced by the project in particular with regard to the loss of habitat, collective infrastructures and agricultural and grazing areas.

Economic impacts
These are the impacts on livelihoods such as farming and livestock activities, fishing, and local economic context such as employment, trade, etc.

Impacts on community development potential
The aim here is to measure the impacts it might have in terms of the development of communities living in the vicinity of the project area.

Impacts on the living environment
These are the visual impacts such as changes induced in the landscape but also noises, vibrations, odours, etc.

Public health impacts
The aim of the airport runway extension project is to measure the evolution of conditions of access to health services.

Impacts on cultural heritage
For the Rodrigues airport runway expansion project, the main aim is to identify cultural heritage sites to be displaced or destroyed, ancestral practices that may be abandoned as a result of changes in the ways of life. Preliminary studies have also shown that there are no cultural sites or practices on the areas directly or indirectly impacted.

Impacts on the safety of people and property
The aim is to measure the different types of risks associated with the safety of people and property such as theft, lack of road safety, and risks of intrusion on the project sites or even social tensions in relation to the project.

Cumulative impacts
Cumulative impacts are the result of the accumulation and interaction of several direct and indirect impacts generated by the same project or by several projects over time and space and which can lead to abrupt or gradual changes in the receptor media.

7.1.3.1.2 Assessment of social impacts and mitigation measures

The assessment of social impacts is developed from a series of indicators that help to highlight the complexity of the dimensions of an impact. The impacts of the project are addressed according to their nature and importance.

The impacts can be either positive (improvement of the components of the environment) or adverse (deterioration of the components of the environment).

To measure the importance of social impacts, indicators are accompanied by variables that express the result of applying an indicator to a given situation. The importance of an impact refers to the changes caused by the project to a component.

7.1.3.1.2.1 Social Impact Assessment Process

Social impact assessment is a process of assigning indicators and their variables in order to assign a value to each impact. The evaluation of these impacts revolves around four questions:

Predictive question:
What will happen to the communities, their living conditions and their activities as a result of the project being implemented?

Evaluation question:
Does this impact pose a problem and how important is it?

Mitigation question:
If the impact is important, is there a solution to avoid or reduce the negative effects or, conversely, to improve the positive effects?

Residual impact evaluation question:
Is the impact still important following the implementation of mitigation measures?

7.1.3.1.2.2 Severity of social impacts

The impact assessment thus gives a description of what will happen to the communities while specifying and quantifying, to the extent possible, the intensity of the impacts.

Spatial limits of the impact:
This corresponds to the scope of the project's effects on the social component under study.

Impact duration:
This corresponds to the period during which the impacts will affect the studied component.

Probability of the impact:
This corresponds to the actual probability that an impact can affect a component.

Intensity of the impact:
This is determined by the intensity of the disturbances induced for the populations subject to impact. The magnitude depends on the degree of disturbance, but also on the number of people affected in relation to the total population of the area considered.

Reversibility of the impact:
This means the possibility for an impact to be mitigated to the point that the impacted environment returns to its initial state.

7.1.3.1.2.3 Magnitude of social impact

The matrix of magnitude is used to cross the receptor sensitivity and the severity of the impact.

7.1.3.2 Landscape and visual impact assessment

7.1.3.2.1 Area of influence

For the purposes of assessment, visual and landscape impact assessment, the study area is defined as the area in which the project can be seen by the human eye. This is called the Zone of Theoretical Visibility or Zone of Visual Influence.

ZTV or ZVI analysis is the process of determining the visibility of an object in the surrounding landscape. The process is objective in which areas of visibility or non-visibility are determined by computer software using a digital elevation dataset. The output from the analysis is used to create a map of visibility.

The ZTV/ZVI illustrates the potential (or theoretical) visibility in the landscape of the Mount Saint-Mary and new runway. The phrase "potential visibility" is used to describe the result because the analysis does not take into account any landscape artefacts such as trees, woodland or buildings etc. The analysis is made on the basis of topography alone.

The results are not intended to show the actual visibility of Mount Saint-Mary or the runway, they are intended to indicate where it may be visible. Therefore, it gives an indication about the project area of influence in the existing landscape.

Actual visibility can only accurately be determined by site survey since there are a multitude of local variables that may affect lines of sight. On the other hand, the ZTV/ZVI map does show where an object definitely cannot be seen.

7.1.3.2.2 Impact prediction and evaluation

The sensitivity, magnitude and significance of impacts will depend on the nature and degree of changes in landscape resources, nature from a receptor perspective, and the population's values and attachment to the landscape.

Receptor perspective could be for example, a village where people have a permanent view of the project from home. Public places will be a more sensitive subject than a site where people only pass through while travelling and have a transitional view of the airport project.

People's reaction to change (i.e. their judgment, positive or negative, and its importance) will be influenced by their attitude towards the airport, the material or other positive impacts it brings to them (employment, economic development, mobility, etc.), its impacts in other areas (land occupation and fragmentation, noise pollution, etc.), and any perception of inequality in the distribution of costs and positive impacts.

7.1.3.2.3 Predict the magnitude of change

In a landscape or field of vision, the magnitude of change depends on a number of factors:

The mass and scale of the new or modified elements in the view;
The probability that the new elements will be masked by other elements such as vegetation, hills, buildings;
The perception of the changes, i.e., how far away from the project they are, if they can see the project in the foreground, intermediate and background or if it can be perceived above or below a person's normal field of vision (factors influencing visibility and perception are highlighted in a box on the next page);
The compatibility of the different components of the project with the character of the existing landscape, takes into account that the landscape is natural, modified or built, the characteristics of the landscape and the importance of each of them in the value of the project, to what extent the components of the project are adapted to these characteristics in terms of size, shape, colour, texture, materials;
The ability of the foreground, intermediate and background of the landscape to integrate the change.
The ZVI and the maps of visual measures efficiency are based on the Mount Saint Mary clearance and runway construction only. No built form was modelised into GIS. Some buildings of visual importance might have further significant visual impact: the water tower, the 20m high Air Traffic Control tower and the fuel farm. They have been assumed to be considered as positive new features in the landscape for the residents.

7.1.3.2.4 Human perception and visibility

A number of assumptions were made about how the project would be perceived at various distances. First, it was assumed that the closer an observer is to the airport, the more likely these changes will be perceived as visually dominant. As the observer moves away, changes perceived as visually dominant become visible, becoming clearly visible, then visible, then discernible and eventually becoming indistinguishable:
Potentially visually dominant (magnitude of change: High) - up to 500 m from project scope;
Clearly visible (magnitude of change: Average) - between 500 m and 7 km;
Visible (magnitude of change: Low) - between 7 and 14 km; however, the perception will start to depend mainly on the horizontal width of the project and its location in the landscape;
Discernible to indistinguishable (magnitude of change: Negligible) - between 14 and 30 km.

7.1.3.2.5 Mapping measures to reduce visibility

Planting represents the main quantifiable measure in terms of efficiency. The planting has been modelised into GIS and the resulting ZVI has been challenged. The planting location and extent has been modified to ensure minimum residual impact persists. Despite exact location and extent of planting, this iterative work required changes in vegetation hight to reach a low mitigated impact. Vegetation high has been considered to range from 5m high (shrub vegetation), to 10m (tall shrub and small trees), to 20m (forest trees) to 30m high (tall trees).

Uninhabited locations have been withdrawn of the ZVI (eg. Forested hillside). Visual mitigations have been assessed for inhabited area only.

7.2 Temporary Impacts during Construction

7.2.1 Physical environment

7.2.1.1 Marine physical environment: shores, currents, turbidity and sedimentation

As approximately 2.7 ha of the new runway is built at sea, it is anticipated that seafloor will be disturbed as a sediment plume will be pumped from the backfilled area into the sea. It will increase turbidity and sedimentation while degrading the seawater quality. The potential dredging related to the construction of the boathouse will also generate a high level of turbidity.

Hence, the main potential temporary impacts on the marine physical environment are:

Increase in turbidity;
Modification of the seabed;
Dredging at the boathouse.

7.2.1.1.1 Impact Phy-Mar-W-Temp-1: Increase in turbidity

7.2.1.1.1.1 Impact before mitigation

First of all, it is assumed that all equipment available for marine construction is land-based, no contamination from maritime equipment is considered.

Primary construction materials are dug out from the hill in the vicinity and used to backfill an enclosing structure, the newly reclaimed land from the sea founding the runway.

Filling the enclosing structure with sediment implies evacuating water once decantation is achieved. It is not recommended to reject it by overflow as there is no control of the process whatsoever. Doing so, important loads of fine particles can be released and impact receptors at significant distances from the work area. Local and temporal resuspension of those sediments can cause temporary increases in suspended particles concentration and turbidity that can lead to lethal stress for coral. It is recommended to pump water from the fenced area and discharge into the ocean in order to be able to regulate the flow rate and concentration of fine particles.

The extent, intensity and persistence of construction generated sediment plumes are determined by hydrodynamic and quality numerical models under main hydrodynamic condition with D-Water Quality module of Delft3D suite.

This module simulates the far- and mid-field water and sediment quality due to a variety of transport and water quality processes. To accommodate these, it includes several advection diffusion solvers and an extensive library of standardised process formulations with the user-selected substances. Default processes allow to simulate the deposition and resuspension of particles to and from the bed. The model used for the dispersion of sediment plume use the same grid as the current model and reuse the hydrodynamics results as input for the dispersion, deposal and resuspension of sediments.

The following hypotheses are taken into account:

- 5 discharges located in the vicinity of the reclaimed to the sea newly build area and near the boathouse (see location in Figure 171);
- A specific flow of 0.1 m^3/s for a 2000g/m^3 concentration;
- 14.5 days simulations to include one neap tide and one spring tide cycle;

- Non-concomitance of the discharge with a 3 days delay;
- Two wind conditions: 8.5 m/s mean wind and 5.5 m/s light wind;

Process parameters:

Table 78: Marine water quality model - Process parameters

Sedimentation velocity	Critical shear stress for sediment	Porosity of sediment layer	Zeroth-order resuspension flux	Critical shear stress for resuspension
0.0002 m/s	0.1 N/m²	0.35[-]	0.0001 kg/m²/s	0.2 N/m²

Main results such as exceedance time and maximum level are presented below.

An overall analysis of the temporal and special variability of the sediment plume highlights 4 main characteristics:

- The plume spreads in the same direction as the current (North-East);
- The level of inorganic matter is the highest at the West side of the new runway where the current is lower and so the dispersion is weaker;
- The inner and shallow part of Topaze Bay is not impacted which it consistent with the local circulation, almost non-existent in this area;
- Spatial variations in the lagoon are much greater with lighter wind. The plume reaches North Bay with light wind but barely passes Pointe Mapou when mean wind blows, respectfully at 9.9km and 4.4km of the boathouse. With lighter wind, the plume tends to go farther west, up to 2 km west from Fregate Island.
- The main receptor affected by this action may be the seawater quality.

The impact severity is major. Considering the receptor sensitivity assessed as high, **the impact magnitude is major**.

Table 79: Results from the marine water quality model

	MEAN WIND	LIGHT WIND
Exceedance Time over 2 NTU of Inorganic Matter Exceedance time <2% 2-5% 5-10% 10-20% 20-30% 30-40% 40-50% 50-60% 60-70% >70%		
Exceedance Time over 10 NTU of Inorganic Matter Exceedance time <2% 2-5% 5-10% 10-20% 20-30% 30-40% 40-50% 50-60% 60-70% >70%		
Exceedance Time over 50 NTU of Inorganic Matter Exceedance time <2% 2-5% 5-10% 10-20% 20-30% 30-40% 40-50% 50-60% 60-70% >70%		
Maximum Level of Inorganic Matter <0.1 0.1 -0.5 mg/l 0.5 - 1 mg/l 1 - 1.5 mg/l 1.5 - 2 mg/l 2 - 4 mg/l 4 - 6 mg/l 6 - 8 mg/l 8 - 10 mg/l 10 - 20 mg/l 20 - 40 mg/l 40 - 60 mg/l 60 - 80 mg/l 80 - 100 mg/l 100 - 500 mg/l >500 mg/l		

7.2.1.1.1.2 Mitigation measure and impact after mitigation

Phy-Mar-Mit-1

The construction processes must ensure a minimal volume of water in the low-lying embankment delimited area to insure the stability and sustainability of the runway. The connection between the seabed and the rocks is as watertight as possible to ensure the minimal infiltration volume. Extra water is carefully drained off to avoid the potential fine-sediment wash-out due to water pressure.

Phy-Mar-Mit-2

The discharge should be located in order to promote a local settling of the inorganic matter, i.e. away from the strongest current, and release a controlled level of fine particles.

A specific hydrodynamic survey should be conducted to optimize the position of each discharges in the vicinity of the build onto the sea part of the new runway using a representative local climate (wave, wind and water level). Several localizations for each discharge could be tested in order to choose which configuration minimizes the plume extent and/or does not reach sensitive areas such as corals.

The selected solution will have to be modelled over the entire discharge period to ensure that there is no impact by taking realistic conditions (representative local climate (wave, wind and water level) and tidal conditions).

Figure 171: Localization of the potential sediment discharges to the lagoon during works phase and current-meter

In order to determinate shutdown and warning thresholds, median value of turbidity in Topaze bay would need to be evaluated in a normal state, constituting an initial and reference state for the future turbidity in-situ measure to be compared to. At least three current meters and

turbidimeters are installed to insure the construction follow-up (see map below) in the vicinity of the runway:

In the channel between Crab Island and the mainland;
South of Plaine Corail to monitor the entrance of Anse Quitor;
Near the corals in the entrance of Topaze Bay.

Phy- Mar-Av-3

The extent of the plume is mitigated by selecting an adequate timetable. Discharges better not occurs during significate reverse of flows.

A specific hydrodynamic survey could be conducted to test the best time to release inorganic matter in the sea. The time of year, the tidal cycle and spring tide or neap tide period should be considered to determine the start of discharge. The duration of discharge and the time it occurs regarding the velocity and direction of current also affects the turbid flume extent and position.

The current and magnitude of current could be monitored by a current-meter in the channel between Crab Island and Plaine Corail where they are at their maximums. Construction would stop if the reversal lasted more than 3 hours and velocity higher than 0.2m/s.

Phy- Mar-Mit-4

Silt curtains can be used to contain suspended sediments during the working operation. This technique has been successfully used to prevent sediment dispersal in numerous projects from dredging to construction projects. It would be used around the 5 discharge points and in case of dredging in front of the jetty boathouse.

A silt curtain is a permeable or impervious structure that sits suspended in the water column to control migrating water borne sediment and silt. It contains sediment about one to two meters from the water surface where the turbidity is the most active. Silt curtains allow suspended sediment to settle and drop to the bottom within the water column by controlling dispersion. Water depth, quantity and type of material in suspension, hydrodynamic conditions and project duration have to be considered when designing and installing silt curtain. The curtain should remain clear from the sea bed at low tide, it should be free moving and not anchored under sand or dispersed mud.

The construction layout and the area expected to be potentially impacted are identified and surveyed after which the required length of the silt curtain is decided. Once the desired length of silt curtain is connected, anchors are fixed on the land and the furled curtains can be towed to site at a maximum two to three knot speed.

The proposed measures result in a high severity mitigated impact thus The residual impact is of **high magnitude**.

7.2.1.1.2 Impact Phy-Mar-W-Temp-2: Modification of the seabed

7.2.1.1.2.1 Impact before mitigation

The turbid plume also affects the seabed. Change in its composition might be detectable after the fine-sediment has settled down. Sediment thickness due to the suspended loaded water discharge is reported in the table below.

Table 80: Thickness of deposit due to the construction of the runway in the surrounding of Plaine Corail

Thickness of Inorganic Matter Deposit	
MEAN WIND Deposit Thickness < 0.1mm 0.1 - 1.0 mm 1.0 - 5.0 mm 5.0 - 10 mm 10 - 50 mm 50 - 100 mm > 100m	
LIGHT WIND Deposit Thickness < 0.1mm 0.1 - 1.0 mm 1.0 - 5.0 mm 5.0 - 10 mm 10 - 50 mm 50 - 100 mm > 100m	

Areas around the discharge location are the most impacted. The thickness of inorganic matter related to the construction can locally be larger than 10 cm. The extent is limited at the entrance of North Bay 9 km away from the first release point. Though the thickness is less than 1 mm.

Sediment deposits in the entrance of Bay Topaze reach a maximum of 5mm.

The main receptor affected by this action may be the marine sediment quality.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.2.1.1.2.2 Mitigation measure and impact after mitigation

The preceding mitigation measures can also be applied to limit the dispersion of the turbid plume and its effects on the marine sediment content.

The proposed measures result in low severity mitigated impact. The residual impact is of **low magnitude**

7.2.1.1.3 Impact Phy-Mar-W-Temp-3: Dredging in front of the boathouse

7.2.1.1.3.1 Impact before mitigation

Dredging may be carried out to deepen the access to the future jetty facilities and boathouse, in the North of the Airport, in order to allow larger ship access. This work is done by mechanical dredgers, this technic generates fine materials suspension that could increase the local turbidity and modify the sea-bed.

The main receptor affected by this action may be the seawater quality.

The impact severity is major. Considering the receptor sensitivity assessed as high, **the impact magnitude is major**.

7.2.1.1.3.2 Mitigation measure and impact after mitigation

The preceding mitigation measures can also be applied to limit the dispersion of the turbid plume and its effects on the marine sediment content. The relevant turbidimeter is the one located next to the corals.

Silt curtain is especially needed to control the suspended solids generated by the dredging. It will be placed around the excavation site.

The proposed measures result in a high severity mitigated impact. Thus The residual impact is of **high magnitude**.

7.2.1.1.4 Summary

Table 81: Temporary Impact during Construction - Physical Environment

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Phy-Mar-W-Temp-1	Increase in turbidity	Adverse	Major	Phy-Mar-Mit-1	Mitigation - Controlled backfilled processes	High
				Phy-Mar-Mit-2	Mitigation - Optimisation of the location of discharges	
				Phy-Mar-Av-3	Avoidance - Optimisation of the discharges timetable to avoid times when currents reverse and/or already turbid condition	
				Phy-Mar-Mit-4	Mitigation - Silt curtain around discharges	
Phy-Mar-W-Temp-2	Modification of the seabed	Adverse	Low	Phy-Mar-Mit-1	Mitigation - Controlled backfilled processes	Low
				Phy-Mar-Mit-2	Mitigation - Optimisation of the location of discharges	
				Phy-Mar-Av-3	Avoidance - Optimisation of the discharges timetable to avoid times when currents reverse and/or already turbid condition	
				Phy-Mar-Mit-4	Mitigation - Silt curtain around discharges	
Phy-Mar-W-Temp-3	Dredging in front of the boathouse	Adverse	Major	Phy-Mar-Av-3	Avoidance - Optimisation of the discharges timetable to avoid times when currents reverse and/or already turbid condition	High
				Phy-Mar-Mit-5	Mitigation - Silt curtain around dredging area	

7.2.1.2 Hydrology

No temporary impact.

7.2.1.3 Geotechnics and Hydrogeology of the karstic system

7.2.1.3.1 Earthworks in the new proposed runway area

The new runway project geometry of the Rodrigues airport, corresponding to option C, as proposed by GIBB (Mauritius) LTD in the Preliminary Design stage, allows to define earthworks cutting and embankment areas depending on the project elevation of the new runway, with respect to ground level.

The Figure 172 highlights the embankment and cutting areas. The total volume of extracted materials from the cutting area (zone 2) is about 3,481,835 m^3 whereas the total volume of imported materials for the embankment areas (zones 1 and 3) is 2,099,022 m^3 (GIBBS, 2018).

The mass haul is thus unbalanced. Cut material are expected to be re-used as filling material. To allow this reuse of materials, the extracted cuttings should comply with the British Standards *BS EN 16907-1:2018 Earthworks. Principles and general rules*:

BS 6031-2009 Code of practive for Earthworks (Table7);
SHW 600 Series earthworks (§ 608, Class 6A soils in Table 6/1 and 6/2).
If all the cut material could be reused, an important volume of cut material would remain left over.

The Figure 173 also highlights that embankment and cutting areas correspond to different geological formations:
The embankment areas (zones 1 and 3) are almost entirely located on Eolian Calcarenite Formation,
The cutting area (zone 2) is mainly located on Eolian Calcarenite Formation, but the southern part of the cutting area is set on an existing basalt outcrop.
Extraction techniques will depend on the stiffness of the basalt and calcarenite materials:
Basalts Formation - it is proposed to prefracture basalts rocks with open phase blasting (sequential blasts with fixed unit explosive charges - need to perform blasts tests before), then to excavate the basalt blasted debris with dedicated excavators.
Calcarenites Formation - softer calcarenite materials could be extracted with excavators (after ripper prefracturing if any). If hard strata is encountered during excavation, then open phase blasting will be locally used.
It has to be noticed that blast vibrations could be adjusted to deal with the impact of the closest caverns to the project area: Grotte Fougère, Petit Lac, Cabris, Bouteille and Gastonia. In this sensitive area where caverns stability needs to be ensured, blast vibrations caused by explosive techniques could be reduced by using smaller unit charges, close to these caverns.

Figure 172: Earthworks areas in the restricted area of influence at Plaine Corail

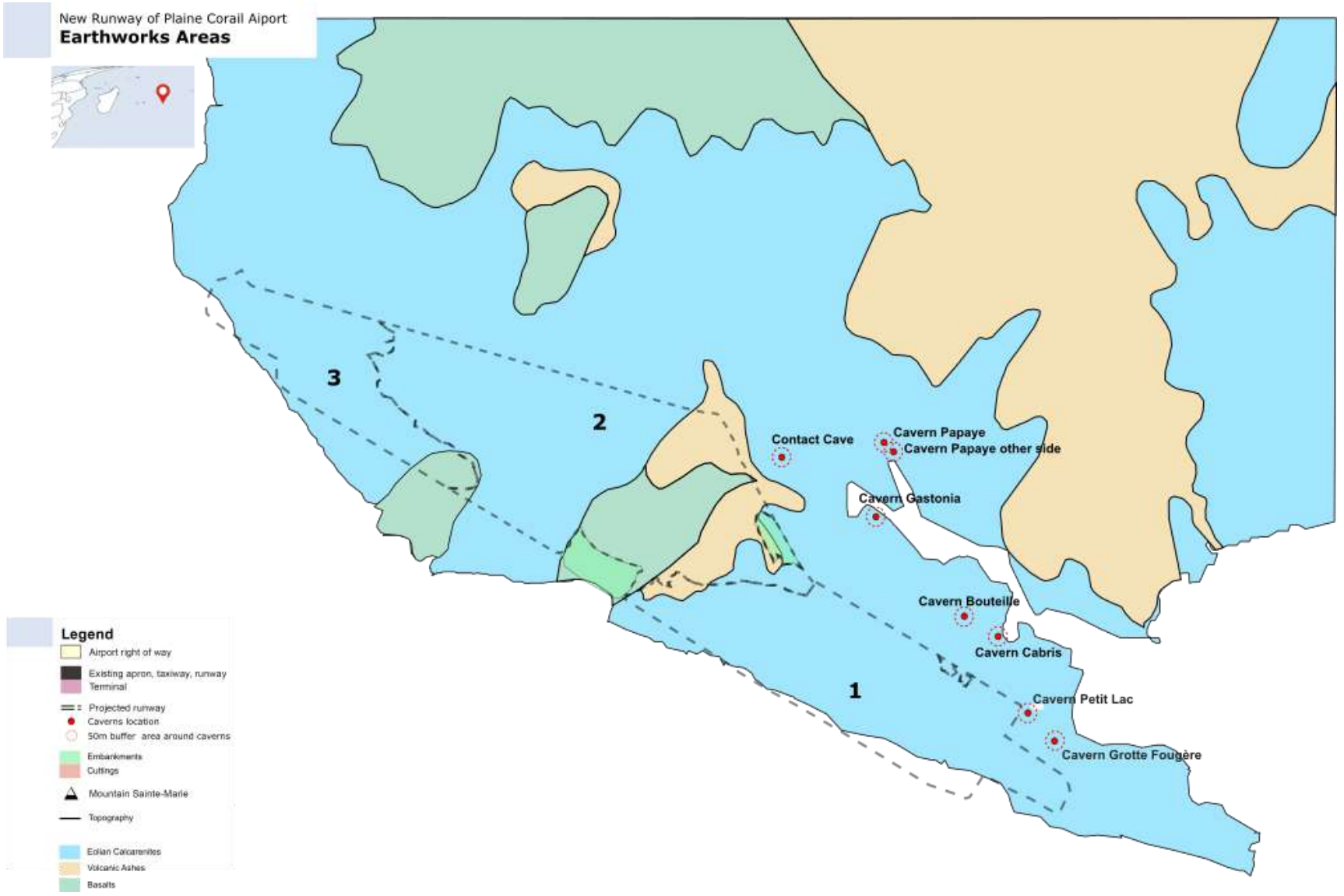


Figure 173: Earthworks areas and associated geological formations in the restricted area of influence at Plaine Corail

7.2.1.3.2 Phy-Kar-W-Temp-1: Vibrations

7.2.1.3.2.1 Impact before mitigation

Heavy earthmoving machinery will generate vibrations.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.2.1.3.2.2 Mitigation measure and impact after mitigation

Reduce speed of trucks' movement to an acceptable level in order to minimize the induced vibrations. Reduce rotations between embankment site and material storage site.

In addition, baseline observations should be carried out and document at potentially exposed buildings to check on the presence of cracks ahead of works.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude.**

7.2.1.3.3 Phy-Kar-W-Temp-2: Mass haul - Hauling equipment movement inducing vibration and noise pollutions

7.2.1.3.3.1 Impact before mitigation

Construction works for the new runway and the associated taxiways and buildings will involve a very significant movement of materials to excavate and fill (see volume of materials in cutting and embankments areas, refer to section 5.6.1 Earthworks and construction above voids). The site level will be changed.
A mass haul movement is the movement of excavated material from where it arises to where it is to be used, treated or disposed of. It impacts local topography drastically and will affect the in situ soils mechanical characteristics (calcarenite and basalt geological formations).

The impact severity is major. Considering the receptor sensitivity assessed as high, **the impact magnitude is major**.

7.2.1.3.3.2 Mitigation measure and impact after mitigation

In order to reduce the quantities of imported materials, the materials extracted from the cutting area in the centre of the project may be reused in embankment areas.
Extracted topsoil materials from the cutting area may be reused inside the project footprint but outside the runway's clear graded strip area.
Material reuse needs to be checked with new ground investigations and laboratory tests in order to appreciate the quality of reuse of all potential extracted materials, taking into account, for example, sulphate contents or moisture contents, this to guaranty that these materials are suitable for reuse in embankments.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.2.1.3.4 Phy-Kar-W-Temp-3: Erosion/Groundwater ingress

7.2.1.3.4.1 Impact before mitigation

Mass haul movements coupled with rainwater will induce local erosion because of existing topography changes and in situ geological formations fracturation. Local and/or large erosion at ground surface may occur during works phase and induce the collapse of features inside and outside the footprint area of the runway project. In addition, groundwater ingress can occur during excavation and may impact the stability of the cutting and embankment areas of the project.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.2.1.3.4.2 Mitigation measure and impact after mitigation

Local erosion features may be mitigated case by case by infilling of low quantities of granular material to stabilise the local topography. Rainwaters will be diverted towards infiltration ponds using drainage accordingly along and inside the entire footprint area of the project.

In addition, open blasting and site excavation works phase may be done during dry season to reduce erosion features at ground surface inside and outside the footprint area too.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.2.1.3.5 Phy-Kar-W-Temp-4: Noise Blasting

7.2.1.3.5.1 Impact before mitigation

Excavation techniques used during works phase will induce noise, especially noise coming from the open blasting excavation phase, which is needed to excavate basalts and very stiff calcarenites. Other noise impacts are generated by the excavator's activity during work.

The impact severity is high. Considering the receptor sensitivity assessed as medium, **the impact magnitude is high**.

7.2.1.3.5.2 Mitigation measure and impact after mitigation

In order to reduce the noise impact generated by blasting and excavator's activity, the following mitigations may be used:
adapt unit explosive charge to generate the lowest noise impact,
schedule open blasting phases as short as possible in operation time,
work during the day (fixed hours within the day), avoid work during the night, and inform local authorities and communities bout the health and safety plan applicable on work site
avoid running excavator's engines if they are not being used.

The proposed measures result in a medium severity mitigated impact. Thus, The residual impact is of **medium magnitude**.

7.2.1.3.6 Phy-Kar-W-Temp-5: Cut and fill balance impacts

The cut and fill balance should lead, if all the cuttings can be reused as expected, to a excess of materials. However, it can't be certain yet that the cuttings will be able to be reused and there might need to import material for filling.

This section addresses the impact of material import and cuttings management. However as it is not known yet how much could be reused, impacts nor measures aren't quantified.

7.2.1.3.6.1 Impact before mitigation

In both cases of infill material import and cuttings export, the transport impact might be high, depending on quantities of material:

in terms of carbon footprint, especially in case of cargo import;
noise and air pollution due to trucks traffic bringing materials to or from the works area.

The impact severity could be medium to major. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium the impact magnitude is high to major**.

7.2.1.3.6.2 Mitigation measure and impact after mitigation

In case of import material need, the closest extraction site would have to be chosen, taking into account the impacts on the extraction site environment. An impact assessment would have to be presented by the contractor and the extraction site will have to be approved by the client.

In case of cuttings to manage, it will be forbidden to export the material out of the airport area. All treatment and reuse possibilities will have to be explored: in backfill is not possible, use in the concrete fabrication process will have to be studied. If no reuse were possible, storage in landscaping hills would have to be done.

The proposed measures could result in a not significant to high severity severity mitigated impact. Thus, the mitigated impact could be of **negligible magnitude to high magnitude**.

7.2.1.3.7 Summary

Table 82: Temporary Impact during Construction – Physical Environment Karstic System

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Phy-Kar-W-Temp-1	Vibrations	Adverse	High	Phy-Kar-Mit-1	Mitigation - Reduce speed of trucks' movement to an acceptable level	Negligible
				Phy-Kar-Mit-2	Mitigation - Reduce rotations between embankment site and material storage site Carry out and document baseline observations at potentially exposed buildings to check on the presence of cracks ahead of works.	
Phy-Kar-W-Temp-2	Mass haul - Hauling equipment movement inducing vibration and noise pollutions	Adverse	Major	Phy-Kar-Mit-3	Mitigation - Reuse of materials from cutting to embankment areas	Low
				Phy-Kar-Mit-4	Mitigation - Reuse of topsoil materials after works phase	
Phy-Kar-W-Temp-3	Erosion/Groundwater ingress	Adverse	High	Phy-Kar-Mit-5	Mitigation - Infilling of local erosion features and use of drainage system to manage rainwater responsible for local erosion	Low
				Phy-Kar-Mit-6	Mitigation - Open blasting and site excavation works to be done during dry season	
Phy-Kar-W-Temp-4	Noise blasting	Adverse	High	Phy-Kar-Mit-7	Mitigation - Reduce unit explosive charge decreasing noise impact	Medium
				Phy-Kar-Mit-8	Mitigation - Concentrate open blasting operations in a short amount of time	
				Phy-Kar-Mit-9	Mitigation - Work only during the day and inform local authorities and communities about the health and safety plan applicable on work site	
				Phy-Kar-Mit-10	Mitigation - Avoid running excavator's engines in case of no use	
Phy-Kar-W-Temp-5	Cut and fill balance impacts (transport impacts)	Adverse	Medium to major	Phy-Kar-Mit-11	Mitigation – Chose the closest extraction site for fill material / Forbid the export of cuttings	Negligible to high

7.2.1.4 Water resource and waste water management

7.2.1.4.1 Impact Phy-Wat-W-Temp-1: impact of water resource due to work water supply

7.2.1.4.1.1 Impact before mitigation

The supply of water (drinking and non-drinking water, intended for watering the tracks, for supplying processes such as concrete manufacturing, washing machinery, etc.) is likely to weigh on the already very tight public water supply network.

The impact severity is high. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.2.1.4.1.2 Mitigation measure and impact after mitigation

It is proposed to install a temporary desalination plant for the works supply, producing water for the works needs including drinking water for the workers. This temporary plant should pump water from the sea and provide fresh water and drinking water. (Phy-Wat-Mit-1)

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**

7.2.1.4.2 Impact Phy-Wat-W-Temp-2: impact of works on water resource due to impact on karstic groundwater

7.2.1.4.2.1 Impact before mitigation

The vibrations associated with the stripping of natural surface materials can increase the transport of fine particles in groundwater. The karst network of aquifers contributes to the transport of these particles without filtering them. The groundwater component that feeds the Caverne Bouteille intake could then have an increase in turbidity. This change in turbidity could affect the pumping system. Most of all, it would then influence the reverse osmosis treatment process (saturation of the micro-membranes) so the Caverne Bouteille desalination plant could be affected to.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.2.1.4.2.2 Mitigation measure and impact after mitigation

To mitigate this impact, the temporary or permanent relocation of the water abstraction at Caverne Bouteille has to be planned. A feasibility study for an alternative source out of the area of influence must be completed before work begins. As it is likely that another intake in the groundwater will be difficult to find, it is proposed to replace Caverne Bouteille intake by a see water pumping. The Caverne Bouteille desalination plant should be upgraded in order to enable it to treat seawater and provide drinking water. The current capacity of 1000 m^3/day must be maintained.

(Phy-Wat-Comp-2)

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**

7.2.1.4.3 Impact Phy-Wat-W-Temp-3: impact of works waste water

7.2.1.4.3.1 Impact before mitigation

The construction activities and processes and the workers living on the site during the works will generate waste water which, if discharged into the natural environment without treatment, would cause unacceptable pollution. However the existing water treatment system is not large enough to take this into account.

The impact severity is major. Considering the receptor sensitivity assessed as high, **the impact magnitude is major**.

7.2.1.4.3.2 Mitigation measure and impact after mitigation

It is proposed to provide a temporary wastewater treatment plant dedicated to the site. (Phy-Wat-Av-3)

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**

7.2.1.4.4 Impact Phy-Wat-W-Temp-4: Risks of accidental pollution

7.2.1.4.4.1 Impact before mitigation

Potential sources of accidental contamination are presented in section 7.2.1.3 Geotechnics and Hydrogeology of the karstic system.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.2.1.4.4.2 Mitigation measure and impact after mitigation

The mitigation of a contamination event consists mainly in the implementation of preventive measures to reduce risks during the construction phase.

Below is a short list of prevention measures for construction on construction sites:
Provide sealed vats for polluting products stored in drums, tanks or cisterns in order to recover any spills.
Avoid buried deposits of pollutants. If this is not possible, provide a system to quickly detect a possible leak.
Provide a waterproof floor where harmful products are handled or delivered.
Use the best technologies to limit the release of hazardous products.
In the event of accidents, have an "intervention kit" at your disposal (absorbent products, etc.)
Development of a Risk Management Plan (RMP): a definition of RMP could be "*The RMP will describe existing and proposed risk management measures that are to either continue or to be put in place to provide confidence that the identified threat activity will cease to be or not become a significant threat to drinking water*". (Phy-Wat-Av/Mit-4)

The proposed measures result in low severity mitigated impact. Thus, The residual impact is of **negligible magnitude.**

7.2.1.4.5 Impact Phy-Wat-W-Temp-5: Risks associated with the desalination plant

7.2.1.4.5.1 Impact before mitigation

The following are assumptions given that the location, type and specifications of the desalination plant are not known to date.

Construction and operation activities could result in a variety of coastal zone impacts including impacts to air quality, to water quality, to marine life, disturbance of ecological important ecosystems (sand-dunes, seagrass beds and other important habitats by the siting of pipelines route), dredging and disposal of dredged material, noise, interference with public access and recreation. The most significant of these impacts are to air quality and water quality, which subsequently, the latter has adverse impacts on marine life and ecosystems[8]

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.2.1.4.5.2 Mitigation measures and impact after mitigation

The mitigation measures are in the form of best engineering design /selection of appropriate SWRO desalination plant and good site practices/ Operation & Maintenance during operation.

Below is an overview of the possible mitigation measures:

- Adequate siting of the plant to minimize disturbance of the natural environment
- Reduce construction activity by preferring containerized units
- Adequate mode of sea water abstract to avoid/reduce Impingement and Entrainment of marine organisms through boreholes/beach wells
- Desalination method: a reverse osmosis plant is to be considered
- Optimize the use of chemicals for pre-treatment, post-treatment, maintenance and cleaning
- Adequate mode of brine management. As mentioned in section 5.6.4.2, a zero liquid discharge of the brine should be favoured, through the installation of an evapo-concentrator-condenser-crystallizer instead of rejecting the diluted brine in the natural environment

An assessment of the potential impacts associated with a desalination plant will be carried out in the final ESIA and provide adequate mitigation measures as part of the ESMP

The tender documents for construction will incorporate all relevant aspects of the ESMP; the contractor will contractually be required to apply all relevant aspects of the ESMP.

The proposed measures result in low severity mitigated impact. Thus, the residual impact is of **negligible to low magnitude.**

[8] UNEP – Sea Water Desalination in the Mediterranean – Assessment and Guidelines - 2033

7.2.1.4.6 Summary

Table 83: Temporary Impact during Construction – Physical Environment - Water & wastewater

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Phy-Wat-W-Temp-1	Impact of water resource resulting from works water supply	Adverse	Major	Phy-Wat-Mit-1	Install a desalination plant to supply drinking water to the workers' camp	Negligible
Phy-Wat-W-Temp-2	Impact of works on water resource resulting from impact on karstic groundwater	Adverse	Major	Phy-Wat-Comp-2	Temporarily replace the Caverne Bouteille intake by a sea water pumping Upgrade Caverne Bouteille plant to enable it to provide drinking water from sea water Thus, temporarily provide drinking water from sea water to people currently connected to Caverne Bouteille plant	Negligible
Phy-Wat-W-Temp-3	Works waste water	Adverse	Major	Phy-Wat-Av-3	Works wastewater treatment plant	Negligible
Phy-Wat-W-Temp-4	Risk of accidental pollution	Adverse	High	Phy-Wat-Av/Mit-4	Preventive measures to reduce risks during the construction phase - Risk management plan	Negligible
Phy-Wat-W-Temp-5	Desalination plant	Adverse	High	Phy-Wat-Av/Mit-5	Good engineering design and best site practices to reduce the impacts Importance of ESMP & ESCP in the contractor's contract	Negligible to low

7.2.2 Biological environment

7.2.2.1 Terrestrial habitats and flora

None.

7.2.2.2 Terrestrial fauna

7.2.2.2.1 Impact BioT-Fau-W-Temp-1: Impacts on the native bat Pteropus rodricensis

The following potential effects of the construction and operation of the project on the native bat *Pteropus rodricensis* are identified as:

- Loss of foraging habitat.
- Impact of construction noise, dust, vibration, light disturbance during night works, and operational lighting.
- Mortality or injury on roads through vehicle strike.

The species has been seen flying high enough to avoid most of the risks coming from vehicle strike. Noise, vibration and dust are potential sources of nuisance but the species is not very present when flying over the project area. The species could feed from the many specimen of *Eleodendron orientale* on the study site or from any other trees that provide fruits. However, the area is generally sparsely forested and the potential for the species to feed within the project footprint is very low.

Figure 174: Pteropus rodricensis flying over the Anse Quitor nature reserve near the project

The number of specimens inside the area of influence or inside the project footprint is used to determine the impact severity. For this species, the number of specimens inside the area of influence is higher than 10, and the number of specimens inside the project footprint is considered 0.

The impact severity is low. Considering the receptor sensitivity assessed as high, **the impact magnitude is low**.

7.2.2.2.2 Mitigation measure and impact after mitigation

No measure is necessary.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.2.2.2.3 Summary

Table : Temporary Impact during Construction - Biological Environment - Terrestrial Habitats & Fauna

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
BioT-Fau-W-Temp-1	Impact on *Pteropus rodricensis (Chiroptera)*	Adverse	Low	None	None	Low

7.2.2.3 Marine habitats

The main potential temporary impacts on marine habitats in the works phase are the:

Degradation of natural habitats;
Modification of ecological functionality.
The construction works (backfilling at sea for the construction of the new runway and the boat house and jetty facilities) are the primary potential source of these potential impacts.

7.2.2.3.1 Impact BioM-Hab-W-Temp-1: Degradation of coral reef dominated by *Acropora formosa* (Pointe Palmiste)

7.2.2.3.1.1 Impact before mitigation

Coral reef located at the Pointe Palmiste is likely to be degraded mainly during the backfilling phases. Indeed, the backfilling will induce a resuspension of fine particles. Resuspension of marine sediments could result in siltation and deposition of fine particles on habitats, including coral reefs. Sedimentation is a recognized stress factor, inhibiting most of their feeding patterns in various ways, including preventing symbiotic algae from accessing the light needed for photosynthesis.

Naturally, the study area is mainly composed of fine sediments. The coastal sector has torrential valleys that radiate from the centre of the island, spilling over a significant volume of detrital materials of various sizes during the rainy season. Topaze Bay is therefore turbid and often very muddy. Under typical weather conditions, the concentration of suspended particles in Topaze Bay is generally less than 20 mg.l-1, rarely exceeding a concentration of 30 mg.l-1.

The modelling results show a dispersion of the turbid plume at the level of the backfill areas (in the order of 60 to >500 mg.l-1). At the exit of Topaze Bay and near Pointe Palmiste (coral reef), concentrations are between 10 and 40 mg.l-1 depending on wind conditions.

The increase in turbidity in the environment and especially the duration of exposure could therefore deeply modify the plant and animal communities associated with the corals of Pointe Palmiste, although they are accustomed to natural variations in turbidity (land inflows).

The impact severity is medium. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium.**

7.2.2.3.1.2 Mitigation measure and impact after mitigation

Reduction measure (BioM-Mit-1): Installation of a floating boom

In order to preserve the coral reef at Pointe Palmiste, a floating boom can be positioned around the backfill areas during works phase. It will confine sediments and prevent their resuspension in the marine environment, particularly in sensitive habitats such as corals.

Considering the taking into account of the measure, the magnitude of the mitigated impact is low.

The proposed measure result in a low severity mitigated impact. Thus, the mitigated impact is is of **low magnitude**.

A monitoring measure for the protection of the coral reef (marking and prohibition of access + monitoring / restoration...) is proposed in Chapter 9.

7.2.2.3.2 Impact BioM-Hab-W-Temp-2: Degradation of habitats dominated by macroalgae and seagrass

7.2.2.3.2.1 Impact before mitigation

In the same manner, habitats dominated by macroalgae and seagrass are likely to be degraded mainly during the backfilling phases. Indeed, the backfilling will induce a resuspension of fine particles. Resuspension of marine sediments could result in siltation and deposition of fine particles on habitats, including macroalgae and seagrass beds. Seagrass beds are aquatic plants (phanerogams) that need light to grow. Excess suspended solids in the water column could reduce access to light and prevent photosynthesis of plants, thereby altering or killing seaweeds.

Naturally, the study area is mainly composed of fine sediments. The coastal sector has torrential valleys that radiate from the centre of the island, spilling over a significant volume of detrital materials of various sizes during the rainy season. Topaze Bay is therefore turbid and often very muddy. Under typical weather conditions, the concentration of suspended particles in Topaze Bay is generally less than 20 mg.l-1, rarely exceeding a concentration of 30 mg.l-1.

The modelling results show a dispersion of the turbid plume at the level of the backfill areas (in the order of 60 to >500 mg.l-1). The Crab Island sector does not seem to be affected by the resuspension of sediments. Thus, habitats dominated by seagrass beds will have been impacted. Only macro-algae habitats in southeast Topaze Bay will be impacted (stations 10, 17 and 35, 20 to 40 mg.l-1, light wind condition).

The increase in turbidity in the environment and especially the duration of exposure could therefore profoundly modify the plant and animal communities associated with the macroalgae, although they are accustomed to natural variations in turbidity (land inflows).

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low.**

7.2.2.3.2.2 Mitigation measure and impact after mitigation

Although the mitigated impact is low, the reduction measure (BioM-Mit-1) will also confine sediments and prevent their resuspension in the marine environment, particularly in sensitive habitats such as macroalgae and seagrass.

Considering the taking into account of the measure, the magnitude of the mitigated impact is negligible.

The proposed measures result in a not significant severity mitigated. Thus, The residual impact is of **negligible magnitude.**

A monitoring measure for the assessment of turbidity is proposed in Chapter 9.

7.2.2.3.3 Impact BioM-Hab-W-Temp-3: Modification of ecological functionality

7.2.2.3.3.1 Impact before mitigation

The impact severity of marine habitats degradation is low. It can therefore be considered that the project will not be likely to modify the ecological functionalities of the habitats mentioned above.

The impact severity is not significant. Considering the receptor sensitivity assessed as high (coral reef), **the impact magnitude is negligible**.

7.2.2.3.3.2 Mitigation measure and impact after mitigation

As the impact magnitude is negligible, no mitigation measure is proposed.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.2.2.3.4 Summary

Table 84: Temporary Impact during Construction - Biological Environment - Marine Habitats

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
BioM-Hab-W-Temp-1	Degradation of coral reef dominated by *Acropora formosa*	Adverse	Medium	BioM-Mit-1	Installation of a floating boom to confine sediments and prevent their resuspension in the marine environment	Low
BioM-Hab-W-Temp-2	Degradation of habitats dominated by macroalgae and seagrass	Adverse	Medium			Negligible
BioM-Hab-W-Temp-3	Modification of ecological functionality	Adverse	Negligible	none	-	Negligible

7.2.2.4 Marine species

7.2.2.4.1 Impact BioM-Spe-W-Temp -1: Ichthyofauna

7.2.2.4.1.1 Impact before mitigation

Ichthyofauna may be sensitive to the temporary effects of backfilling and the presence of flat boats. Potential impacts are of several types:

Risks of destruction of areas of piscicultural interest (nurseries, spawning grounds, etc.);
Disturbance or risk of injury due to noise generated by ships and works;
Risk of asphyxiation by suspending particles;
Decrease in trophic resource.

Noise

Concerning acoustic impact, fishes have the ability to avoid these exposures by maintaining a certain distance from the noise source. Moreover, the area of influence presents a low fish diversity.

The impact severity of the project related to the increase in noise on ichthyofauna is adverse, low, temporary and direct. The impact magnitude is low.

Environmental quality

The dispersion of the turbid plume will occur mainly in Topaz Bay, where natural turbidity conditions will be quite high. Since fish are mobile, they have the ability to escape the most turbid areas.

The impact severity of the project related to the increase in turbidity on ichthyofauna is adverse, low, temporary and direct. The impact magnitude is low.

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.2.2.4.1.2 Mitigation measure and impact after mitigation

Although the mitigated impact is low, the reduction measure (BioM-Mit-1) will also confine sediments and prevent their resuspension in the marine environment.

Considering the taking into account of the measure, the magnitude of the mitigated impact is negligible.

The proposed measures result in a not significant severity mitigated. Thus, The residual impact is of **negligible magnitude.**

7.2.2.4.2 Impact BioM-Spe-W-Temp -2: Impact on marine turtles

7.2.2.4.2.1 Impact before mitigation

Marine turtles are sensitive to the temporary effects of backfilling and the presence of flat boats. Potential impacts are of several types:

- Disturbance or risk of injury due to noise generated by ships and works;
- Risk of asphyxiation by suspending particles;
- Decrease in trophic resource.

Noise

Within the framework of this project, the acoustic impacts could concern marine turtles. Nevertheless, Topaze Bay is not an important habitat for these species, as they only occasionally visit the Rodrigues lagoon (Crab Island could be a sea turtle spawning site).

The impact severity of the project related to the increase in noise on marine turtles is adverse, medium, temporary and direct. The impact magnitude is medium.

Impacts can be reduced with the implementation of mitigation measures such as the avoidance of backfilling during marine turtle spawning periods which would reduce the intensity and probability of the impact.

Environmental quality

The loss or degradation of seagrass habitats can also indirectly impact turtles. Indeed, marine seagrasses are a source of food for turtles. The modelling results show a dispersion of the turbid plume at the level of the backfill areas (in the order of 60 to >500 mg.l-1). Crab Island sector does not seem to be affected by the resuspension of sediments. Thus, habitats dominated by seagrass beds will have been impacted.

The impacts severity of the project related to the increase in turbidity on marine turtles is adverse, low, temporary and direct. The impact magnitude is low.

The impact severity is medium. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium**.

7.2.2.4.2.2 Mitigation measure and impact after mitigation

Reduction measure (BioM-Mit-2): Monitoring for the possible presence of turtles in the project area and egg laying site on Crab Island

In order to reduce the risk of disturbance of marine turtles during the spawning period, increased monitoring of the work area and beaches on Crabes Island will be carried out. In the event that marine turtles are found in the lagoon near the work area or on the beaches of Crab Island, the noisiest work (backfilling at sea) must be stopped.

Considering the taking into account of the measure, the magnitude of the mitigated impact is low.

The proposed measure result in a low severity mitigated impact. Thus, the mitigated impact is of **low magnitude**.

A monitoring and census of marine turtles in the south of Rodrigues is proposed in Chapter 9.

7.2.2.4.3 Impact BioM-Spe-W-Temp -3: Impact on marine mammals

7.2.2.4.3.1 Impact before mitigation

The potential impacts of the project on marine mammals are identical to those of marine turtles.

Considering the five main species observed in the coastal waters of Rodrigues, only the Indo-Pacific bottlenose dolphin is likely to be encountered. This species remains coastal and sedentary, possibly isolated from other populations. This reflection is ongoing at the Mascarene scale for this species where scientific work has been initiated (Globice, pers. com., 2015). Within the framework of this project, the acoustic impacts could concern this species.

However, this dolphin is more common in coastal waters along the outer slope of the lagoon, occasionally coming into Topaze Bay (no proven long residences in this area).

The impact severity is low. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.2.2.4.3.2 Mitigation measure and impact after mitigation

As the impact magnitude is low, no mitigation measure is proposed.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.2.2.4.4 Summary

Table 85: Temporary Impact during Construction - Biological Environment - Marine Species

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
BioM-Spe-W-Temp -1	Impact on Ichtyofauna : - Noise pollution related to marine works - Degradation of environmental quality - Destruction of species	Adverse	Low	None	-	Low
BioM-Spe-W-Temp -2	Impact on Marine turtles : - Noise pollution related to marine works - Degradation of environmental quality - Destruction of species	Adverse	Medium (noise and pollution)- Low	BioM-Mit-2	Monitoring for the possible presence of turtles in the project area and egg laying site on Crab Island	Low
BioM-Spe-W-Temp -3	Impact on Marine mammals Noise pollution related to marine works - Degradation of environmental quality - Destruction of species	Adverse	Low-negligible	None	-	Low-negligible

7.2.3 Transport network, electricity supply and waste management

7.2.3.1 Transport network

7.2.3.1.1 Impact Trspt-W-Temp-1: Impact on the transport network

7.2.3.1.1.1 Impact before mitigation

Road

During the works phase, the road network will be affected by:

The circulation of construction machinery around the study area;
Convoys of construction materials arriving in Port Mathurin by boat which will have to be transferred to Plaine Corail airport.
These factors will increase and slow down road traffic.

Air

Some of the construction materials could be transported by air, directly to Plaine Corail airport.

This should not affect the passenger air traffic, however, the cargo traffic could be increased.

Maritime routes

As for the air traffic, there should be only minor impact on the port traffic of Rodrigues.

The supply of materials will lead to an increase in the volume of goods arriving at the port. However, this will only have a little impact on passenger traffic or other freight traffic.

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.2.3.1.1.2 Mitigation measure and impact after mitigation

The transfer of equipment can be done either in the early morning or at night to set minimum disruption on road traffic (measure Inf-Mit-1).

For the mobilization of construction equipment; a police escort is provided for such special convoys. A prior survey is normally done before the transfer of equipment from Mauritius. An approval of the commission for public infrastructure is normally sought prior to shipment from Mauritius (measure Inf-Mit-2).

According to the local commission in charge of roads management, the works road traffic doesn't require specific arrangement with regard to maximum allowable equipment weight. However, in order to prevent the roads degradation by trucks traffic, the contractor will have to plan the roads rehabilitation as many times as needed during the works and at least at the end of the works (measure Inf-Mit-3).

The proposed measures result in a low severity mitigated impact. Thus, **The residual impact is of low magnitude**.

7.2.3.2 Electricity supply

7.2.3.2.1 Impact Elec-W-Temp-1: Impact on electricity supply

7.2.3.2.1.1 Impact before mitigation

The construction will require electricity use.

This electricity may come from the general electricity network or from specific generators.

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.2.3.2.1.2 Mitigation measure and impact after mitigation

In order to avoid overloading the power consumption, the work can be adapted as far as possible during electric underload periods (measure Inf-Mit-3).

In addition, the use of generators may limit the electricity drawn from the island's general network (measure Inf-Mit-4).

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.2.3.3 Solid waste management

7.2.3.3.1 Impact Sol-Wst-W-Temp-1: Impact on the solid waste management

7.2.3.3.1.1 Impact before mitigation

The construction phase will generate two types of construction site waste:

conventional household waste;
construction site building waste, which may result from the destruction of existing buildings.

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.2.3.3.1.2 Mitigation measure and impact after mitigation

The solid waste which is like household waste will be managed with the rest of the island's waste.

Construction site waste will be maximally recovered through recycling and reuse.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.2.3.4 Summary

Table 86: Temporary Impact during Construction - Transport Network, Electricity Supply & Waste Management

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Trspt-W-Temp-1	Impact on the transport network	Adverse	Low	Inf-Mit-1	Transfer materials out of high traffic periods	Low
				Inf-Mit-2	Anticipate and supervise exceptional convoys	
				Inf-Mit-3	Rehabilitate roads that were used during construction and at the end of works	
Elec-W-Temp-1	Impact on electricity supply	Adverse	Low	Inf-Mit-3	Adapt the period of work	Low
				Inf-Mit-4	Use generators	
Sol-Wst-W-Temp-1	Impact on the solid waste management	Adverse	Low	Inf-Mit-5	Recycling and reuse of materials	Low

7.2.4 Socio-economic environment

7.2.4.1 Impacts on demographics and social dynamics

7.2.4.1.1 Impact SE-Demo-W-Temp-1: Increase of the population of Plaine Corail and its surroundings

Source of the impact: Migration of Mauritian or foreign workers and workers from other communities in Rodrigues

7.2.4.1.1.1 Impact before mitigation

With the advent and temporary installation of Mauritian or foreign workers on the project area level, the local population is expected to increase during the construction phase, which could influence the habits of the inhabitants.

This temporary impact can lead to changes in social dynamics within local communities as a result of population growth in the area.

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.2.4.1.1.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Provide support and communication measures to local populations facilitating the integration of external workers. (Measure SE-Mit-5):
Organize information meetings at the level of the towns affected by the project
Communicate transparently about the procedures for direct and indirect hiring of the project (opportunities, skills and education levels required)
Develop and implement a workforce management plan that includes a management and quality policy concerning the accommodation of external workers
Prepare a training program for employees and a training plan for communities in collaboration with regional administrative authorities
Implement an influx management plan that includes appropriate communication from outside workers on local methods of operation and customs. (Measure SE-Mit-6):
Develop and implement a workforce management plan that includes a management and quality policy concerning the accommodation of external workers
Prepare a training program for employees and a training plan for communities in collaboration with regional administrative authorities
These mitigation measures will limit the magnitude of the impact to a negligible level.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.2.4.1.2 Impact SE-Demo-W-Temp-2: Evolutions of internal relations and in relation to foreign influx

Source of the impact: Migration of Mauritian or foreign workers and workers from other communities in Rodrigues

7.2.4.1.2.1 Impact before mitigation

The prolonged contact of the surrounding communities with the populations of migrant workers during the construction phase can change local perceptions towards foreigners. This potential impact can lead to possible tensions between host communities and visitors in case of cultural disparities that are too significant and misunderstood practices.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium**.

7.2.4.1.2.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Provide support and communication measures to local populations to facilitate the integration of external workers. (Measure SE-Mit-5 – see 7.2.4.1.1.2)
Implement an influx management plan that includes appropriate communication from outside workers on local methods of operation and customs. (Measure SE-Mit-6 see 7.2.4.1.1.2)
These mitigation measures will limit the magnitude of the impact to a negligible level.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **negligible magnitude**.

7.2.4.1.3 Impact SE-Demo-W-Temp-3: Social tensions arising from hiring conditions

Source of the impact: Creation of direct and indirect jobs for construction work

7.2.4.1.3.1 Impact before mitigation

The recruitment of workers for the construction of the Plaine Corail airport can lead to the emergence of social tensions if the hiring conditions are not clearly stated among the local people who are waiting for these employment opportunities.

Communities in the vicinity of the affected area are very sensitive to being considered in recruitment measures for construction, there may be conflicts and a sense of rejection.

The consideration of the inhabitants of the towns in the perimeter of the project is to be noted in order to limit the emergence of social tensions of the communities towards the project.

The impact severity is low. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.2.4.1.3.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a workforce management plan incorporating a transparent recruitment process and the promotion of recruitment of young people from the surrounding communities. (Measure SE-Mit-7):
Organize information meetings at the level of the towns affected by the project
Communicate transparently about the procedures for direct and indirect hiring of the project (opportunities, skills and education levels required)

Establish a framework for consultation with regular meetings (local authorities, communities, ARL, RRA) to address public development initiatives
Develop and implement a workforce management plan that includes a description of working conditions and hiring conditions
Ensure the implementation of a recruitment policy favouring local citizens and prioritizing the resettled people and the affected local communities
Prepare a training program for employees and a training plan for communities in collaboration with regional administrative authorities
Carry out an inventory of local skills within the framework of the training and skill-building action plan in order to prioritise the employment of those directly affected by the project
Implement a regular communication and complaint management plan for local communities. (Measure SE-Mit-8):
Use an effective and transparent complaint management mechanism at project level and communicate this mechanism to the authorities and towns impacted by the project activities
Communicate transparently about the procedures for direct and indirect hiring of the project (opportunities, skills and education levels required)
Establish a complaint management mechanism that is widely known to local stakeholders (local authorities and populations affected directly or indirectly by the project) and works in an efficient and transparent manner
Develop and implement a workforce management plan that includes a worker complaint management process
Develop and implement a workforce management plan that includes a worker awareness program that includes ways of informing workers about their rights through training or communication campaigns
Prepare a training program for employees and a training plan for communities in collaboration with regional administrative authorities

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **negligible magnitude**.

7.2.4.1.4 Impact SE-Demo-W-Temp-4: Temporary employment opportunities for neighbouring residents

Source of the impact: Creation of direct and indirect jobs for construction work

7.2.4.1.4.1 Positive impact

The construction created by the project of expansion of the runway will open up employment opportunities for the inhabitants of the airport area which can lead to the creation of constructive social dynamics (such as female association or small business set up) within the local communities.

The hiring of the inhabitants of neighbouring towns is a positive impact on the communities concerned for the social cohesion of the town.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.2.4.1.4.2 Improvement measure and resulting improved impact

To improve this impact, it is proposed to:

Implement a regular communication plan with local communities to inform residents about unskilled job opportunities at project level. (Measure SE-Mit-7 – see 7.2.4.1.3.2)
Communication plan for the integration of external workers (SE-Mit-5 - see 7.2.4.1.1.2)

This improvement measure will increase the magnitude of the impact to a medium level as job opportunities provided by the project will mainly concern younger inhabitants in a working capacity.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.2.4.1.5 Summary

Table 87: Temporary Impact during Construction - Socio-Economic Environment - demographics and social dynamics

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Demo-W-Temp-1	Increase of the population of Plaine Corail and its surroundings	Adverse	Low	SE-Mit-5	Mitigation - Communication plan for the integration of external workers.	Negligible
				SE-Mit-6	Mitigation - Influx management plan	
SE-Demo-W-Temp-2	Evolutions of internal relations and in relation to foreign influx	Adverse	Medium	SE-Mit-5	Mitigation : Mitigation - Communication plan for the integration of external workers.	Negligible
				SE-Mit-6	Mitigation - Influx management plan	
SE-Demo-W-Temp-3	Social tensions arising from hiring conditions	Adverse	Low	SE-Mit-7	Mitigation - Communication and hiring management plan	Negligible
				SE-Mit-8	- Communication and complaint management plan connected with employment	
SE-Demo-W-Temp-4	Temporary employment opportunities for neighbouring residents	Positive	Low	SE-Mit-5	Mitigation - Communication and hiring management plan	Medium

7.2.4.2 Impacts on power, governance and civil society

7.2.4.2.1 Impact SE-Gov-W-Temp-1: Risk of tension between the displaced community and the host community (cumulative impact)

Source of the impact: Involuntary displacement of the populations affected by the project

7.2.4.2.1.1 Impact before mitigation

The involuntary displacement of the populations affected by the project caused the relocation of the Sainte Marie inhabitants and the users of the impacted area such as livestock breeders and fishermen. The integration of these communities will have to consider the populations of the proposed relocation areas. In fact, it is probable that tensions will arise relating to the adaptation of lifestyles, space management and governance.

All of the communities mentioned here are potentially sensitive receptors and if support measures adapted and oriented to the two communities are not put in place, a sense of injustice could occur.

The impact severity is medium. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.2.4.2.1.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a communication plan (including complaint management) and internal support for all displaced residents and those in the towns within the proposed relocation areas. This plan must incorporate a regular consultation process to collect the source of dissatisfaction and to obtain solutions formulated by the communities themselves. (Measure SE-Mit-3):

Organize information meetings at the level of the towns affected by the project
Use an effective and transparent complaint management mechanism at project level and communicate this mechanism to the authorities and towns impacted by the project activities
Develop and adopt a continuous and transparent communication strategy concerning the issues of displacement and relocation
Establish a complaint management mechanism that is widely known to local stakeholders (local authorities and populations affected directly or indirectly by the project) and works in an efficient and transparent manner
These mitigation measures will limit the magnitude of the impact to a negligible level.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **negligible magnitude**.

7.2.4.2.2 Summary

Table 88: Temporary Impact during Construction - Socio-Economic Environment - Power, Governance & Civil Society

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Gov-W-Temp-1	Risk of tension between the displaced community and the host community (cumulative impact)	Adverse	Low	SE-Mit-3	Mitigation - Communication plan, complaint management and internal support for relocation.	Negligible

7.2.4.3 Impacts on land

7.2.4.3.1 Impact SE-Land-W-Temp-1: Increase in social tensions in relation to the land resource (cumulative impact)

Source of the impact: Involuntary displacement of the populations affected by the project

7.2.4.3.1.1 Impact before mitigation

The risk of the emergence of social tensions in relation to land use resources is a potential problem to be considered between communities that will need to be displaced and communities in the proposed relocation areas. In addition to habitat, it particularly involves land use related to agriculture and pastures that may be the source of potential tension.

All of the communities in the area directly impacted by the construction project as well as the towns proposed for relocation are the direct receptors of this potentially major impact of pressure on agro-pastoral systems. Accompanying measures must mandatorily be taken to minimize this negative impact.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.2.4.3.1.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to implement a communication plan (including a complaint management plan) and internal support to all villagers, displaced users and residents of the towns within the proposed relocation areas. This plan must incorporate a regular consultation process to collect sources of dissatisfaction and to obtain solutions formulated by the communities themselves. (Measure SE-Mit-3 – see 7.2.4.2.1.2)

These mitigation measures will limit the magnitude of the impact to a medium level as land resource remains a sensitive element that particularly needs to be followed up.

The proposed measures result in a major severity mitigated impact. Thus, The residual impact is of **medium magnitude**.

7.2.4.3.2 Impact SE-Land-W-Temp-2: Evolution of land management procedures (cumulative impact)

Source of the impact: Involuntary displacement of the populations affected by the project

7.2.4.3.2.1 Impact before mitigation

The involuntary displacement of the population affected by the construction project will entail a necessary adaptation of the different communities to the use of space. Indeed, the relocation of Sainte Marie villagers to proposed resettlement areas will call for a certain organisation with existing village communities. This is particularly relevant for agricultural land and in particular livestock breeding, the main activity of all the inhabitants of the area.

The main receptors of this irreversible impact on livestock-related land management are the inhabitants of the towns approached for relocation and of course the Sainte Marie villagers, and the Bangélique area livestock breeders.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.2.4.3.2.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Implement an internal support plan for all villagers, displaced users and residents of towns in the proposed relocation areas. This plan must incorporate a regular consultation process to organise the management of complaints and to obtain proposals for solutions formulated by the communities themselves. (Measure SE-Mit-3 – see 7.2.4.2.1.2)
Implement integrated technical support measures to facilitate specific adaptation to new agricultural management and pasture parcels. (Measure SE-Mit-9):
Develop programs to support agricultural and agro-pastoral development in order to make the best use of the territory's resources and adapt land uses
Improve access to water in proposed areas such as the resettlement areas
These mitigation measures will limit the magnitude of the impact to a medium level as land management remains an important concern for the locals.

The proposed measures result in a major severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.2.4.3.3 Summary

Table 89: Temporary Impact during Construction - Socio-Economic Environment - Land

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Land-W-Temp-1	Increasing social tensions in relation to the land resource	Adverse	Major	SE-Mit-3	Mitigation - Communication plan, complaint management and internal support for relocation.	Medium
SE-Land-W-Temp-2	Evolution of land management procedures	Adverse	Major	SE-Mit-3	Mitigation - Communication plan, complaint management and internal support for relocation.	Medium
				SE-Mit-9	Mitigation - Agricultural technical support plan.	

7.2.4.4 Impacts on agriculture and livestock

7.2.4.4.1 Impact SE-Agri-W-Temp-1: Decrease in income from agriculture during the adjustment period (cumulative impact)

Source of the impact: Loss of farmland

7.2.4.4.1.1 Impact before mitigation

The relocated Sainte Marie villagers will have to cultivate new parcels that have not necessarily been farmed before. The soils of the area are generally shallow and a period of rehabilitation will most likely be necessary to attain the level of fertility currently possessed by the village parcels.

Harvests are likely to be lower during the first years of cultivation and thus agricultural incomes will decline. In addition, while these incomes generally do not represent the most important part of household incomes, they are a necessity for their social equilibrium.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.2.4.4.1.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to implement follow-up procedures in the RAP to provide agricultural and economic technical support to communities during their period of adaptation and integration into their new environment. (Measure SE-Mit-10):

Organize information meetings at the level of the towns affected by the project
Use an effective and transparent complaint management mechanism at project level and communicate this mechanism to the authorities and towns impacted by the project activities
Conduct consultations with potentially impacted villages to prepare for the implementation of the Resettlement Action Plan
Develop and adopt a continuous and transparent communication strategy concerning the issues of displacement and relocation
Establish a complaint management mechanism that is widely known to local stakeholders (local authorities and populations affected directly or indirectly by the project) and works in an efficient and transparent manner
Ensure that the implementation of the Resettlement Action Plan (RAP) is in line with the project's commitments for the resettlement and restoration of livelihoods and IFC standards
Compensate land and infrastructure on the basis of a plan to manage individual and community compensation by land as much as possible, cover losses incurred for both individuals and the community
Develop a Livelihood Restoration Plan for communities that will be affected by "economic displacement" (loss of property and/or livelihoods) and establish a monitoring-assessment program of the socio-economic conditions of displaced people
Create a Resettlement Monitoring Committee for helping the follow up and ensuring the proceedings of activities and procedures
These mitigation measures will limit the magnitude of the impact to a medium level due to the still important role of crops in households.

The proposed measures result in a high severity mitigated impact. Thus, The residual impact is of **medium magnitude**.

7.2.4.4.2 Impact SE-Agri-W-Temp-2: Decrease in livestock breeding activity (cumulative impact)

Source of the impact: Loss of farmland

7.2.4.4.2.1 Impact before mitigation

The relocation of the Sainte Marie villagers and the Bangélique livestock breeders will potentially lead to a direct impact on the livestock activity. The majority of the livestock breeding in the area currently planned for construction will be located in the vicinity of the proposed relocation area, in addition to the herds already present. This could lead to an overgrazing of the area and an obligation for livestock breeders to restrict livestock if livestock breeding methods do not adapt.

However, the likelihood of declining livestock is not too large if support measures are taken. These measures are indispensable because livestock breeding is a major issue for the communities concerned.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.2.4.4.2.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Support livestock breeders from different communities in the establishment of semi- intensive farming methods in order to maintain herd sizes. (Measure SE-Mit-11):
Organize information meetings at the level of the towns affected by the project
Use an effective and transparent complaint management mechanism at project level and communicate this mechanism to the authorities and towns impacted by the project activities
Develop and adopt a continuous and transparent communication strategy concerning the issues of displacement and relocation
Establish a complaint management mechanism that is widely known to local stakeholders (local authorities and populations affected directly or indirectly by the project) and works in an efficient and transparent manner
Develop programs to support agricultural and agro-pastoral development in order to make the best use of the territory's resources and adapt land uses
Establish a visit and consultation timetable for the communities in regard to specific integration topics of the displaced herds in their new environment and the evolution of the agro-pastoral system. (Measure SE-Mit-12):
Organize information meetings at the level of the towns affected by the project
Develop programs to support agricultural and agro-pastoral development in order to make the best use of the territory's resources and adapt land uses
Support livestock breeding by allowing for the creation of water points and creating fodder perimeters for livestock
Improve access to water in proposed areas such as the resettlement areas
These mitigation measures will limit the magnitude of the impact to a medium level as livestock represents a major socio-economic component for local communities.

The proposed measures result in a major severity mitigated impact. Thus, The residual impact is of **medium magnitude**.

7.2.4.4.3 Impact SE-Agri-W-Temp-3: Change of livestock breeding practices due to the reduction in available pasture land (cumulative impact)

Source of the impact: Decrease in livestock breeding activity

7.2.4.4.3.1 Impact before mitigation

The Sainte Marie villagers and the Bangélique livestock breeders will have to raise their cattle on proposed areas close to the town of Plaine Corail. The fact that this area is already used as pastureland by other livestock breeders could lead to a general change in the way cattle is managed. It should be foreseen that the actual extent must be reviewed and the practices must be adapted, potentially through an adequate breeding intensification.

This is a very important issue for livestock breeders and is to be considered because the measures to be taken will shape the future of the livestock breeding of the area.

The impact severity is high. Considering the receptor sensitivity assessed as major, **the impact magnitude is high**.

7.2.4.4.3.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Support livestock breeders from different communities in the establishment of semi- intensive farming methods in order to maintain herd sizes. (Measure SE-Mit-11 – see 7.2.4.4.4.2)
Establish a visit and consultation timetable for the communities in regard to specific integration topics of the displaced herds in their new environment and the evolution of the agro-pastoral system. (Measure SE-Mit-12 – see 7.2.4.4.4.2)
These mitigation measures will limit the magnitude of the impact to a medium level as livestock represents a major socio-economic component for local communities.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.2.4.4.4 Impact SE-Agri-W-Temp-4: Increase in the rehabilitation time of agricultural surfaces (cumulative impact)

Source of the impact: Decrease in livestock breeding activity

7.2.4.4.4.1 Impact before mitigation

The decrease in livestock activity will simultaneously decreases the contribution of organic matter from animal origins, limiting the changes of cultivated soils and therefore can extend the period necessary for the regeneration of soils for crops.

Soil fertility is an important issue for local communities where agricultural plants represent a significant part of the economic and social functioning.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.2.4.4.4.2 Mitigation measures and impact after mitigation

Support livestock breeders from different communities in the establishment of semi-intensive farming methods in order to maintain herd sizes. (Measure SE-Mit-11 – see 7.2.4.4.4.2)

Establish a visit and consultation timetable for the communities in regard to specific integration topics of the displaced herds in their new environment and the evolution of the agro-pastoral system. (Measure SE-Mit-12 – see 7.2.4.4.4.2)
These mitigation measures will limit the magnitude of the impact to a medium level as soil rehabilitation is a long process.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.2.4.4.5 Summary

Table 90: Temporary Impact during Construction - Socio-Economic Environment - Agriculture & Livestock

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Agri-W-Temp-1	Decrease in income from agriculture during the adjustment period	Adverse	High	SE-Mit-10	Mitigation - RAP follow-up plan	Medium
SE-Agri-W-Temp-2	Decrease in livestock breeding activity	Adverse	Major	SE-Mit-11	Mitigation - Community consultation plan for monitoring the evolution of the agro-pastoral system.	Medium
				SE-Mit-12	Mitigation - Support plan concerning livestock breeding techniques.	
SE-Agri-W-Temp-3	Change of livestock breeding practices due to the reduction in available pasture land	Adverse	High	SE-Mit-11	Mitigation - Community consultation plan for monitoring the evolution of the agro-pastoral system.	Medium
				SE-Mit-12	Mitigation - Support plan concerning livestock breeding techniques.	
SE-Agri-W-Temp-4	Increase in the rehabilitation time of agricultural surfaces	Adverse	High	SE-Mit-11	Mitigation - Community consultation plan for monitoring the evolution of the agro-pastoral system.	Medium
				SE-Mit-12	Mitigation - Support plan concerning livestock breeding techniques.	

7.2.4.5 Impacts on the local economic context

7.2.4.5.1 Impact SE-Eco-W-Temp-1: Decrease in household incomes due to the potential decrease in the livestock (or even agricultural) activity of the people affected (indirect impact)

Source of the impact: Reduction of agriculture, livestock and fishing activities

7.2.4.5.1.1 Impact before mitigation

The reduction of agricultural and fishing activities in the entire airport area undoubtedly impacts household incomes since these activities are the main and often the only income source of households.

This is a major socio-economic issue and the sensitivity of all households is definitely very high.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.2.4.5.1.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Ensure follow-up on the establishment of the Resettlement Action Plan (RAP) respecting the resettlement, livelihood restoration commitments and complying with the IFC standards. (Measure SE-Mit-10 – see 7.2.4.4.1.2)
Establish a visit and consultation timetable for the communities in regard to the specific subjects of adaptation of the displaced and host communities to the changes observed in the income-generating activities. (Measure SE-Mit-14):
Organize information meetings at the level of the towns affected by the project
Develop and adopt a continuous and transparent communication strategy concerning the issues of displacement and relocation
Establish a framework for consultation with regular meetings (local authorities, communities, airport, Rodrigues government) to address public development initiatives
Conduct consultations with potentially impacted villages to prepare for the implementation of the Resettlement Action Plan
Compensate land and infrastructure on the basis of a plan to manage individual and community compensation by land as much as possible, cover losses incurred for both individuals and the community
Develop a Livelihood Restoration Plan for communities that will be affected by "economic displacement" (loss of property and/or livelihoods) and establish a monitoring-assessment program of the socio-economic conditions of displaced people
Support the diversification of income-generating economic activities in the context of the Livelihood Restoration Plan so that people affected by the project can regain sustainable livelihoods and possibly invest in these activities a part of the financial indemnifications resulting from the RAP
Support projects for the development of income-generating activities aimed at internally displaced people, in particular people displaced due to economic reasons
Promote local economic development initiatives to accompany the people and communities affected by the project
Reinforce or create income-generating activities, in particular those carried out by women

Develop programs to support economic diversification and the development of income-generating activities (e.g. crafts, trade, services and processing of agricultural and fishery products)
These mitigation measures will limit the magnitude of the impact to a medium level as incomes from farming and fishing represent a socio-economic pillar of households.

The proposed measures result in a major severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.2.4.5.2 Impact SE-Eco-W-Temp-2: Increase in local production prices (indirect impact)

Source of the impact: Reduction of agriculture, livestock and fishing activities

7.2.4.5.2.1 Positive impact

The reduction of activities related to agriculture, livestock and fisheries leads to a decrease in production and a decline in marketed quantities that encourages the increase in local production prices.

This impact can be positive due to the fact that this can help to improve the incomes of producers, livestock breeders and fishermen.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.2.4.5.2.2 Improvement measure and impact after improving

To promote this impact, it is proposed to:
Promote the establishment of a timetable for visits and consultations of all the communities in the area in relation to the specific subjects of adaptation of the displaced and host communities to the changes observed in the income-generating activities. (Measure SE-Mit-14 – see 7.2.4.5.1.2)
Create a favourable economic framework to enable households to balance income from income-generating activities. (Measure SE-Mit-15):
Organize information meetings at the level of the towns affected by the project
Develop and adopt a continuous and transparent communication strategy concerning the issues of displacement and relocation (only during operating phase)
Establish a framework for consultation with regular meetings (local authorities, communities, airport, Rodrigues government) to address public development initiatives
These improvement measures will permit the achievement of an impact magnitude at a high level.

The proposed measures result in a medium severity mitigated impact. Thus, the improved impact is of **high magnitude**.

7.2.4.5.3 Impact SE-Eco-W-Temp-3: Increase in local production prices (cumulative impact)

Source of the impact: Reduction of agriculture, livestock and fishing activities

7.2.4.5.3.1 Impact before mitigation

A decrease in the quantities marketed for agricultural or fishing products is an incentive to increase local production prices. However, this impact can also be seen as a negative impact on households in towns that see their purchasing power decrease. In this regard, household sensitivity is highly characterized making it an impact considered as high.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.2.4.5.3.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Establish a visit and consultation timetable for all the communities in the area in relation to the specific subjects of adaptation of the displaced and host communities to the changes observed in the income-generating activities. (Measure SE-Mit-14 – see 7.2.4.5.1.2)
Create a favourable economic framework to enable households to balance income from income-generating activities. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
These mitigation measures will limit the magnitude of the impact to a medium level as particular attention will have to be taken for local purchasing power.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.2.4.5.4 Impact SE-Eco-W-Temp-4: Increase in local development initiatives (cumulative impact)

Source of the impact: Reduction of agriculture, livestock and fishing activities

7.2.4.5.4.1 Positive impact

The reduction of agricultural or fishing activities may lead to the establishment and development of other activities to generate sufficient incomes for households in the communities or create opportunities for local entrepreneurship (e.g. through the women's association) that will respond to a growing demographic demand.

This positive impact concerns all the communities in the airport area and its environs and specifically those that will comprise the relocation areas of the villagers of Sainte Marie. This potentiality represents a considerable stake for all the communities.

The impact severity is medium. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium**.

7.2.4.5.4.2 Improvement measure and impact after improving

To promote this impact, it is proposed to:

Establish a visit and consultation timetable in regard to the specific subjects of adaptation of the displaced and host communities to the changes observed in the income-generating activities. (Measure SE-Mit-14 – see 7.2.4.5.1.2)

Implement measures supporting households in order to integrate initiatives proposed by the communities into the local economic context. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
These improvement measures will produce an impact magnitude at a high level.

The proposed measures result in a medium severity mitigated impact. Thus, the improved impact is of **high magnitude**.

7.2.4.5.5 Impact SE-Eco-W-Temp-5: Increase in household incomes (cumulative impact)

Source of the impact: Creation of direct and indirect jobs

7.2.4.5.5.1 Positive impact

The project can create jobs within the surroundings for the local population and even for women during the various phases of project management, with great potentialities during works phase. This job creation will undeniably lead to increase in household income security in surrounding towns.

This positive impact here concerns all communities in relation to the project and represents a strong socio-economic issue for the project area.

The impact severity is high. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium**.

7.2.4.5.5.2 Improvement measure and impact after improving

To promote this impact, it is proposed to:

Implement a workforce management plan incorporating a transparent recruitment process, promoting the recruitment of young people from the surrounding communities. (Measure SE-Mit-7 – see 7.2.4.1.3.2)
Implement a regular communication plan with local communities. (Measure SE-Mit-7 – see 7.2.4.1.3.2)
These improvement measures will produce an impact magnitude at a high level.

The proposed measures result in a high severity mitigated impact. Thus, the improved impact is of **high magnitude**.

7.2.4.5.6 Impact SE-Eco-W-Temp-6: Necessary adaptation to athe new local economic landscape (cumulative impact)

Source of the impact: Creation of direct and indirect jobs

7.2.4.5.6.1 Impact before mitigation

The creation of direct and indirect jobs implies a potential change in the local economic landscape, including the emergence of various companies creating an interesting economic dynamic in the airport area.

This impact can potentially be considered adverse to a lesser extent if specific support is not provided in order to harmonize future economic developments. While it may be classified as low-magnitude, this potential impact is nonetheless an issue to be taken into consideration.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.2.4.5.6.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a regular communication plan with local communities. (Measure SE-Mit-14 – see 7.2.4.5.1.2)
Implement a management plan for local economic development to propose a harmonisation of community-based initiatives in response to the changing economic environment of the area. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
These mitigation measures will permit the limitation of the impact's magnitude to a negligible level

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **negligible magnitude.**

7.2.4.5.7 Impact SE-Eco-W-Temp-7: Collaborative partnership or operational opportunities between local communities (indirect impact)

Source of the impact: Creation of direct and indirect jobs

7.2.4.5.7.1 Positive impact

The potential for creating direct and indirect jobs can lead to the development of socio-economic projects involving the various parts of the surrounding towns of the airport project. The presence of a favourable economic and social environment triggers opportunities for groupings of skills and thus the creation of partnerships.

This impact permits the establishment and maintenance of a positive socio-economic network within communities and can be of considerable importance.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium**.

7.2.4.5.7.2 Improvement measure and impact after improving

To promote this impact, it is proposed to:

Implement a regular communication plan with local communities. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
Implement a management plan for local economic development to propose a harmonisation of community-based initiatives in response to the changing economic environment of the area. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
These mitigation measures will limit the magnitude of the impact to a medium level.

The proposed measures result in a medium severity mitigated impact. Thus, the improved impact is of **medium magnitude**.

7.2.4.5.8 Impact SE-Eco-W-Temp-8: Reinforcement of professional skills (cumulative impact)

Source of the impact: Creation of direct and indirect jobs

7.2.4.5.8.1 Positive impact

New job creation opportunities during the various phases of the project represent a strong potential to reinforce the professional skills of the surrounding populations, who will then have the opportunity to have access to certain professions inexistent until now in the area and therefore receive specific training to respond to the demand.

This impact represents a highly positive opportunity for the local people and more evidently for the younger generations, who will complement the local skills palette and the citizens of Rodrigues more generally.

The impact severity is high. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium.**

7.2.4.5.8.2 Improvement measure and impact after improving

To promote this impact, it is proposed to:

Implement a regular communication plan with local communities. (Measure SE-Mit-7 – ssee 7.2.4.1.3.2)
In the proposal plan for project hiring, ensure a distribution in order to foster the relationship between the experienced workers and the young people of the surrounding towns which are less experienced. (Measure SE-Mit-7 – see 7.2.4.1.3.2)
Identify opportunities for economic development from local initiatives to provide training and coaching plans to reinforce professional skills. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
These improvement measures will permit the achievement of an impact magnitude at a high level.

The proposed measures result in a high severity mitigated impact. Thus, the improved impact is of **high magnitude**.

7.2.4.5.9 Summary

Table 91: Temporary Impact during Construction - Socio-Economic Environment - Local Economy

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Eco-W-Temp-1	Decrease in household incomes due to the potential decrease in the livestock (or even agricultural) activity of the people affected	Adverse	Major	SE-Mit-10	Mitigation- RAP follow-up plan	Medium
				SE-Mit-14	Mitigation- Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	
SE-Eco-W-Temp-2	Increase in local production prices	Positive	Low	SE-Mit-14	Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	High
				SE-Mit-15	Economic support plan for households.	
SE-Eco-W-Temp-3	Increase in local production prices	Adverse	High	SE-Mit-14	Mitigation- Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	Medium
				SE-Mit-15	Mitigation- Economic support plan for households.	
SE-Eco-W-Temp-4	Increase in local development initiatives	Positive	Medium	SE-Mit-14	Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	High
				SE-Mit-15	Economic support plan for households.	
SE-Eco-W-Temp-5	Increase in household incomes	Positive	Medium	SE-7	Communication and hiring management plan	High
SE-Eco-W-Temp-6	Necessary adaptation to athe new local economic landscape	Adverse	Low	SE-Mit-14	Mitigation- Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	Negligible
				SE-Mit-15	Mitigation- Economic support plan for households.	

SE-Eco-W-Temp-7	Opportunities for partnerships or cooperative operations	Positive	Medium	SE-Mit-15	Economic support plan for households.	High
SE-Eco-W-Temp-8	Reinforcement of professional skills	Positive	Medium	SE-Mit-7	Communication and hiring management plan	High
				SE-Mit-15	Economic support plan for households.	

7.2.4.6 Impacts on the health and safety of the communities

7.2.4.6.1 Impact SE-Safe-W-Temp-1: Increased risk of accidents due to traffic

Source of the impact: Increase in the movement of equipment and vehicles for the construction area

7.2.4.6.1.1 Impact before mitigation

The construction of the airport infrastructures will induce the use of specific construction equipment and other vehicles in the area. Some of them will travel regularly on the main road, which statistically increases the risk of accidents.

The impacted, very sensitive populations are the village communities in the vicinity but also the people who use the area and potentially their cattle. Special attention is to be paid to children, users of the sides of the road at the exit of the school, who are specifically vulnerable. This peculiarity makes it possible to consider that this impact can be classified as important.

The impact severity is major. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.2.4.6.1.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Measure SE-Mit-16:
Establish a communication plan with the local and surrounding communities of the airport project aimed at emphasizing the potential risks associated with the movement of large equipment and increasing traffic in general.
Sensitize livestock breeders to the potential dangers of the proximity of their animals to the main road
Organize information meetings at the level of the towns affected by the project
Design and construct the structural elements of the project, taking into consideration the risks to workers and affected communities
Implement a public awareness campaign for the population on road safety issues in the vicinity of construction sites
Measure SE-Mit-17:
Promote the establishment and use of pedestrian paths along the road and the multiplication of crossways such as pedestrian crossings.
Promote communication with local communities concerning road safety guidelines and the importance of their compliance (warning signs, preventive messages, etc.):
Design and construct the structural elements of the project, taking into consideration the risks to workers and affected communities

The proposed measures result in a major severity mitigated impact. Thus, the residual impact is of **low magnitude**.

7.2.4.6.2 Impact SE-Safe-W-Temp-2: Respiratory discomfort of the inhabitants of the towns closest to the building area

Source of the impact: Possible dust deposits during construction activities

7.2.4.6.2.1 Impact before mitigation

Traffic and work in the construction area can produce considerable quantities of dust that is transported by the wind and can reach the surrounding dwellings creating potential respiratory problems.

The inhabitants of the villages closest to the construction area are most susceptible to this potential impact, which is not, according to the people interviewed in the closest village of Plaine Corail, a significant impact.

This low-magnitude adverseimpact does not imply the establishment of mitigation measures.

The impact severity is medium. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.2.4.6.3 Summary

Table 92: Temporary Impact during Construction - Socio-Economic Environment - Health & Safety of the Community

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Safe-W-Temp-1	Increased risk of accidents due to traffic	Adverse	High	SE-Mit-16	Mitigation - Communication plan for the communities and livestock breeders of the area concerning road safety.	Low
				SE-Mit-17	Mitigation - Facilitation of access to protected pedestrian lanes and safety signage management plan.	
SE-Safe-W-Temp-2	Respiratory discomfort of the inhabitants of the towns closest to the building area	Adverse	Low	None	No mitigation measures to be undertaken	Low

7.2.4.7 Impacts on the health and safety of workers

7.2.4.7.1 Impact SE-Wor-W-Temp-1: Increased risk of accidents and illnesses

Source of the impact: Demanding nature of the construction work

7.2.4.7.1.1 Impact before mitigation

The construction of airport infrastructures implies the necessity of hiring workers for certain difficult, demanding or dangerous tasks which result in an increase in the probability of accidents at work or, in the longer term, work-related illness.

The populations that are receptors of this probable impact are the hired workers from the communities surrounding the project area. The importance of the impact is major and the sensitivity of the receptors can be considered important.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.2.4.7.1.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Maintain a connection with the promoters in order to ensure the establishment of appropriate training for workers concerning the potential and specific hazards of their work as well as on the practical actions to be taken to avoid health problems that can occur during their activity during the project. (Measure SE-Mit-18):
Establish a joint occupational health committee as a framework for consultation with regular meetings (local authorities, communities, airport, Rodrigues government) to address public development initiatives
Identify all hazards to workplaces, equipment, processes, etc. and assess the risks of accidents occurring for each hazard, in order to prioritize them and set priorities for prevention and to ensure that the infrastructure of the project in order to limit untimely penetrations that could generate accidents
Establish a system of protection of workers against occupational diseases (screening of nuisance factors, regular medical visits of workers, etc.)
Establish a project worker training program to ensure that these employees have the skills, information and capabilities to manage the risks associated with the position to which they are assigned
The goal of this plan is to initiate measures to prevent accidents, injuries and illnesses resulting from work by minimizing the causes of these hazards as much as possible
Equip workers with all the necessary protective equipment to minimize the risks associated with the tasks carried out in the course of their employment
Develop and implement a workforce management plan that includes the provision of a safe and healthy working environment
Report any accident, incident or professional disease
Conduct a medical follow-up of the all workers and a more specific follow-up for the workers exposed to specific nuisiances and dangers (noise, dust, vibrations)
Prepare a training program for employees and a training plan for communities in collaboration with regional administrative authorities
Ensure that employees are continuously trained on the following subjects:
training in relation to the performance of work specific to each position
specific training for each task for any new assignment
knowledge of the risks associated with the work and the current health and safety procedures

understanding of the appropriate procedures associated with the use and handling of hazardous materials
knowledge of hiring conditions and personnel rights
knowledge of emergency procedures and training related to this topic
knowledge of the workers' code of conduct (internal rules of the base camp)
Promote communication with local communities on the importance of complying with the safety instructions given by the contractors for the new airport infrastructures. (Measure SE-Mit-19):
Organize information meetings at the level of the towns affected by the project
Ensure the infrastructure of the project in order to limit untimely penetrations that could generate accidents
The goal of this plan is to initiate measures to prevent accidents, injuries and illnesses resulting from work by minimizing the causes of these hazards as much as possible
Develop the health/safety culture of project workers and raise awareness of risks and their mastery
Prepare a training program for employees and a training plan for communities in collaboration with regional administrative authorities
Ensure that employees are continuously trained on the following subjects:
Training in relation to the performance of work specific to each position
specific training for each task for any new assignment
knowledge of the risks associated with the work and the current health and safety procedures
understanding of the appropriate procedures associated with the use and handling of hazardous materials
knowledge of hiring conditions and personnel rights
knowledge of emergency procedures and training related to this topic
knowledge of the workers' code of conduct
Train employees as soon as they are admitted to the project and on an ongoing basis over the life of the project concerning safety risk issues and the procedures applicable to project employees
These mitigation measures will permit the limitation of the magnitude of the impact to a medium level as risks still exist for such works projects.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.2.4.7.2 Summary

Table 93: Temporary Impact during Construction - Socio-Economic Environment - Health & Safety of Workers

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Wor-W-Temp-1	Increased risk of accidents and illnesses	Negative	High	SE-Mit-18	Mitigation - Coordination with the contractors involved in the work sites for the implementation of specific Health-Safety training.	Medium
				SE-Mit-19	Mitigation - Communication plan for the communities concerning the importance of complying with safety instructions on construction sites	

7.2.5 Air quality and noise

7.2.5.1 Air quality

7.2.5.1.1 Impact Air-W-Temp-1: Alteration of air quality due to construction activities

7.2.5.1.1.1 Impact before mitigation

During construction phase, dust and pollutants emissions could affect air quality in the area around the work.

As the project is only at the Preliminary Design stage, the construction phase is not yet precisely described, only some principles are known.

The operations that might generate pollutions are earthworks, infrastructures construction and the demolition of Sainte-Marie Hill. Also, the supplies for the construction site will be transported by road, which will cause polluting emissions due to the increase in road traffic, in particular with heavy goods vehicles.

Sensitivity to dust and air pollution in the area is high, since several households are located at less than 1000m from the work area. Ambient air quality will be affected in a non-quantifiable proportion at this stage; however the foreseeable effects relate to the increase of air pollutants such as CO, HC, NOx, and particulate matter, dust fallout and less visibility in the immediate environment of the work.

As these effects will be of limited duration, the impact severity is assessed to be medium.

The impact severity is medium. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium**.

7.2.5.1.1.2 Mitigation measure and impact after mitigation

A set of various mitigation measures are to be considered:

Institute a speed limit on all unpaved roads around the site (max 30 km/h)
Regularly water the main roads and areas producing dust
Limit the storage and handling of materials that may create dust
Reduce road traffic to a minimum by optimizing the truck loading for the site supply
Minimize on-site travel distances and avoid traffic close to inhabited areas as much as possible
With mitigation measures, the impact severity is assessed to be low.

The proposed measures result in a medium severity mitigated impact. Thus, **The residual impact is of low magnitude**.

7.2.5.1.2 Summary

Table 94: Temporary Impact during Construction - Air Quality

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Air-W-Temp-1	Alteration of air quality due to construction activities	Adverse	Medium	Air-Mit-1	Institute a speed limit on all unpaved roads around the site (max 30 km/h)	Low
				Air-Mit-2	Regularly water the main roads and areas producing dust	
				Air-Mit-3	Limit the storage and handling of materials that may create dust	
				Air-Mit-4	Reduce road traffic to a minimum by optimizing the truck loading for the site supply	
				Air-Mit-5	Minimize on-site travel distances and avoid as far as possible traffic close to inhabited areas	

7.2.5.2 Noise

7.2.5.2.1 Impact Noi-W-Temp-1: nuisance caused by noise due du construction activities

7.2.5.2.1.1 Impact before mitigation

As the project is only at the Preliminary Design stage, the construction phase is not yet precisely described, only some principles are known.

The operations that might generate noise are earthworks, infrastructure construction and the demolition of Sainte-Marie Hill. Also, the supplies for the construction site will be transported by road, which will cause noise emissions due to the increase in road traffic, in particular with heavy goods vehicles.

As residential areas are very close to the work area (less than 200m), sensitivity to noise is high. Construction activities such as excavations, earthworks and movements of large vehicules, will cause noise in a non-quantifiable proportion at this stage, and disturb the neighbours, especially because the background noise is low. However, these nuisances will be limited in time and will not affect populations in the long term.

As these effects will be of limited duration, the impact severity is assessed to be low.

The resultant impact magnitude is therefore low.

Thus, the impact severity is low. Considering the receptor sensitivity assessed as high, **the impact magnitude is low**.

7.2.5.2.1.2 Mitigation measure and impact after mitigation

Since the disturbance is greatest at night, the key mitigation measure is to limit or even eliminate all night work, and if possible to avoid work during the period 18.00 – 22.00 hrs.

The choice of the least noisy techniques and equipment can also help to reduce the acoustic impact of the worksite.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.2.5.2.2 Summary

Table 95: Temporary Impact during Construction - Socio-Economic Environment - Noise

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Noi-W-Temp-1	Nuisance caused by noise due du construction activities	Adverse	Low	Noi-Mit-1	Avoid night work and limit work during evening period	Low
				Noi-Mit-2	Choose the least noisy techniques and equipements	Low

7.2.6 Heritage resources and visual environment

7.2.6.1 Paleonthology

None.

7.2.6.2 Landscape and visual environment

Landscape and visual resources are defined as the combination of the following components that are part of the landscape and give visual, aesthetic or scenic quality to the environment: topography, geology, forests, open spaces, biodiversity, relief, rivers and coastlines.

Visual and landscape impacts can occur when new elements are introduced into a landscape, or when existing elements are modified or removed, leading to a change in the way stakeholders access, perceive or use landscape resources.

In each case, the impact can be perceived as adverseor positive, depending on the nature and degree of the change and people's attitudes towards the current and new landscape. These impacts can be assessed by referring to changes in the landscape as perceived from perspectives from which individuals or groups of individuals see the project.

7.2.6.2.1 Impact Vis-W-Temp-1: alteration of the living environment

7.2.6.2.1.1 Impact before mitigation

Sources of temporary impact associated with the construction phase may include:

Road and track construction;
Vegetation clearance;
The movement of large construction vehicles;
Construction and operation of the crushers, conveyors and processing plant;
Temporary earthworks.
Plaine Corail and existing buildings have moderately valued characteristics. Local landscape thus is reasonably tolerant to changes.

Sensitivity to alteration of the living environment in the area can be considered has Medium.

Impacts listed before are likely to occur with an absolute certainty.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium.**

7.2.6.2.1.2 Mitigation measure and impact after mitigation

A series of mitigation measures will help to minimize the landscape and visual impacts of construction activities. These measures will be designed to:

Limit the vegetation clearing area during construction to the minimum necessary to carry construction works;
Prevent encroachment of areas outside designated boundaries to avoid damaging landscape resources;
Minimize visual intrusion through the sensitive design of structures and buildings, including the choice of implantation, size and colours for key buildings. Colour finishes for site buildings will be limited to browns, ochres and greens. White, light colours and primary colours shall be avoided as much as possible;

Minimize of construction sites necessary for safety and security, and minimize scattered light outside the immediate work area, particularly towards the sky at night;
Ensure that platforms and construction work areas are maintained in a clean and orderly manner through adequate maintenance;
Perform temporary seeding during all construction stage to avoid dust or soil washout, but help weed control and pest control;
Temporary fences and earthworks will be arranged to reduce visual intrusion on neighbouring homes;
Ensure that earth and material storage areas are not located directly on the coast, are not likely to be dragged into a river or sea, and are located taking into account the surrounding landscape;
Plantings (trees and bushes) are designed and arranged to form visual screens to mitigate visual impacts from nearby roads and homes:
Early planting needed for efficient screening when construction works starts;
Screen planting does contribute to construction acceptance and generally speaking planting contributes to a positive perception of the construction phase; Screen planting is described in 7.4.6.2.
Rehabilitate areas that were temporarily used during construction as soon as possible after completion of the work.
These mitigation measures will permit the limitation of the magnitude of the impact to a low level.

There is a risk on living environment of considering visual and aesthetic measures as secondary or unnecessary.

The proposed measures result in a medium severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.2.6.2.2 Impact Vis-W-Temp-2: increasing pressure on island landscape

7.2.6.2.2.1 Impact before mitigation

Sources of temporary indirect impacts associated with the construction phase may include:

The simultaneous construction of residential buildings to relocate 30 families;
Changes in land use as a result of the relocation of associated farms.

Population shift might be reflected in dispersed building or new community settlement. It has been monitored and associated into existing settlements. Therefore, impact on landscape is not yet to come. Natural environment and landscape are not considered to have been degraded and modified.

General sensitivity to pressure increase on island landscape can therefore be considered as not significant.

Alteration to key elements of the landscape character, might result in noticeable to partial change of character.

The impact severity is not significant. Considering receptor sensitivity assessed as medium, **the impact magnitude is negligible**.

7.2.6.2.2.2 Mitigation measure and impact after mitigation

Three mitigation measures will help to minimize the landscape and visual impacts of construction activities:

Favor dispersed relocation building in existing communities;
Relocate families outside of the Zone of Visual Influence;
Community support in construction process.
These mitigation measures will permit the limitation of the magnitude of the impact to a medium level.

The proposed measures result in a not significant impact. Thus, The residual impact is of **negligible magnitude**.

7.2.6.2.3 Summary

Table 96: Temporary Impact during Construction - Landscape & Visual Environment

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Impact Vis-W-Temp-1	Alteration of the living environment	Adverse	Medium	Land-Mit-1	Limit the vegetation clearing area during construction;	Low
				Land-Mit-2	Prevent encroachment of areas outside designated boundaries to avoid damaging landscape resources;	
				Land-Mit-3	Minimize the lighting of construction sites	
				Land-Mit-4	Minimize visual intrusion	
				Land-Mit-5	Ensure that platforms and construction work areas are maintained in a clean and orderly manner	
				Land-Mit-6	Perform temporary seeding	
				Land-Mit-7	Temporary fences and earthworks will be arranged to reduce visual intrusion;	
				Land-Mit-8	Ensure that earth and material storage areas are not located directly on the coast;	
				Land-Mit-9	Plantings are designed and arranged to form visual screens to mitigate visual impacts;	
				Land-Mit-10	Rehabilitate areas that were temporarily used during construction.	
Impact Vis-W-Temp-2	Increasing pressure on island landscape	Adverse	Negligible	Land-Mit-11	Favor dispersed relocation building in existing communities;	Negligible
				Land-Mit-12	Relocate families outside of the Zone of Visual Influence;	
				Land-Mit-13	Community support in construction process	

7.3 Permanent and irreversible impacts during Construction Phase

7.3.1 Physical environment

7.3.1.1 Marine physical environment: shores, currents, turbidity and sedimentation

The main permanent impacts due to the construction on the marine physical environment are the:

Modification of the local bathymetry and the shoreline;
Modification of the hydrodynamic processes;
Modification of the sediment transit;
Modification of the bathymetry due to the dredging to access jetty facilities;
Remains of suspended particulate matter and sediment.

7.3.1.1.1 Impact Phy-Mar-W-Def-1

7.3.1.1.1.1 Impact before mitigation

The action of changing the coastline and adding aggregate might alter the topography from which it existed previously.

The shoreline is modified by the extensions at 4 locations which represents more than 900m of new coastline, due to the extension of the runway and the vicinity of the jetty facilities. The constitution of the coastline is now partly artificial instead of being mainly composed of rock (see image below) interspersed with a few sandy beaches.

Figure 175: rocky coast in the west backfilled area

The impact severity is low. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.3.1.1.1.2 Mitigation measure and impact after mitigation

As the impact magnitude is low, no mitigation measure is necessary.

7.3.1.1.2 Impact Phy-Mar-W-Def-2

7.3.1.1.2.1 Impact before mitigation

Newly built areas will change the coastline geometry and seabed morphology leading to cause significant changes to the coastal hydrodynamics; it may redistribute wave energy, cause changes in wave propagation and change tidal current speed and direction especially in the channel between Crab Island and the mainland where the width is limited.

However, the dimensions of the constructed area are so secondary that the impact severity is low at Rodrigues's scale. Wave pattern does not experience significant changes, wave heights are restricted by the lagoon's restraining action, breaking on the reef barrier.

In Plaine Corail, flow magnitudes are higher, beyond 0.10 m/s behind the the construction. Flow locally changes direction to circumvent the new runway delineation, and resume its trajectory, see table below.

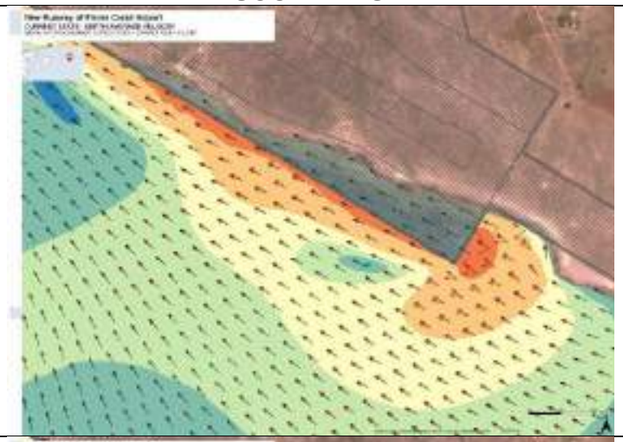
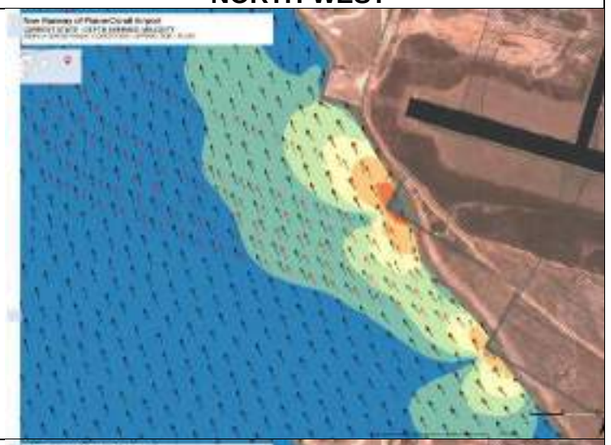
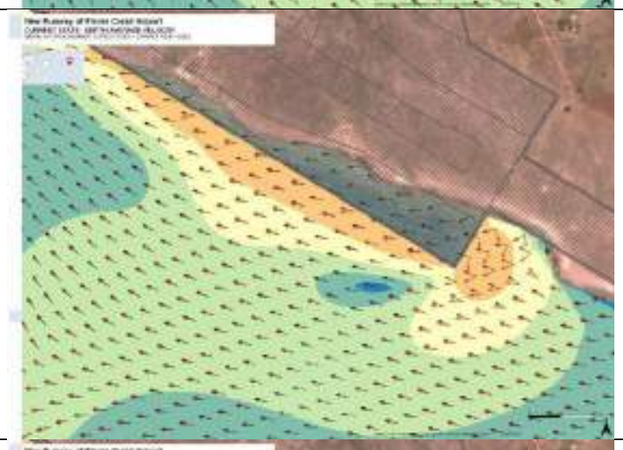
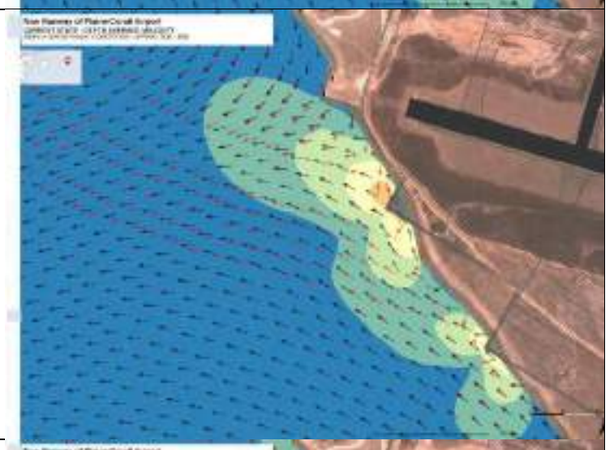
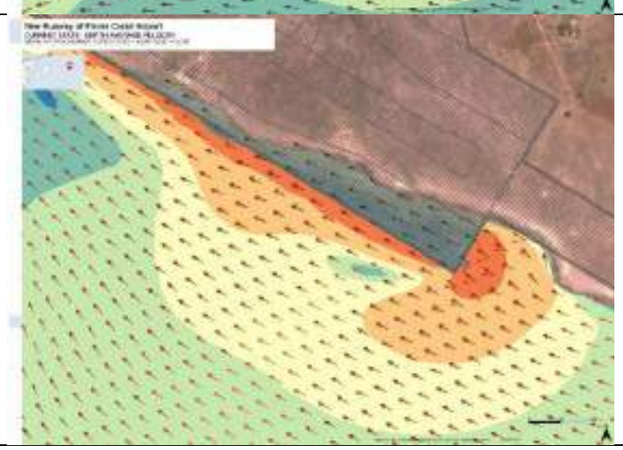
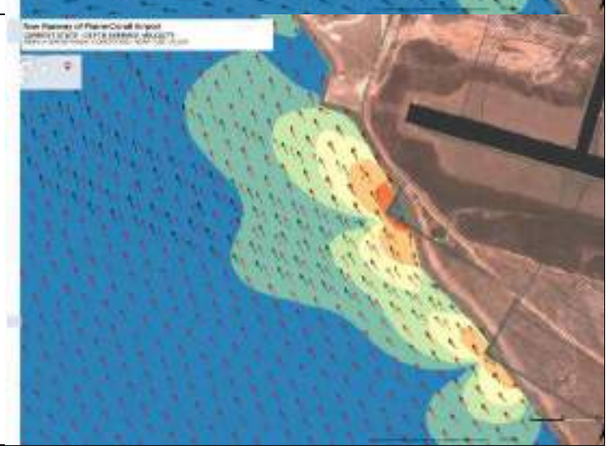
The main receptor affected by this action may be the physical coastal processes.

The impact severity is not significant. Considering the receptor sensitivity assessed as medium, **the impact magnitude is negligible**.

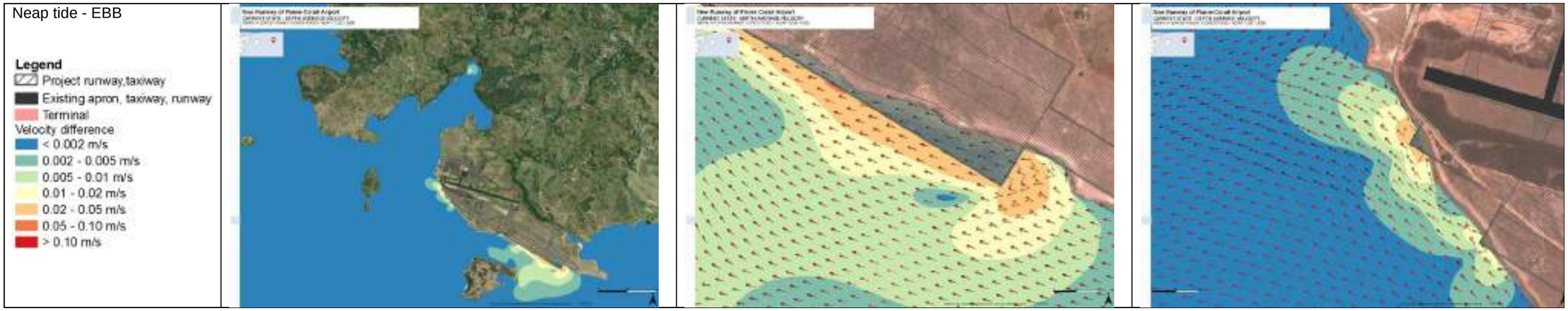
7.3.1.1.2.2 Mitigation measure and impact after mitigation

As the impact magnitude is negligible, no mitigation measure is necessary.

Table 97: Differential of circulation due to the constructed runway

	PLAINE CORAIL	SOUTH-EAST	NORTH-WEST
Spring tide - FLOW **Legend** Project runway,taxiway Existing apron, taxiway, runway Terminal Velocity difference < 0.002 m/s 0.002 - 0.005 m/s 0.005 - 0.01 m/s 0.01 - 0.02 m/s 0.02 - 0.05 m/s 0.05 - 0.10 m/s > 0.10 m/s			
Spring tide - EBB **Legend** Project runway,taxiway Existing apron, taxiway, runway Terminal Velocity difference < 0.002 m/s 0.002 - 0.005 m/s 0.005 - 0.01 m/s 0.01 - 0.02 m/s 0.02 - 0.05 m/s 0.05 - 0.10 m/s > 0.10 m/s			
Neap tide - FLOW **Legend** Project runway,taxiway Existing apron, taxiway, runway Terminal Velocity difference < 0.002 m/s 0.002 - 0.005 m/s 0.005 - 0.01 m/s 0.01 - 0.02 m/s 0.02 - 0.05 m/s 0.05 - 0.10 m/s > 0.10 m/s			

Neap tide - EBB



7.3.1.1.3 Impact Phy-Mar-W-Def-3

7.3.1.1.3.1 Impact before mitigation

The extension of the airport will change the coastline geometry, seabed morphology and flow pattern leading to changes in sediment balance, transport and deposition regime.

Areas exposed to current and wave action are different from before the construction. The sedimentary composition of the seabed has changed: new sediments are available in the vicinity of the discharge and sediment that used to be on the area reclaimed from the sea has been replaced by artificial structure, non-erodible.

A numerical sediment transport model is constructed and exploited to identify deposit/erosion areas and sediment movement pattern in general. The model is forced by mean annual meteorological conditions, summarized in the table below, during a hydrodynamic period of 14.5 days (1 neap tide + 1 spring tide). As morphological changes take place over much longer periods than short-term hydrodynamics, a morphological acceleration factor is used in the model enabling a 3 months evolution simulation. A simulation is conducted with the runway extension achieved, another one in the current state.

Table 98: Marine sediment model inputs

Sediment transport model input (DELFT-3D)				
Winds conditions	Waves conditions		Sediment	Roughness
V = 8.5 m/s Dir = 105°	Hs = 2.25m Tp = 14.5s Dir = 215°	Hs = 2.75m Tp = 9.25s Dir = 105°	Specific density = 2650 kg/m^3 Dry bed density = 1600 kg/m^3	C = 40 m$^{1/2}$/s in the lagoon C = 65 m$^{1/2}$/s elsewhere

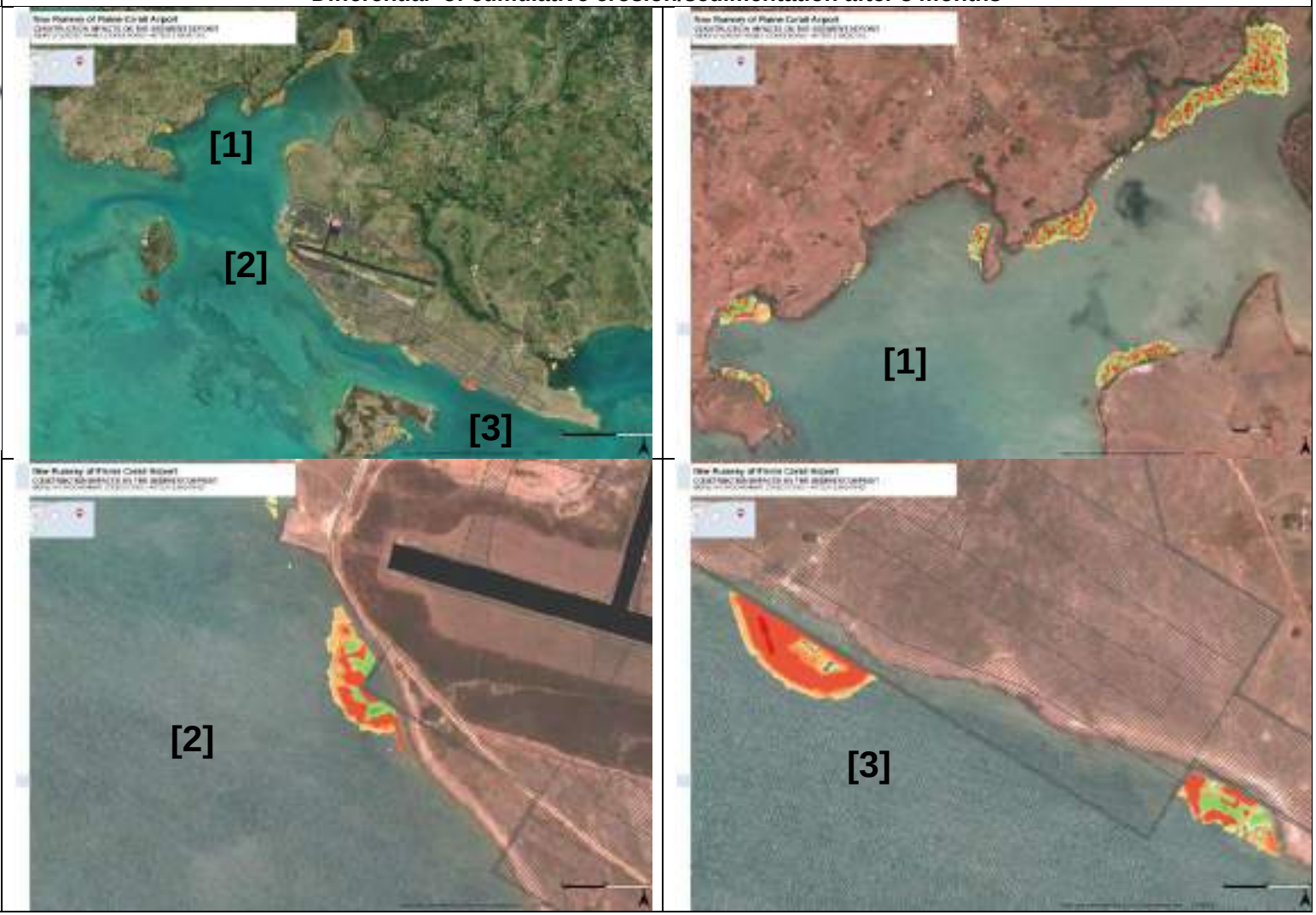
A movable sediment bed of 0.3m in thickness was assumed to exist everywhere from the seaward of the reef to the coast. Two types of sediments are used in the model, the grain size (750µm and 380µm) and special distribution is retrieved from analysis of the sample collected in the surroundings of Plaine Corail.

Outcomes are qualitative. The sediment accumulation/deposit result assessment will be analyzed to define whether or not the construction stage of the project will affect sensitive areas.

Three months after the constructions are achieved, two areas will be impacted:

The shoreline of Topaze bay. However, values are so small that it may be residual numerical errors;
The newly build area reclaimed from the sea and its immediate surroundings.
The general sediment flux has not been affected.

Table 99: Impact on sediment deposit due to the construction of the Runway

	Differential of cumulative erosion/sedimentation after 3 months
Legend Project runway,taxiway Existing apron, taxiway, runway Terminal Sediment deposit thickness < 100 mm -100 - -10 mmm -10 - -5 mm -5 - -2 mm -2 - -1 mm 1 - 2 mm 2 - 5 mm 5 - 10 mm 10 - 100 mm > 100 mm	

The main receptor affected by this action may be the marine sediment dynamic.

The impact severity is low. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.3.1.1.3.2 Mitigation measure and impact after mitigation

As the impact magnitude is negligible, no mitigation measure is necessary.

7.3.1.1.4 Impact Phy-Mar-W-Def-4

7.3.1.1.4.1 Impact before mitigation

The potential new dredge channel to access the jetty facilities and the boathouse changes the bathymetry of the area leading to modification in the sediment balance, transport and deposition regime.

The area is located away from main currents and thus from sediment transport. Impacts on those parameters are very small.

The impact severity is low. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.3.1.1.4.2 Mitigation measure and impact after mitigation

As the impact magnitude is low, no mitigation measure is necessary.

7.3.1.1.5 Impact Phy-Mar-W-Def-5

7.3.1.1.5.1 Impact before mitigation

The land reclaimed by the ocean construction process and dredging near the jetty facilities generates a turbid flume and releases an important amount of suspended matter. Once the work is done, part of it still remains. It has not settled down to the seabed and has not been flown away with the ebb/flow currents.

Depending on the concentration of sediment released, remaining particles can stay for a long period but the turbidity will naturally decrease with time.

The main receptor affected by this action may be the marine sediment quality.

The impact severity is low. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.3.1.1.5.2 Mitigation measure and impact after mitigation

As the impact magnitude is low, no mitigation measure is necessary.

7.3.1.1.6 Summary

Table 100: Permanent Impact during Constructon - Physical Environment - Marine

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Phy-Mar-W-Def-1	Alteration of the local bathymetry and shoreline	Adverse	Low	None	-	Low
Phy-Mar-W-Def-2	Modification of the local hydrodynamic processes	Adverse	Negligible	None	-	Negligible
Phy-Mar-W-Def-3	Modification of the sediment transit	Adverse	Low	None	-	Low
Phy-Mar-W-Def-4	Modification of the bathymetry due to the dredging to access jetty facilities	Adverse	Low	None	-	Low
Phy-Mar-W-Def-5	Remains of suspended particulate matter and sediment	Adverse	Low	None	-	Low

7.3.1.2 Hydrology

7.3.1.2.1 Impact Phy-Hyd-W-Def-1: Transfer of sediments to the lagoon

7.3.1.2.1.1 Impact before mitigation

Excavation and remodeling of the natural terrain will facilitate soil erosion in the event of a heavy rainfall during the construction phase, increasing the supply of materials to the lagoon and destabilizing the ecosystem.

The impact severity is high. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.3.1.2.1.2 Mitigation measure and impact after mitigation

The aim of the proposed mitigation measures is to avoid erosion during the works. Temporary sedimentation ponds downstream of the construction sites will be implemented. These ponds may be made of materials available on site; particular attention must be paid to the stability of the structures thus created.

The proposed measures result in a low severity mitigated impact. Thus, **The residual impact is of low magnitude**.

7.3.1.2.2 Summary

Table 101: Permanent Impact during Constructon - Physical Environment - Hydrology

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Phy-Hyd-W-Def-1	Transfer of sediments to the lagoon	Adverse	Major	Phy-Hyd-Mit-1	Temporary sedimentation ponds	Low

7.3.1.3 Geotechnics and Hydrogeology

Chapter 7.2.1.3.1 Earthworks in the new proposed runway area refers.

7.3.1.3.1 Impact Phy-Kar-W-Def-1: Caverns collapse

7.3.1.3.1.1 Impact before mitigation

The works that could threaten the known caverns (Cabris, Gastonia and Grotte Fougère) closest to the new infrastructure during construction would be the collapse of the cavities from the passage of heavy vehicles or by backfilling with alternative materials. This would make access to the karst network difficult.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium**.

7.3.1.3.1.2 Mitigation measure and impact after mitigation

Different mitigation measures can be used to limit and or avoid the impact of heavy vehicles such as the definition of a restricted area around the caverns (restricted area to be defined taking into account each particular specificity of the caverns) where no heavy vehicle will be allowed to access. In addition, speed of trucks' movement can be reduced to an acceptable level in order to minimize the induced vibrations, susceptible to collapse caverns. If not able to avoid going close to the restricted area, trucks' movements and rotations can be adapted to reduce rotations between the embankment filling site and the material storage site.

Note that these mitigation measures only need to be planned for the extreme southeastern part of the project, where the three mentioned caverns are located.

The proposed measures result in a medium severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.1.3.2 Impact Phy-Kar-W-Def-2: Damage to caves

7.3.1.3.2.1 Impact before mitigation

Permanent closure of access to karst cavities would not allow future studies to be carried out in the sediments of the Caverne Fougère or others not yet explored.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium**.

7.3.1.3.2.2 Mitigation measure and impact after mitigation

Caverns entries need to be secured, for example, by installing a fence around the entrance openings. Some specialists in karst and environmental paleontology have strongly recommended that the sedimentary content of Grotte Fougère, and potentially other ones, be removed before construction work is carried out. It would also be important to better map the extension of the karst network, mainly in the eastern part of Plaine Corail, before construction begins. This would give specialists the opportunity to record or move all relevant scientific and environmental information before any disturbances or losses occur.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.1.3.3 Impact Phy-Kar-W-Def-3: Groundwater flow disturbances

7.3.1.3.3.1 Impact before mitigation

The nature of the impacts on the groundwater flow will focus mainly on changing surface coverage. Indeed, the excavation of the topsoil and the removal of geological material, such as basalt from Mont Sainte-Marie, will change the vertical recharge regime and thus the groundwater flow regime. Replacing these natural materials with an impermeable cover, as it is the case with the airstrip and its drainage system, will reduce recharge and therefore, depending on the contribution of this component to the total recharge of aquifers, will decrease the volume of groundwater in the Coral Plain. The hydraulic gradient and direction of groundwater flow may therefore be subject to local changes. However, it is not possible at this stage of knowledge to quantify the impact on groundwater flow.

The impact severity is medium. Considering the receptor sensitivity assessed as high, **the impact magnitude is low**.

7.3.1.3.3.2 Mitigation measure and impact after mitigation

There are no possible mitigation measures during the works because the groundwater regime is locally linked to the recharge rate, which is mainly associated with precipitation, soil type and topography. Where the nature of the soil and topography change, the recharge rate will inevitably change.

The proposed measures result in a medium severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.1.3.4 Impact Phy-Kar-W-Def-4: Pollution of groundwater

7.3.1.3.4.1 Impact before mitigation

The flow of any foreign liquid on the ground and indirectly into aquifers through the unsaturated part will modify groundwater quality in the more or less long term depending on the percolation rate and underground transport process. The water quality of the only water catchment structure (Caverne Bouteille) is therefore threatened in quantity and quality during the construction phase. Refer to section 7.3.1.4.2 for groundwater resource impact.

Groundwater contamination can therefore be considered permanent following the construction phase since unsaturated cavities in the karst network can contain this contamination for a very long time.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.3.1.3.4.2 Mitigation measure and impact after mitigation

The mitigation of a contamination event consists mainly in the implementation of preventive measures to reduce risks during the construction phase.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude.**

7.3.1.3.5 Impact Phy-Kar-W-Def-5: Cut and fill balance impacts

The cut and fill balance should lead, if all the cuttings can be reused as expected, to a excedent of materials. However, it can't be certain yet that the cuttings will be able to be reused and there might need to import material for filling.

This section addresses the impact of material import and cuttings management. However, as it is not known yet how much could be reused, impacts nor measures aren't quantified.

7.3.1.3.5.1 Impact before mitigation

The potential impacts of infill material import are the followings are associated to the material extraction on the quarries site: Mount Topaze and Mount Coupier were targeted as potential source of material in the case of not reusable cuttings. The contractor could also choose to bring material from outside of the island.

The permanent potential impacts of material impact are:

on the extraction site: biodiversity destruction, water flows disturbance, slopes modification and associated risks, on site pollution (extraction works), landscape impacts,
on the works area: import of pollutants or alien invasive species seeds risk.
The potential impacts of the cuttings excess management are associated to the final storage place environment: biodiversity destruction, water flows disturbance, slopes modification and associated risks, on site pollution (extraction works), landscape impacts, import of pollutants or alien invasive species seeds risk.

The impact magnitude can't be assessed as the receptor isn't known.

7.3.1.3.5.2 Mitigation measure and impact after mitigation

In case of import material need, the international environmental standards and recommendations compliance should be checked prior to the extraction site and methods choice. An impact assessment would have to be presented by the contractor and the extraction site will have to be approved by the client.

In case of cuttings to manage, it will be forbidden to export the material out of the airport area. All treatment and reuse possibilities will have to be explored: in backfill is not possible, use in the concrete fabrication process will have to be studied. If no reuse were possible, storage in landscaping hills would have to be done.

The proposed measures result in a low mitigated impact.

7.3.1.3.6 Summary

Table 102: Permanent Impact during Construction - Physical Environment - Karstic Environment

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Phy-Kar-W-Def-1	Caverns collapse	Adverse	Medium	Phy-Kar-Mit/Av-12	Define a restricted area around the caverns with no heavy vehicles allowed to access	Low
				Phy-Kar-Mit-13	Reduce trucks' movement's speed to an acceptable level for minimizing the induced vibrations	
				Phy-Kar-Av-14	Adapt and reduce trucks' movements and rotations between the embankment filling site and material storage site	
Phy-Kar-W-Def-2	Damages to caves	Adverse	Medium	Phy-Kar-Av-15	Restrict traffic in close vicinity of the caves	Low
				Phy-Kar-Av-16	restrict access to airport to necessary construction and operations staff	
				Phy-Kar-Comp-17	Remove the remaining fossiliferous sediments from all threatened caves	
Phy-Kar-W-Def-3	Groundwater flow disturbances	Adverse	High	Phy-Wat-Comp-5	Relocation of the intake of Caverne Bouteille (replacement by seawater).	Low
Phy-Kar-W-Def-4	Pollution of groundwater	Adverse	Medium	Phy-Kar-Av/Mit-18	Daily maintenance and inspection of excavators	Low
				Phy-Kar-Av/Mit-19	No maintenance and refuelling on the construction site (or with specific waterproof delimited zone)	
				Phy-Kar-Mit-20	Establishment of a storage site for earthworks wastes (wood from formwork, material and equipment wrappings, unusable cement / grouting mixes, damaged or contaminated construction material), close to the project site, in order to reduce pollution induced by traffic from storage activity	

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
				Phy-Wat-Comp-5	Relocation of the intake of Caverne Bouteille (replacement by seawater).	
Phy-Kar-W-Def-5	Cut and fills balance impacts on extraction and storage sites	Adverse	Unknown	Phy-Kar-Mit-21	Proceed to an impact assessment of the extraction site and have the material origin validate priori the works phase	Low
				Phy-Kar-Mit-11	Chose the closest extraction site for fill material / Forbid the export of cuttings	

7.3.1.4 Water resource and waste water management

7.3.1.4.1 Impact Phy-Wat-W-Def-1: Demolition of Bangelique reservoir

7.3.1.4.1.1 Impact before mitigation

The reservoir of Bangélique is located within the project footprint, close to Sainte Marie Hill. It's to be demolished by the project. However, this tank is not used anymore.

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low** .

7.3.1.4.1.2 Mitigation measure and impact after mitigation

No measure is proposed as the tank is not used anymore.

The residual impact is of

7.3.1.4.2 Impact Phy-Wat-W-Def-2: impact of works on water resource supply

7.3.1.4.2.1 Impact before mitigation

The temporary impacts on the groundwater resource presented in section 6.2.1.4 (increased groundwater turbidity and impact on the pumping system and on the reverse osmosis process) may become permanent if they are not controlled and corrected in time.

Furthermore, the groundwater flow disturbance could result in a decrease of Caverne bouteille flow alimentation.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.3.1.4.2.2 Mitigation measure and impact after mitigation

Risk prevention measures and an action plan in the event of an accident are the best means of minimizing the risk of contamination and controlling and cleaning up the receiving environment. (Phy-Wat-Av/Mit-4)

After the construction works, the supply of seawater (or relocated intake) to the upgraded Caverne Bouteille plant must be maintained, long enough to carry out measurements and analyzis on Caverne Bouteille underground water intake.

In case of a decrease of Caverne Bouteille's supply by underground water, or persistent impact on the pumping or desalination system, the temporary solution (relocation or supply by seawater pumping) should become definitive. (Phy-Wat-Comp-5)

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.1.4.3 Summary

Table 103: Permanent Impact during Construction - Physical Environment - Water & Wastewater

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Phy-Wat-W-Def-1	Demolition of Bangelic reservoir	Adverse	Low	-	-	Low
Phy-Wat-W-Def-2	Impact on Caverne Bouteille's supply	Adverse	High	Phy-Wat-Comp-5	Carry out measurements on Caverne Bouteille intake Go on supplying inhabitants from water supply during analyzis and measurements According to measurements results, keep using seawater in a definitive manner or get back to the initial situation, pumping underground water in Caverne Bouteille intake	Low
				Phy-Wat-Av/Mit-4	Preventive measures to reduce risks during the construction phase - Risk management plan	

7.3.2 Biological environment

The relocation of the control tower and fire station shall be considered at detailed design stage. Taking into account response time for the rescue and fire fighting services and visibility of the control tower.

Human impacts on terrestrial biodiversity have escalated with the spread and development of agriculture, resulting in the replacement of forest and other natural habitats by simpler ecosystems of much higher human carrying capacity. These types of developments have had a cumulative impact on biodiversity and resulted in effects such as habitat loss and fragmentation, pollution (both chemical and biotic) and disturbance such as light, noise and pet predation.

The main effects of the proposed airstrip extension will be:

Loss of semi-natural vegetation and some ecosystem functions.
Loss of native gasteropoda individuals and their foraging habitat. These aspects are discussed in more detail below.
Loss of native trees of a low, medium, high and major sensitivity for Rodrigues Island.

7.3.2.1 Terrestrial habitat

It is likely that the overall area of semi-natural habitats (grazing lawns, thickets and shrubs) within the project footprint contributes to the ecological corridor of the Anse Quitor nature reserve, for instance, as a corridor and feeding site for arthropods, bats and birds (*Numenius phaeopus*). At least, 84 hectares of grazing lands, Lantana's and Leucaena's thickets, or coastal vegetation will be destroyed, which represents more than a third of the total surface area of influence.

The overall impact magnitude on habitat loss is assessed at low. The impacts for each type of habitat are detailed below.

7.3.2.1.1 Impact BioT-Hab-W-Def-1: Impact on Grazing lands on basaltic resurgences

7.3.2.1.1.1 Impact before mitigation

The different areas which are concerned by the project are detailed in the table below.

Items	Area/number of specimens inside the area of influence (ha)	Area/number of specimens inside the project footprint (ha)
Grazing lands on basaltic resurgences	4,55	0,16

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is low. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.3.2.1.1.2 Mitigation measure and impact after mitigation

No measure is recommended.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.1.2 Impact BioT-Hab-W-Def-2: Impact on Grazing lands on calcarenic substratum

7.3.2.1.2.1 Impact before mitigation

The different areas which are concerned by the project are detailed in the table below.

Items	Area/number of specimens inside the area of influence (ha)	Area/number of specimens inside the project footprint (ha)
Grazing lands on calcarenic substratum	66,61	39,86

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.3.2.1.2.2 Mitigation measure and impact after mitigation

No measure is recommended.

The proposed measures result in a medium severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.1.3 Impact BioT-Hab-W-Def-3: Impact on Coastal vegetation dominated by Ipomoea pes caprae

7.3.2.1.3.1 Impact before mitigation

The different areas which are concerned by the project are detailed in the table below.

Items	Area/number of specimens inside the area of influence (ha)	Area/number of specimens inside the project footprint (ha)
Coastal vegetation dominated by Ipomoea pes caprae	11,52	3,47

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.3.2.1.3.2 Mitigation measure and impact after mitigation

No measure is recommended.

The proposed measures result in a medium severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.1.4 Impact BioT-Hab-W-Def-4: Impact on Anthropized areas

7.3.2.1.4.1 Impact before mitigation

The different areas which are concerned by the project are detailed in the table below.

Items	Area/number of specimens inside the area of influence (ha)	Area/number of specimens inside the project footprint (ha)
Anthropized areas	62,77	11,85

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is not significant. Considering the receptor sensitivity assessed as low, **the impact magnitude is negligible**.

7.3.2.1.4.2 Mitigation measure and impact after mitigation

No measure is recommended.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.3.2.1.5 Impact BioT-Hab-W-Def-5: Impact on Grazing lands on Dry forest

7.3.2.1.5.1 Impact before mitigation

The different areas which are concerned by the project are detailed in the table below.

Items	Area/number of specimens inside the area of influence (ha)	Area/number of specimens inside the project footprint (ha)
Dry forest	17,57	0,67

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is medium. Considering the receptor sensitivity assessed as major, **the impact magnitude is high**.

7.3.2.1.5.2 Mitigation measure and impact after mitigation

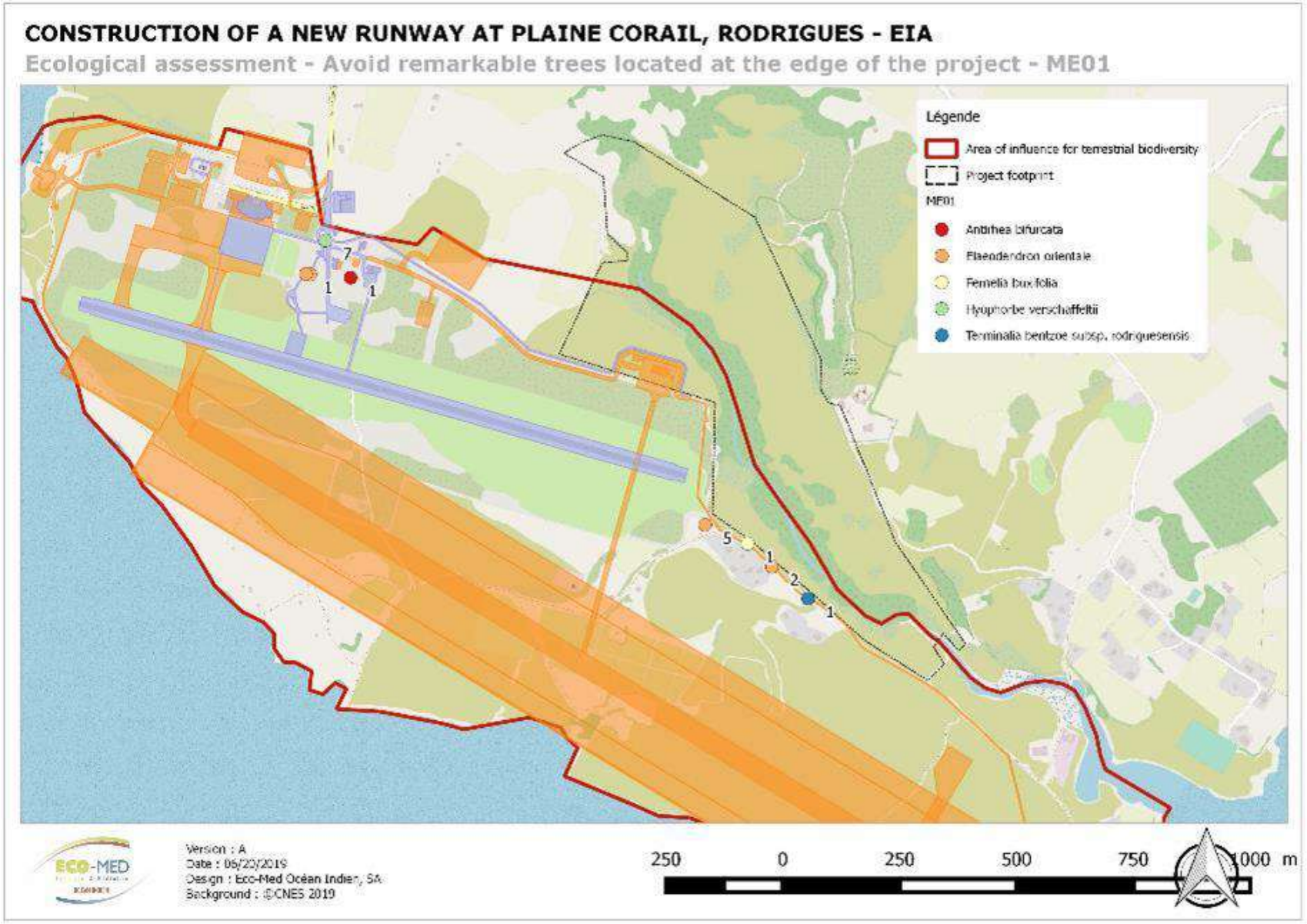
Avoidance measure (BioT-Av-1): Avoid remarkable trees located at the project edge

This measure consists in avoiding the destruction of remarkable trees located at the boundaries of the project footprint by locally adapting the project boundaries. A total of 19 trees could be easily avoided, as shown by the table and the map below.

Targeted species	Number of specimens avoided
Antirhea bifurcata	1
Elaeodendron orientale	9
Fernelia buxifolia	1
Hyophorbe verschaffeltii	7
Terminalia bentzoe subsp. rodriguesensis	1

Implementation conditions / Points of vigilance: these 19 trees must be marked prior to the works phase with permanent devices (fences, ribbons, paintings…) and tagged with an identification number (ID) in order to be properly followed during the works phase.

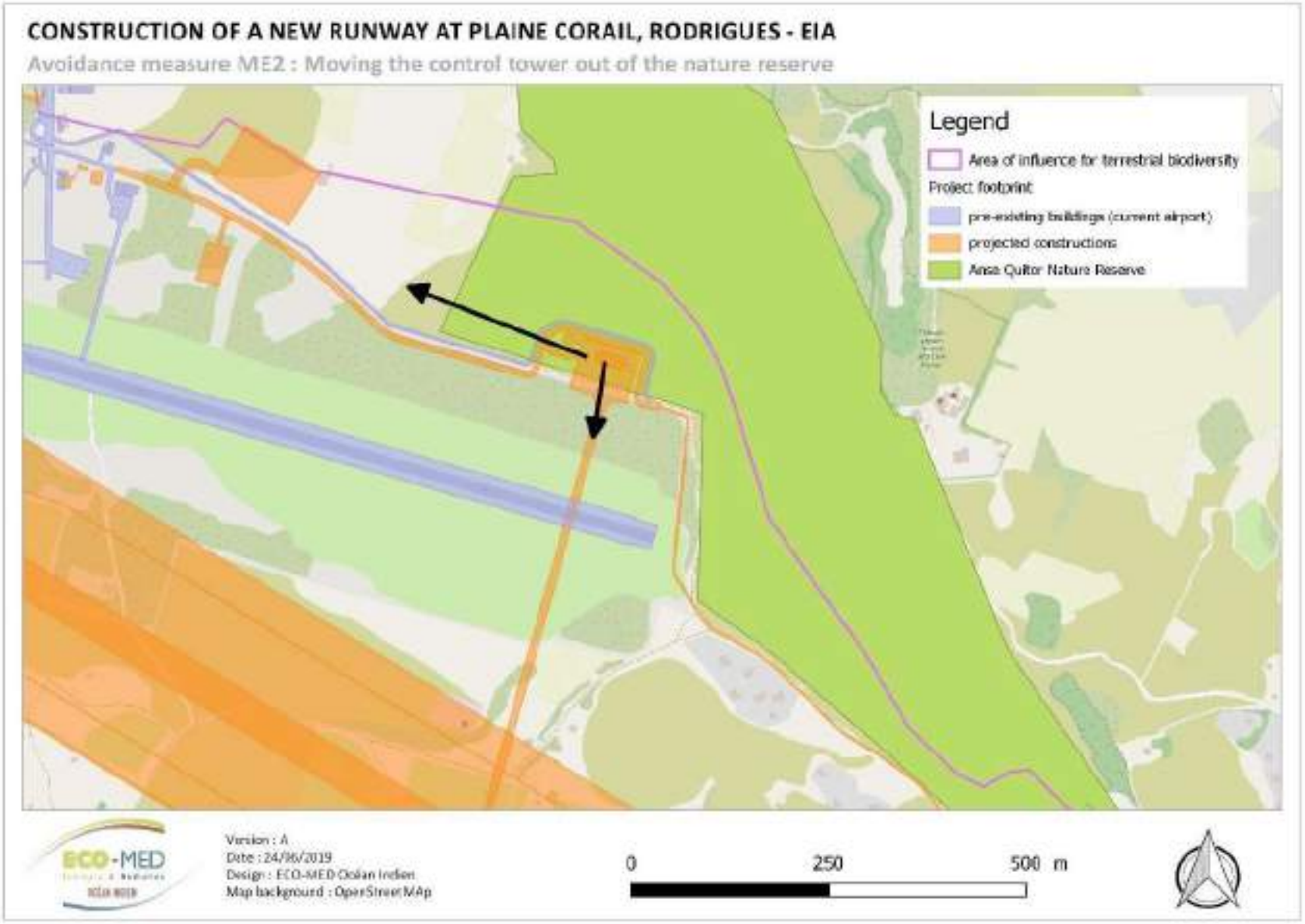
The responsible person or structure for this measure could be the contractor or ARL, and the potential partners: Mauritius Wildlife Foundation or Forestry Services.


CONSTRUCTION OF A NEW RUNWAY AT PLAINE CORAIL, RODRIGUES - EIA
Ecological assessment - Avoid remarkable trees located at the edge of the project - ME01
Légende
Area of influence for terrestrial biodiversity
Project footprint
ME01
Antirhea bifurcata
Elaeodendron orientale
Fernelia buxifolia
Hyophorbe verschaffeltii
Terminalia bentzoe subsp. rodriguesensis
7
1
1
5
1
2
1
Version : A
Date : 06/20/2019
Design : Eco-Med Océan Indien, SA
Background : ©CNES 2019
250
0
250
500
750
1000 m

<u>Avoidance measure (BioT-Av-2)</u>: Moving the control tower out of the nature reserve

This measure consists in avoiding the destruction of approximately 1 hectare of the buffer area of the Anse Quitor nature reserve, as mapped below. This measure allows to save 6 specimens of *Elaeodendron orientale (2), Sarcanthemum coronopus (3) and Terminalia bentzoe subsp. Rodriguesensis (1)*.

The responsible person or structure for this measure could be the contractor or ARL, and the potential partners: Wildlife Foundation and Forestry Services for the official limits of the nature reserve.


CONSTRUCTION OF A NEW RUNWAY AT PLAINE CORAIL, RODRIGUES - EIA
Avoidance measure ME2 : Moving the control tower out of the nature reserve
Legend
Area of influence for terrestrial biodiversity
Project footprint
pre-existing buildings (current airport)
projected constructions
Anse Quitor Nature Reserve
Version : A
Date : 24/06/2019
Design : ECO-MED Océan Indien
Map background : OpenStreetMap
0
250
500 m

<u>Reduction measure (BioT-Mit-3)</u>: Creating an arboretum of endemic species inside the airport landscaping

This measure consists in planting 80 specimens of rare and endangered endemic species within the airport limits after the extension airstrip project. This aims to protect, preserve and create an arboretum of endemic seeds that will be used afterwards to produce endemic plants for the nature reserves in Rodrigues.

(An attempt to transplant all or part of the remarkable trees intended to be destroyed by the project is also proposed (in the least, Diospyros, Terminalia, Foetidia, Antirhea): reduction measure 2 and reduction measure 4).

A complementary list of species is proposed below, in regard of the impacts of the project on endemic flora.

Scientific name	French name	Family	Status	Type
Clerodendrum laciniatum Balf.f.	Bois cabri	Lamiaceae	Endemic	Bush
Fernelia buxifolia Lam.	Bois bouteille	Rubiaceae	Sub-endemic	Bush
Hyophorbe verschaffeltii H. Wendl.	Palmiste marron	Arecaceae	Endemic	Palm
Latania verschaffeltii Lem.	Latanier jaune	Arecaceae	Endemic	Palm
Polyscias rodriguesiana (Marais) Lowry & G.M. Plunkett	Bois blanc	Araliaceae	Endemic	Tree
Ramosmania rodriguesii Tirveng.		Rubiaceae	Indigène (Endemic ?)	Tree

Implementation conditions / Points of vigilance: A partnership with the Forestry Services or the Mauritius Wildlife Fondation will be conducted in order to produce seedlings of native species from seeds, cuttings or juveniles collected from the nature reserves of Rodrigues and/or Mauritius.

Collection of plant material will be authorized in advance by the reserve managers in any case.

A specific protocol will be designed for trees transplantation.

The responsible person or structure for this measure could be the contractor or ARL, and the potential partners: Mauritius Wildlife and Forestry Services.

<u>Reduction measure (BioT-Mit-4)</u>: Transplant remarkable trees and ferns intended to be cut down during the works phase

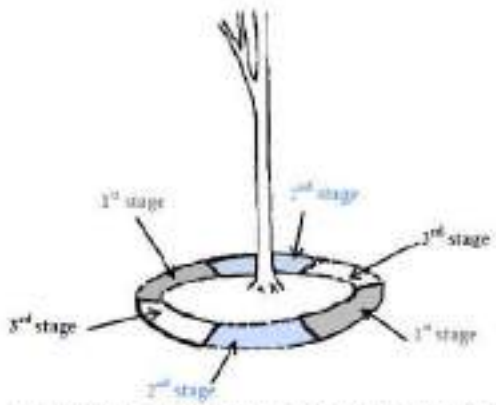
This measure consisting in transplanting all or part of the remarkable trees and ferns intended to be destroyed by the project is also proposed (in priority, Diospyros, Terminalia, Foetidia, Antirhea, Nephrolepis).

Targeted species	Number of specimen targeted for transplantation
Adiantum rhizophorum	1
Diospyros diversifolia	1
Elaeodendron orientale	182
Foetidia rodriguesiana	2
Nephrolepis biserrata	1
Pandanus heterocarpus	25
Phyllanthus dumentosus	1
Sarcanthemum coronopus	1
Terminalia bentzoe subsp. rodriguesensis	2

Transplantating operations (<u>Source</u>: Guidelines on Tree Transplanting, Greening, Landscape and Tree Management Section Development Bureau - The Government of the Hong Kong Special Administrative Region - September 2014):

1 - Tools and equipment:
All tools and equipment should be appropriate to the operations and prepared in advance. Digging and root pruning tools shall be sharp and clean in order to cut without breaking, crushing or tearing roots;
Lifting cables, chains, straps, and/or slings can be used to lift the tree and its roots out of the ground;
2- Timing of transplantation:
In general, summer is not a common transplanting season as evapo-transpiration rate is high and the transplanted trees will be under stress when transplanting work is taking place during that time.
Before the rainy season seems like an optimal time (October to December)
3 – Preparation of rootball:
Root pruning is sometimes required before transplanting a tree. Sufficient time should be allowed between preparation and final lifting for development of new roots capable of sustaining and continuing the growth of the transplanted tree;
The root system of a woodland or open-grown tree will normally be widespread. Lifting such trees without initial preparation of a root ball will result in much of the root system being left in the soil. After transplanting, the tree crown may then die back, or the tree may not be able to recover and will die eventually;
In general, the root ball diameter to tree diameter ranges from 8:1 to 10:1 according to international standards (except for a palm which may require a smaller root ball). The root ball sizes should be of a diameter and depth encompassing enough of the root system as necessary for establishment.
4 - Stage digging:
Root pruning to form a reasonable size of root ball is required and may be adjusted to suit specific tree species and/or imposed project constraints. For mature trees, root pruning is usually required to be carried out at different stages with a minimum of 1 month allowed for

root regeneration between cuts. Stage digging can be carried out in the following stages in situations if the locations and work program are considered suitable. The four stages are:
1st stage – Dig a trench on the outside of the marked circumference in only two opposing segments;
2nd stage – After a period of no less than 1 month since the 1st root pruning, dig a trench on the outside of the marked circumference in the adjacent two opposing segments;
3rd stage – After another period of no less than 1 month since the 2nd root pruning, dig a trench on the outside of the marked circumference, in the remaining two opposing segments; and
4th stage – After a further period of not less than 1 month since the 3rd root pruning, prepare the root ball and cut the underside of the root ball, followed by uplifting and transplanting
Cuts must be clean to avoid tearing or breaking the roots.



The 4th stage in preparing the root ball by cutting its underside

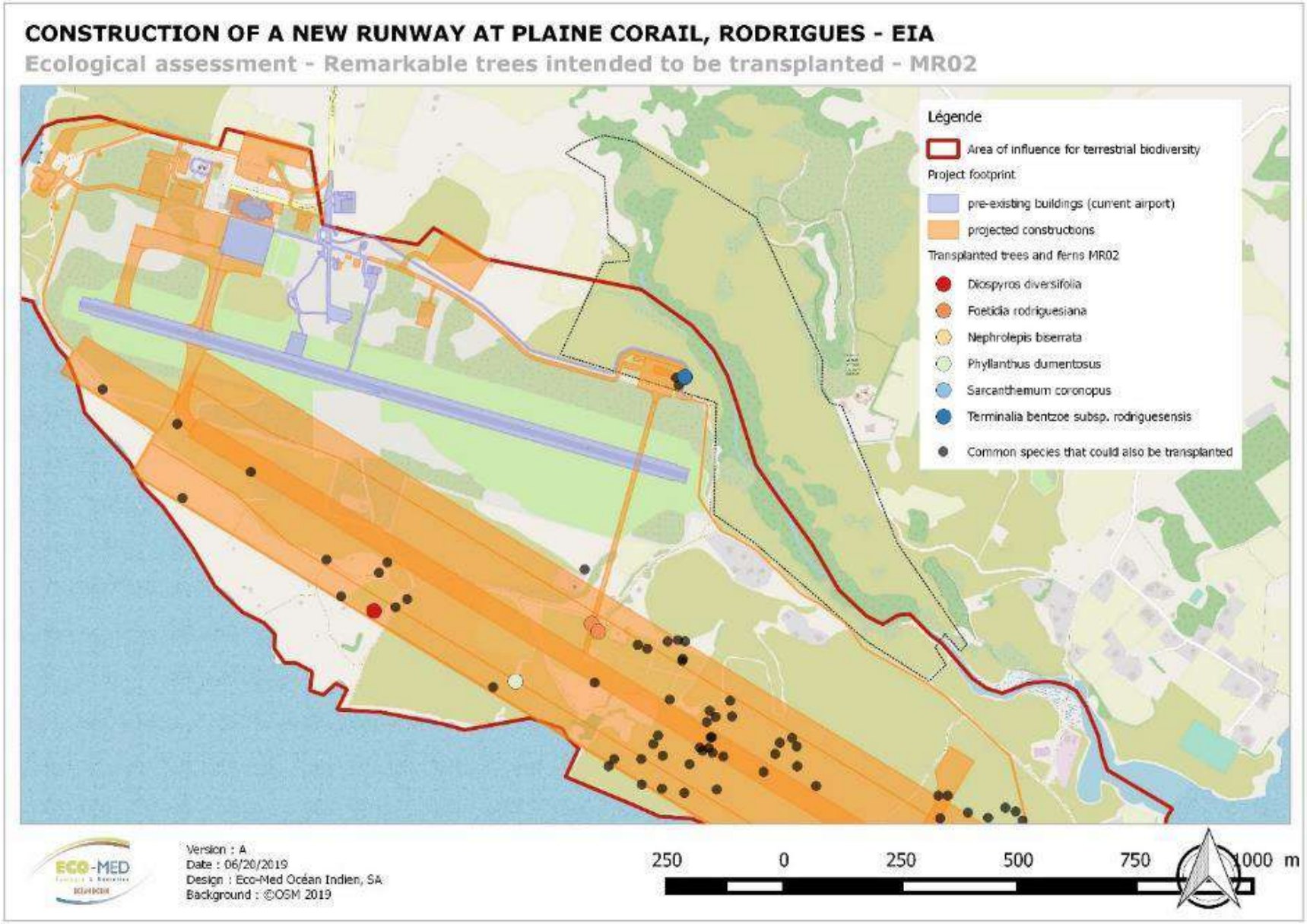
5 – Crown pruning
Pruning of tree crown during transplanting may not be necessarily beneficial to the trees as thinning the crown can reduce the tree's capability in making food and building up reserves. Excessive pruning can ruin the natural form of a tree and reduce photosynthesis.
Crown cleaning however can be carried out to remove unhealthy, damaged, diseased, dead and crossed branches so as to minimize susceptibility to pests and diseases.
6 – Tree lifting operations
Tree lifting operations shall be carefully timed so as to enable direct delivery to the receptor site. No transplanting operation should commence until either the receptor site or the holding nursery is fully prepared.
Damp hessian is placed on the sides and across the tip of the ball and pinned. The hessian should cover the full circumference of the root ball with bottom skirt hanging out.
The root ball should be properly wrapped before lifting. Lifting should be done by direct lift, with padded protection for the tree, using a machine of appropriate capacity connected to the support around the root ball, not to any other part of the tree. The tree should not be lifted by the trunk as this can cause serious trunk injury but by its root ball which should be properly prepared and wrapped. Root balls that are not properly protected would easily collapse during transplanting due to their own weight.
7 - Protection during transportation
Trees are often too tall to be transplanted in the upright position and are tipped to a horizontal position. Root balls may be flattened during transportation. When trees are being loaded on a lorry or trailer bed, care must be taken to avoid injuring the tree or breaking the soil ball. The crown of the tree should be carefully wrapped to minimize the risk of drying, branch damage due to excessive movements, and wind damage.
8 - Preparation of receptor site

Trees will not tolerate highly compacted soil, which should be broken up over as large an area of the site as possible. Planting pits should be provided with drainage to allow effective percolation of water.
During pit preparation, the existing topsoil ploughed from digging should be stripped and put aside for reuse as much as possible and to avoid a distinct interface between the planting pit and the surrounding soil.
In general, the depth of the planting hole shall not exceed the depth of the root ball and the sides of the planting hole should be scarified.
9 – Planting
Trees should preferably be placed in the same orientation from which they originated.
All root ball supporting materials should be removed from the planting hole prior to final back filling
When finally set, the top surface of the root ball should not be below the surrounding soil;
The backfill soil should be tamped firmly around the base to stabilise a tree, but the rest of the soil should be tamped only lightly, or left to settle on its own;
Mulch can be used to conserve soil moisture, to buffer soil temperature extremes, to control weeds and other competing vegetation, and to replenish organic matters and nutrients in the soil.

Sufficient and appropriate watering is important for proper root growth. Provision should be made for watering, allowing for total wetting of the rooting volume to minimize susceptibility to stress and assure survival.

Implementation conditions / Points of vigilance: A competent and trained external coordinator of the transplantation protocol will be mobilized.

The responsible person or structure for this measure could be the contractor or ARL, and the potential partners: Mauritius Wildlife and Forestry Services.


CONSTRUCTION OF A NEW RUNWAY AT PLAINE CORAIL, RODRIGUES - EIA
Ecological assessment - Remarkable trees intended to be transplanted - MR02
Légende
Area of influence for terrestrial biodiversity
Project footprint
pre-existing buildings (current airport)
projected constructions
Transplanted trees and ferns MR02
Diospyros diversifolia
Foetidia rodriguesiana
Nephrolepis biserrata
Phyllanthus dumentosus
Sarcanthemum coronopus
Terminalia bentzoe subsp. rodriguesensis
Common species that could also be transplanted
Version : A
Date : 06/20/2019
Design : Eco-Med Océan Indien, SA
Background : ©OSM 2019
250 0 250 500 750 1000 m

<u>Reduction measure (BioT-Mit-5)</u>: Genetic conservation of populations of impacted rare species

In response to the destruction of several rare species specimens, this measure consists in ensuring the production and reintroduction of clones and genetic ancestors of these species in order to preserve their genetic lineage in the long term. A total of 14 to 35 specimens will be produced, depending on the results obtained by vegetative and sexual propagation.

The entire project is conditional on the success of this measure.

1 - Targeted species
The targeted species are those that will be threatened by the project after avoidance measures. One exception is Zanthoxylum paniculatum as the species is of major sensitivity in the area of influence and is in a very bad situation in Rodrigues - 3 plants left. Another exception is Antirhea bifurcata, one specimen will be left alive inside the airport limits: this species has become very rare in Rodrigues and requires conservation efforts.

Targeted species	French name	Family	Status	IUCN (status retained)	Number of specimens destroyed by the project	Comment	Proposed number of plants to be produced
Antirhea bifurcata (Desr.) Hook.f.	Bois goudron	Rubiaceae	Sub-endemic	**CR**	0	*See avoidance measure BioT-Av-1*	2 to 5
Diospyros diversifolia Hiern	Bois d'ébène / Ebénier	Ebenaceae	Endemic	**EN**	1		2 to 5
Foetidia rodriguesiana F. Friedmann	Bois puant	Lecythidaceae	Endemic	**CR**	2		2 to 5
Terminalia bentzoe (L.) G.Forst.. subsp. rodriguesensis Wickens	Bois benjoin	Combretaceae	Endemic	**Not listed**	1	*See avoidance measure BioT-Av-2*	2 to 5
Zanthoxylum paniculatum Balf. f.	Bois pasner	Rutaceae	Endemic	**CR**	0	*Very rare species located inside the nature reserve*	2 to 5
Elaeodendron orientale Jacq.	Bois rouge	Celastraceae	Sub-endemic	**LC**	182		2 to 5
Pandanus heterocarpus Balf. f.	Vacoa parasol	Pandanaceae	Endemic	**NT**	25		2 to 5

2 - Harvesting of plant material
Two methods can be used at the same time to ensure the effectiveness of the measure:

a. By collecting seeds: Several campaigns have to be scheduled in order to target the right periods of fruiting. It requires to have someone locally implanted who can watch the different specimen on a regular basis (1 time every month for a year). As an indication, here are the flowering periods for the following genera in Reunion Island:
Foetidia = February; Eleodendron = from July to January; Zanthoxylum = June/July; Pandanus = from January to March; Terminalia bentzoë = from August to November; Diospyros = December; Antirhea = rainy season

Seeds have already been collected for *Foetidia rodriguesiana* by the Forestry services in July 2019 (Payandee, com. Pers.).

Species of high sensitivity impacted by the project	Cuttings	Layering	Grafting	Sowing	Germination rate?
Diospyros diversifolia	?	?	?	No dormancy reported for its sister species *D. borbonica* *An adult tree can produce 1500 fruits, each containing 10 to 12 seeds*	Germination rate is very good and can get to 60% but transplanting them then can get down to 50% on the total transplanted. The plantation success is very low as it is very sensitive to drought or heavy rainfall. The survival rate is around 30 to 40% and even less in some years. Germination rate of 60 to 80% for its sister species *D. borbonica*
Foetidia rodriguesiana	Seems to work according to (Dupont et al. 1989) but some tests ran by WWF do not confirm this data	Seems to work (Debize et al. 2007) as it works for F. mauritiana	?	Fruit has to be prepared to eliminate dormancy	Highly variable and around 30% for its sister species *F. mauritiana*
Terminalia bentzoë	?	?	?	Fruit has to be prepared to eliminate dormancy	< 50%

Figure 176: Fruit of Foetidia rodriguesiana

b. By collecting cuttings: to produce clones of the specimens destroyed by the project.
Period of collection: rainy season, from November to March

Take cuttings from the wild specimens: select young straight shoots about the diameter of a pencil (except trailing snowberry, which can be thinner). Collect long branches– they will be divided into individual cuttings later. Cut just above a leaf node. Put the cuttings in a plastic bag or the ends in a bucket of water, and keep them cool, moist, and out of direct sunlight.

Prepare individual cuttings: cut the branches into pieces long enough to have at least three or four leaf nodes (for most species, cuttings will be about 15 cm long). The end of the cutting closest to the roots (the “bottom”) should be cut at a 45° angle just below a node. To not confuse the bottom with the top of the cutting (essential), cut the top at a right angle (straight across) slightly above a node.

Production: while not essential, for some species success is improved by dipping the bottom (angled) end of the cutting in rooting hormone. Fill a pot with an unfertilized fast-draining soil mix (and in many cases perlite, sharp sand or vermiculite alone will work but cuttings need soil after rooting). Poke holes in the soil with a stick a bit larger than the cutting diameter, insert cuttings with at least 2 nodes in soil and 1 or 2 nodes above soil level, tamp soil and water it. Wait until leaf growth unfurls and gently check for substantial root development (it can take a few months). If there are leaves or roots but not the other reinsert the cutting and wait. Cuttings can be transplanted into a soil mix in a larger container, or transplanted into native soil. During a dry spring keep the rooting medium moist. During the following summer, supplemental water will improve survival and development.

3 - Plant production
The plants will be kept at the nursery until the receptor site is ready to receive the plant.

4 - In situ plantation: see BioT-Mit-3

Focus on Foetidia spp.

A sister species of F. rodriguesiana is present in Mauritius and La Réunion. We report here some informations about seeds harvesting, conservation and germination rates for this closely related species of F. rodriguesiana and some informal clarifications for F. rodriguesiana obtained from WWF and the Commission for Forestry from Rodrigues (Alfred Bègue, Richard Payandee).

***Collection**: F. mauritiana: Although the fruit ripens from October to January, it can be picked from the ground all year round because it keeps well.*

***Seeds**: F. mauritiana: The fruit is indestructible and waterproof. In nature, it takes several years to deteriorate. This dormancy can be eliminated by breaking the fruit as specified below. It is a delicate operation, which can sometimes destroy seeds. The fruits must be broken into four pieces, by tapping with the short side of a hammer on their diagonal. They are then left to soak for 1 hour in a 5% bleach solution (10 teaspoons of bleach for 1 litre of water) to destroy all the fungi that could harm the young seedling. Out of this bath, they should be rinsed thoroughly.*

***Storage**: F. mauritiana: The seed can be kept for more than one year in the fruit at room temperature and more than 5 years in a cold room.*

***Sowing**: F. mauritiana: The sowing must be done in boxes on a substrate relatively low in raw organic matter (half earth sieved and half sand). The fruit pieces are then deposited on the surface without covering them. The water from each watering shall contain a fungicide and from time to time an insecticide against ants. The first lifts take place after 15 days at best and may be extended over more than 6 months to 1 year.*

***Germination rate:** F. mauritiana: very variable, generally > 30%.*
F. rodriguesiana: i) Less than 1% success with no human help for cracking the seeds (10 young plants in 10,000 seeds), ii) 60 -70 % success when using a technique of cracking the seed with a hammer or with a vice to allow water to get inside the seed (imitating the effect of digestion by turtles), iii) One tree produces thousands of seeds.

***Cuttings**: F. rodriguesiana: does not work well according to the few trials carried out by MWF, but might work if carried out by a specialist. Recommended: horticulturists from Kew Garden (Martin Stanyford, Carlos Magdalena) or Brest laboratory.*

***Plant breeding**: F. mauritiana: The young root being very fragile, the transplanting must be done as soon as the germ appears (at most 1 cm long). Fungicide treatment should continue as long as the seedling remains at the cotyledon stage. It is advisable to provide containers deep enough for transplanting because the pivot of this relatively long species, has quite a fast development. F. rodriguesiana: Almost 100% success when planted excluding invasive species intrusion.*

Implementation conditions / Points of vigilance: A partnership with the Forestry Services or the Mauritius Wildlife Fondation will be conducted in order to produce seedlings of native species from seeds, cuttings or juveniles collected from the specimen located within the project footprint.

The responsible person or structure for this measure could be the contractor or ARL, and the potential partners: Mauritius Wildlife and Forestry Services.

<u>Offset measure (BioT-Comp-6):</u> Action plan towards more sustainable agricultural practices for native biodiversity.

This measure consists in initiating a new approach for the management of extensive agriculture on the island of Rodrigues by proposing a turnkey operational action plan.

Grazing land management is the manipulation of the soil-plant-animal complex in pursuit of a desired result. Rodrigues's native shrubs and trees are sometimes desirable plant species for the livestock of which the wandering grazing is almost everywhere. These shrubs and trees not only provide an important food source at certain times throughout the year, but also provide numerous habitat values for a wide array of wildlife species. This includes browsing opportunities for ungulates and feeding and nesting sites for birds and small mammals. However, overuse by livestock leads to the destruction of native species or prevents spontaneous sexual and vegetative reproduction which causes the native flora disappearance.

Here, we propose to set up an action plan to provide concrete elements for the management of grazed areas with regard to biodiversity issues on the island of Rodrigues. Several steps will be necessary for its establishment, including consultation phases with all local stakeholders throughout the process in order to obtain a consensus document for all the Rodriguans.

The grazing management plan should have the following components:
A definition of goals including livestock production and pasture and range sustainability;
A definition of biodiversity areas, including isolated trees with high heritage value and riparian health;
A list of native species that can be or are impacted by livestock grazing;
A map of grazing areas including all developments such as fences, gates, water sources, etc…
Type and number of livestock grazing in the pastures;
Approximate period of use for pastures.
This action plan can be approached by:
1-the inventory and consultation of all agricultural and ecologist partners throughout the project;
2-the establishment of the development challenges of livestock breeding in Rodrigues;
3-drawing up an inventory of actions that can improve the quality and productivity of livestock farming by promoting local biodiversity;

4-proposing a fine cartographic work accompanied by spatialized actions throughout the Rodrigues territory.

The responsible person or structure for this measure could be the contractor or ARL, and the potential partners: Wildlife Fondation, Agricultural and Forestry Services, Regional Assemblee.

<u>Offset measure BioT-Comp-7:</u> Ecological restauration within the limits of the Anse Quitor nature reserve

This measure consists in:

Rebuilding the fence around the Anse Quitor nature reserve, with one that would be similar to the fence around the airport in order to discourage grazing livestock from going inside the reserve. This measure is a short-term response to the grazing vs. biodiversity issue that has to be solved with the offset measure (BioT-Comp-6: Action plan towards more sustainable agricultural practices for native biodiversity).
Reinforcing native species populations by planting 500 native plant specimens within the Anse Quitor nature reserve buffer area, located besides the future airport boundaries (see map below).

Methods:
Harvesting**:**
The geographical origin of the seeds is an important criterion. The producer must be able to provide this information for each plant produced. Labelling (aluminium plate) of individuals may be considered. In addition, if harvests are required, four methods are proposed that are concerned with ecological conservation concepts:
The objective is to harvest primarily in the area of influence or in the immediate vicinity in order to offer the best guarantees of adaptation and to save the genetic heritage of the site;
Harvesting within the Anse Quitor nature reserve in priority;
Harvesting within existing arboretums;
To harvest in a natural environment requires the intervention of a qualified botanist. In order not to deprive the natural environment of the seeds necessary for its renewal, only one third of the fruits of a tree specimen must be harvested.
Production of plants:
Harvesting (seeds, cuttings) and production must take place well before the works phase in order to obtain plants of sufficient size for planting and to set up the restoration during the works phase of the project. The aims are:
To obtain medium-sized plants, for optimal recovery and easy transport;
To "wean" the plants, i.e. gradually reduce watering to accustom the young trees to the lack of water;
To promote good root development, for a good nutrition of the plant;
To limit the use of fertilizers and insecticides.

Planting:
Planting should take place in the wet season. Planting plots of 25 m² (5 m x 5 m) of native species with a density of 1 plant/m2 will be implemented. A total of 500 individuals will be distributed in 20 25 m² plots.

Planting young plants in dense masses would allow an optimal success rate: better protection of the plants against the sun, limiting competition with weed species... The very high density of indigenous species with rapid growth is a major element for the success of the measure. The plots will be supplied with topsoil to a depth of 1 to 2 metres to stimulate root development.

Several planting techniques can be carried out (mechanical, manual, etc.). We remind you that the young plants must be planted relatively close to each other (1 plant/m2), in order to stimulate their growth and avoid the return of invasive species.

Considering the taking into account of these measures, the magnitude of the mitigated impact is negligible.

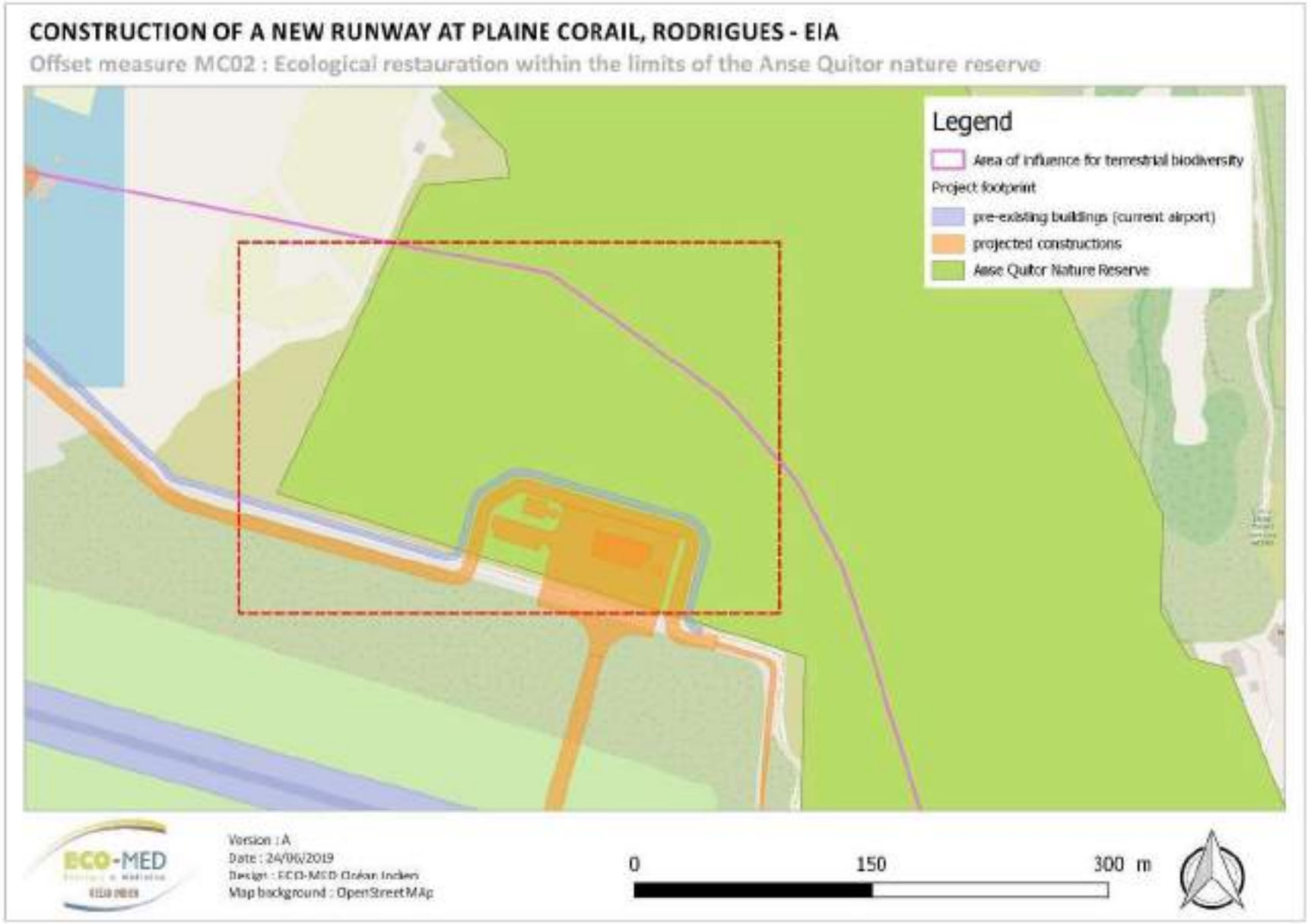
The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

Table 104: Targeted plant species

Scientific name	French name	Family	Status	Type
Adiantum rhizophorum Sw.		Pteridaceae	Sub-endemic	Herbaceous
Allophylus borbonicus (J.F. Gmel.) F. Friedmann	Bois de merle	Sapindaceae	Sub-endemique	Tree
Aloe lomatophylloides Balf. f.	Ananas marron	Asphodelaceae	Endemique ROD	Herbaceous
Antirhea bifurcata (Desr.) Hook.f.	Bois goudron	Rubiaceae	Sub-endemic	Tree
Camptocarpus sphenophyllus (Balf. F.)		Asclepiadaceae	Endemic	Liane
Canavalia rosea (Sw.) DC.	Liane cocorico	Fabaceae	Indigène	Herbaceous
Carissa spinarum L.	Bois amer	Apocynaceae	Indigène	Bush
Carissa xylopicron	Bois de ronde	Apocynaceae	Indigène	Bush
Cassytha filiformis L.	Liane foutafout	Lauraceae	Indigène	Liane
Clerodendrum laciniatum Balf.f.	Bois cabri	Lamiaceae	Endemic	Bush
Cynodon dactylon (L.) Pers.	Petit-chiendent	Poaceae	Indigenous	Herbaceous
Dactyloctenium ctenioides (Steud.) Lorch ex Bosser		Poaceae	Indigenous	Herbaceous
Dictyosperma album (Bory) H. Wendl. et Drude ex Scheff.	Palmiste blanc	Arecaceae	Sub-endemique	Palm
Diospyros diversifolia Hiern	Bois d'ébène / Ebénier	Ebenaceae	Endemic	Tree
Dodonaea viscosa Jacq.	Bois d'arnette	Sapindaceae	Indigenous	Bush
Dombeya acutangula Cav.	Mahot tantan	Malvaceae	Sub-endemique	Bush
Dombeya rodriguesiana F. Friedmann	Mahot / Bois Julien	Malvaceae	Endemique ROD	Bush
Doricera trilocularis	Bois chauve-souris	Rubiaceae	Endémique ROD	Bush
Dracaena reflexa Lam.	Bois de chandelle	Asparagaceae	Indigenous	Tree
Elaeodendron orientale Jacq.	Bois rouge	Celastraceae	Sub-endemic	Tree
Eugenia rodriguesensis J. Guého & A.J. Scott	Bois fer	Myrtaceae	Endemique ROD	Tree
Fernelia buxifolia Lam.	Bois bouteille	Rubiaceae	Sub-endemic	Bush
Ficus reflexa Thunb.	Ti l'affouche	Moraceae	Indigenous	Tree
Ficus rubra Vahl	Affouche rouge	Moraceae	Indigenous	Tree
Foetidia rodriguesiana F. Friedmann	Bois puant	Lecythidaceae	Endemic	Tree
Heteropogon contortus (L.) P. Beauv. ex Roem. et Schult.	Herbe polisson	Poaceae	Indigenous	Herbaceous

Scientific name	French name	Family	Status	Type
Hibiscus liliiflorus Cav.	Augerine	Malvaceae	Sub-endemique	Tree
Hibiscus tiliaceus L.	Var	Malvaceae	Indigène	Tree
Hyophorbe verschaffeltii H. Wendl.	Palmiste marron	Arecaceae	Endemic	Palm
Ipomoea pes-caprae (L.) R. Br.	Liane batatran	Convolvulaceae	Indigenous	Herbaceous
Ipomoea pes-caprae (L.) R. Br. subsp. brasiliensis (L.) Ooststr.	Patate à Durand	Convolvulaceae	Indigène	Herbaceous
Latania loddigesii Mart.	Latanier bleu	Arecaceae	Endemique MAU	Palm
Latania verschaffeltii Lem.	Latanier jaune	Arecaceae	Endemic	Palm
Lycium mascarenense A.M. Venter et A.J. Scott	Souveraine de mer	Solanaceae	Indigène	Bush
Mathurina penduliflora Balf. f.	Bois gandine	Passifloraceae	Endemic	Bush
Mucuna gigantea (Willd.) DC.		Fabaceae	Indigène	Liane
Nephrolepis acutifolia (Desv.) Christ		Nephrolepidaceae	Indigène	Herbaceous
Nephrolepis biserrata (Sw.) Schott	Fougère rivière	Nephrolepidaceae	Indigenous	Herbaceous
Obetia ficifolia (Poir.) Gaudich.	Bois d'ortie	Urticaceae	Sub-endemique	Tree
Pandanus heterocarpus Balf. f.	Vacoa parasol	Pandanaceae	Endemic	Tree
Pemphis acidula J.R. Forst. et G. Forst.	Bois matelot	Lythraceae	Indigène	Bush
Phyllanthus casticum Soy.-Will.	Bois de demoiselle	Phyllanthaceae	Indigène	Bush
Phyllanthus dumentosus Poir.		Phyllanthaceae	Indigenous	Bush
Pisonia grandis R. Br.	Bois mapou	Nyctaginaceae	Indigène	Tree
Pittosporum balfourii Cuf.	Bois bécasse	Pittosporaceae	Endemique ROD	Bush
Pleurostylia putamen Marais	Bois d'olive blanc	Celastraceae	Endemic	Bush
Polyscias rodriguesiana (Marais) Lowry & G.M. Plunkett	Bois blanc	Araliaceae	Endemic	Tree
Poupartia castanea (Baker) Engl.	Bois lubine / figue marron	Anacardiaceae	Endemique ROD	Tree
Premna serratifolia L.	Bois sureau	Lamiaceae	Sub-endemic	Tree
Ramosmania rodriguesii Tirveng.		Rubiaceae	Indigène (Endémique ROD?)	Tree
Sarcanthemum coronopus Cass.		Asteraceae	Endemic	Bush
Sarcostemma viminale (L.) R. Br.	Liane calé	Apocynaceae	Indigenous	Bush
Scolopia heterophylla (Lam.) Sleumer	Goyave marron	Salicaceae	Sub-endémique	Tree
Scutia myrtina (Burm. f.) Kurz	Bois de sinte	Rhamnaceae	Indigène	Bush
Secamone rodriguesiana F.Friedmann		Apocynaceae	Endemic	Liane
Securinega durissima J.F. Gmel.	Bois dur	Phyllanthaceae	Indigène	Tree
Tephrosia purpurea (L.) Pers.	Lentille marronne	Fabaceae	Indigène	Herbaceous
Terminalia bentzoe (L.) G.Forst.. subsp. rodriguesensis Wickens	Bois benjoin	Combretaceae	Endemic	Tree

Scientific name	French name	Family	Status	Type
Thespesia populnea (L.) Sol. ex Corrêa	Sainte Marie	Malvaceae	Indigenous	Tree
Thespesia populneoides (Roxb.) Kostel.	Porché	Malvaceae	Indigène	Tree
Tournefortia argentea L.f.	Veloutier argenté	Boraginaceae	Indigenous	Tree
Turraea lacinata (Balf. f.) Harms	Bois balai	Meliaceae	Endemique ROD	Tree
Vepris lanceolata (Lam.) G. Don	Patte poule	Rutaceae	Indigène	Tree
Zanthoxylum heterophyllum (Lam.) Sm.	Bois de poivre	Rutaceae	Sub-endemique	Tree
Zanthoxylum paniculatum Balf. f.	Bois pasner	Rutaceae	Endemic	Tree
Zoysia matrella (L.) Merr.	Herbe pique-fesses	Poaceae	Indigène	Herbaceous


CONSTRUCTION OF A NEW RUNWAY AT PLAINE CORAIL, RODRIGUES - EIA
Offset measure MC02 : Ecological restauration within the limits of the Anse Quitor nature reserve
Legend
Area of influence for terrestrial biodiversity
Project footprint
pre-existing buildings (current airport)
projected constructions
Anse Quitor Nature Reserve
Version : A
Date : 24/06/2019
Design : ECO-MED Océan Indien
Map background : OpenStreetMap
0
150
300 m

7.3.2.1.6 Impact BioT-Hab-W-Def-6: Impact on grazing lands on riparian vegetation

7.3.2.1.6.1 Impact before mitigation

The different areas which are concerned by the project are detailed in the table below.

Items	Area/number of specimens inside the area of influence (ha)	Area/number of specimens inside the project footprint (ha)
Riparian vegetation	1,20	0

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is not significant. Considering the receptor sensitivity assessed as medium, **the impact magnitude is negligible**.

7.3.2.1.6.2 Mitigation measure and impact after mitigation

No measure is recommended.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.3.2.1.7 Impact BioT-Hab-W-Def-7: Impact on grazing lands on estuarine habitat

7.3.2.1.7.1 Impact before mitigation

The different areas which are concerned by the project are detailed in the table below.

Items	Area/number of specimens inside the area of influence (ha)	Area/number of specimens inside the project footprint (ha)
Estuarine habitat	8,25	0

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is not significant. Considering the receptor sensitivity assessed as medium, **the impact magnitude is negligible**.

7.3.2.1.7.2 Mitigation measure and impact after mitigation

No measure is recommended.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.3.2.1.8 Impact BioT-Hab-W-Def-8: Impact on grazing lands on calcarenic dry lawns of anthropogenic origin

7.3.2.1.8.1 Impact before mitigation

The different areas which are concerned by the project are detailed in the table below.

Items	Area/number of specimens inside the area of influence (ha)	Area/number of specimens inside the project footprint (ha)
Calcarenic dry lawns of anthropogenic origin	2,19	0,07

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is not significant. Considering the receptor sensitivity assessed as medium, **the impact magnitude is negligible.**

7.3.2.1.8.2 Mitigation measure and impact after mitigation

No measure is recommended.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.3.2.1.9 Impact BioT-Hab-W-Def-9: Impact on coastal grasslands dominated by secondarized thickets (Lantana camara)

7.3.2.1.9.1 Impact before mitigation

The different areas which are concerned by the project are detailed in the table below.

Items	Area/number of specimens inside the area of influence (ha)	Area/number of specimens inside the project footprint (ha)
Coastal grasslands dominated by secondarized thickets (Lantana camara)	25,55	17,68

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.3.2.1.9.2 Mitigation measure and impact after mitigation

No measure is recommended.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.1.10 Impact BioT-Hab-W-Def-10: Impact on secondarized thickets (Leucaena leucocephala)

7.3.2.1.10.1 Impact before mitigation

The different areas which are concerned by the project are detailed in the table below.

Items	Area/number of specimens inside the area of influence (ha)	Area/number of specimens inside the project footprint (ha)
Secondarized thickets (Leucaena leucocephala)	23,84	10,92

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is negligible**.

7.3.2.1.10.2 Mitigation measure and impact after mitigation

No measure is recommended.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.3.2.1.11 Summary

Table 105: Permanent impact during Construction - Biological Environment – Terrestrial Habitat

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
BioT-Hab-W-Def-1	Impact on grazing lands on basaltic resurgences	Adverse	Low	None	None	Low
BioT-Hab-W-Def-2	Impact on grazing lands on calcarenic substratum	Adverse	Low	None	None	Low
BioT-Hab-W-Def-3	Impact on coastal vegetation dominated by Ipomoea pes caprae	Adverse	Low	None	None	Low
BioT-Hab-W-Def-4	Impact on anthropized areas	Adverse	Negligible	None	None	Low
BioT-Hab-W-Def-5	Impact on dry forest	Adverse	Medium	BioT-Av-1	Avoid remarkable trees located at the edge of the project	Negligible
				BioT-Av-2	Moving the control tower out of the nature reserve	
				BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	
				BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	
				BioT-Mit-5	Genetic conservation of populations of impacted rare species	
				BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity.	
				BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
BioT-Hab-W-Def-6	Impact on riparian vegetation	Adverse	Negligible	None	None	Negligible

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
BioT-Hab-W-Def-7	Impact on estuarine habitat	Adverse	Negligible	None	None	Negligible
BioT-Hab-W-Def-8	Impact on calcarenic dry lawns of anthropogenic origin	Adverse	Negligible	None	None	Negligible
BioT-Hab-W-Def-9	Impact on coastal grasslands dominated by secondarized thickets (Lantana camara)	Adverse	Low	None	None	Low
BioT-Hab-W-Def-10	Impact on secondarized thickets (Leucaena leucocephala)	Adverse	Negligible	None	None	Negligible

7.3.2.2 Terrestrial flora

A total of 7 specimens of major sensitivity, 8 specimens of high sensitivity and 27 specimens of medium sensitivity are expected to be destroyed by the project: see table below.

Amongst low sensitivity species, 2 require special attention:

Eleodendron orientale: subendemic and LC (least concerned), the local population of this species in Plaine Corail is quite large and will be largely destroyed by the project (191 individuals out of 264 censored in total within the area of influence). The total population in Rodrigues is estimated at between 500 and 1000 individuals and the species is present in almost all valleys of the island along the coast.
Phyllanthus dumentosus: indigenous and VU (vulnerable), this species looks quite common elsewhere in Rodrigues. Its sensitivity for the project is therefore assessed at low.

Table 106. Number of native flora specimens destroyed by the project

Flora species	Sensitivity				Total
	Major	High	Medium	Low	
Adiantum rhizophorum			1		1
Antirhea bifurcata		1			1
Diospyros diversifolia		1			1
Elaeodendron orientale				191	191
Fernelia buxifolia		1			1
Fimbristylis cymosa					
Foetidia rodriguesiana		2			2
Hyophorbe verschaffeltii	7				7
Nephrolepis biserrata			1		1
Pandanus heterocarpus			25		25
Phyllanthus dumentosus				1	1
Sarcanthemum coronopus			1		1
Terminalia bentzoe subsp. rodriguesensis		3			3
Total	**7**	**8**	**28**	**192**	**235**

Direct destruction of these species implies an overall impact magnitude assessed to high level.

Detailed impact sensitivity and magnitude are exposed below.

7.3.2.2.1 Impact BioT-Flo-W-Def-1: Impact on *Hyophorbe verschaffeltii*

7.3.2.2.1.1 Impact before mitigation

The number of specimens inside the project is detailed in the table below.

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the project footprint	Comments
Hyophorbe verschaffeltii	43	7	Impacted specimens are known to be of domestic origin

The impact is the loss of native trees from a major sensitivity for the island of Rodrigues.

The impact severity is medium. Considering the receptor sensitivity assessed as major, **the impact magnitude is high**.

7.3.2.2.1.2 Mitigation measure and impact after mitigation

Avoidance measure BioT-Av-1: Avoid remarkable trees located at the edge of the project

Reduction measure BioT-Mit-3: Creating an arboretum of endemic species inside the airport landscaping

Reduction measure BioT-Mit-4: Transplant remarkable trees and ferns intended to be cut down during the works phase

Reduction measure BioT-Mit-5: Genetic conservation of populations of impacted rare species

Offset measure BioT-Comp-6: Action plan towards more sustainable agricultural practices for native biodiversity

Offset measure BioT-Comp-7: Ecological restauration within the limits of the Anse Quitor nature reserve

All these measures are presented in the chapter 7.3.2.1 Terrestrial habitat.

The proposed measures result in a medium severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.2.2 Impact BioT-Flo-W-Def-2: Impact on *Polyscias rodriguesiana*

7.3.2.2.2.1 Impact before mitigation

The number of specimens inside the project is detailed in the table below.

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the project footprint	Comments
Polyscias rodriguesiana	7	0	/

The impact is the loss of native trees of a major sensitivity for the island of Rodrigues. This impact severity is negligible (no impact).

The impact severity is not significant. Considering the receptor sensitivity assessed as major, **the impact magnitude is negligible**.

7.3.2.2.2.2 Mitigation measure and impact after mitigation

No measure is necessary.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.3.2.2.3 Impact BioT-Flo-W-Def-3: Impact on *Antirhea bifurcata*

7.3.2.2.3.1 Impact before mitigation

The number of specimens inside the project is detailed in the table below.

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the project footprint	Comments
Antirhea bifurcata	1	1	Has become very rare in Rodrigues

The impact is the loss of native trees of a high sensitivity for the island of Rodrigues.

The impact severity is major. Considering the receptor sensitivity assessed as high, **the impact magnitude is major**.

7.3.2.2.3.2 Mitigation measure and impact after mitigation

Avoidance measure BioT-Av-1: Avoid remarkable trees located at the edge of the project

Reduction measure BioT-Mit-3: Creating an arboretum of endemic species inside the airport landscaping

Reduction measure BioT-Mit-5: Genetic conservation of populations of impacted rare species

Offset measure BioT-Comp-6: Action plan towards more sustainable agricultural practices for native biodiversity

Offset measure BioT-Comp-7: Ecological restauration within the limits of the Anse Quitor nature reserve

All these measures are presented in the chapter 7.3.2.1 Terrestrial habitat.

The proposed measures result in a major severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.3.2.2.4 Impact BioT-Flo-W-Def-4: Impact on *Clerodendrum laciniatum*

7.3.2.2.4.1 Impact before mitigation

The number of specimens inside the project is detailed in the table below.

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the project footprint	Comments
Clerodendrum laciniatum	3	0	/

The impact is the loss of native trees of a high sensitivity for the island of Rodrigues. This impact severity is negligible (no impact).

The impact severity is not significant. Considering the receptor sensitivity assessed as high, **the impact magnitude is negligible**.

7.3.2.2.4.2 Mitigation measure and impact after mitigation

No measure is necessary.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.3.2.2.5 Impact BioT-Flo-W-Def-5: Impact on *Diospyros diversifolia*

7.3.2.2.5.1 Impact before mitigation

The number of specimens inside the project is detailed in the table below.

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the project footprint	Comments
Diospyros diversifolia	1	1	Has become very rare in Rodrigues. The information obtained from wildlife indicates that the number of plants remaining in Rodrigues is about 300 to 500. Their localisation is : Mourouk valley, Cascade St Louis, English Bay (Baie aux Anglais), Creve Coeur, Cascade Pigeon, Oyster Bay (Baie aux Huitres), Cascade Pistache, Plaine Corail, Dan Coco, Rivière Coco, Anse Raffin, Anse Baleine, Cascade Victoire, Port Sud Est The main threats to them are development, grazing, low regeneration.

The impact is the loss of native trees of a high sensitivity for the island of Rodrigues.

The impact severity is major. Considering the receptor sensitivity assessed as high, **the impact magnitude is major**.

7.3.2.2.5.2 Mitigation measure and impact after mitigation

Reduction measure BioT-Mit-3: Creating an arboretum of endemic species inside the airport landscaping

Reduction measure BioT-Mit-4: Transplant remarkable trees and ferns intended to be cut down during the works phase

Offset measure BioT-Comp-6: Action plan towards more sustainable agricultural practices for native biodiversity

Offset measure BioT-Comp-7: Ecological restauration within the limits of the Anse Quitor nature reserve

All these measures are presented in the chapter 7.3.2.1 Terrestrial habitat.

The proposed measures result in a major severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.2.6 Impact BioT-Flo-W-Def-6: Impact on Fernelia buxifolia

7.3.2.2.6.1 Impact before mitigation

The number of specimens inside the project is detailed in the table below.

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the project footprint	Comments
Fernelia buxifolia	2	1	/

The impact is the loss of native trees of a high sensitivity for the island of Rodrigues.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.3.2.2.6.2 Mitigation measure and impact after mitigation

Avoidance measure BioT-Av-1: Avoid remarkable trees located at the edge of the project

Reduction measure BioT-Mit-3: Creating an arboretum of endemic species inside the airport landscaping

Offset measure BioT-Comp-6: Action plan towards more sustainable agricultural practices for native biodiversity

Offset measure BioT-Comp-7: Ecological restauration within the limits of the Anse Quitor nature reserve

All these measures are presented in the chapter 7.3.2.1 Terrestrial habitat.

The proposed measures result in a high severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.3.2.2.7 Impact BioT-Flo-W-Def-7: Impact on Foetidia rodriguesiana

7.3.2.2.7.1 Impact before mitigation

The number of specimens inside the project is detailed in the table below.

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the project footprint	Comments
Foetidia rodriguesiana	3	2	50 to 100 specimens in the wild or ex-situ collections

The impact is the loss of native trees of a high sensitivity for the island of Rodrigues.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.3.2.2.7.2 Mitigation measure and impact after mitigation

Reduction measure BioT-Mit-3: Creating an arboretum of endemic species inside the airport landscaping

Reduction measure BioT-Mit-4: Transplant remarkable trees and ferns intended to be cut down during the works phase

Offset measure BioT-Comp-6: Action plan towards more sustainable agricultural practices for native biodiversity

Offset measure BioT-Comp-7: Ecological restauration within the limits of the Anse Quitor nature reserve

All these measures are presented in the chapter 7.3.2.1 Terrestrial habitat.

The proposed measures result in a high severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.2.8 Impact BioT-Flo-W-Def-8: Impact on *Latania verschaffeltii*

7.3.2.2.8.1 Impact before mitigation

The number of specimens inside the project is detailed in the table below.

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the project footprint	Comments
Latania verschaffeltii	10	0	/

The impact is the loss of native trees of a high sensitivity for the island of Rodrigues.

The impact severity is not significant. Considering the receptor sensitivity assessed as high, **the impact magnitude is negligible**.

7.3.2.2.8.2 Mitigation measure and impact after mitigation

No measure is necessary.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.3.2.2.9 Impact BioT-Flo-W-Def-9: Impact on Terminalia bentzoe subsp. Rodriguesensis

7.3.2.2.9.1 Impact before mitigation

The number of specimens inside the project is detailed in the table below.

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the project footprint	Comments
Terminalia bentzoe subsp. Rodriguesensis	28	3	Reported to be very rare (Mauritius herbarium) but many specimens seem to have been planted around Anse Quitor. The information obtained from wildlife indicates that the number of plants remaining in Rodrigues is about less than fifty.

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the project footprint	Comments
			Their localisation is: Mourouk Valley, Cascade St Louis, St Francois, Anse Ally, English Bay, Pointe Canon, Oyster Bay, Ile Aux Crabes, Plaine Corail, Anse Quitor, Anse Baleine. The main threats to them are development, grazing, hybridization with T.b. bentzoe from Mauritius.

The impact is the loss of native trees of a high sensitivity for the island of Rodrigues.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.3.2.2.9.2 Mitigation measure and impact after mitigation

Avoidance measure BioT-Av-1: Avoid remarkable trees located at the edge of the project

Avoidance measure BioT-Av-2: Moving the control tower out of the nature reserve

Reduction measure BioT-Mit-3: Creating an arboretum of endemic species inside the airport landscaping

Reduction measure BioT-Mit-4: Transplant remarkable trees and ferns intended to be cut down during the works phase

Reduction measure BioT-Mit-5: Genetic conservation of populations of impacted rare species

Offset measure BioT-Comp-6: Action plan towards more sustainable agricultural practices for native biodiversity

Offset measure BioT-Comp-7: Ecological restauration within the limits of the Anse Quitor nature reserve

All these measures are presented in the chapter 7.3.2.1 Terrestrial habitat.

The proposed measures result in a high severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.2.10 Impact BioT-Flo-W-Def-10: Impact on *Zanthoxylum paniculatum*

7.3.2.2.10.1 Impact before mitigation

The number of specimens inside the project is detailed in the table below.

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the project footprint	Comments
Zanthoxylum paniculatum	1	0	/

The impact is the loss of native trees of a high sensitivity for the island of Rodrigues.

The impact severity is not significant. Considering the receptor sensitivity assessed as high, **the impact magnitude is negligible**.

7.3.2.2.10.2 Mitigation measure and impact after mitigation

No measure is necessary.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.3.2.2.11 Impact BioT-Flo-W-Def-11: Impact on other native trees with a medium sensitivity for the island of Rodrigues

7.3.2.2.11.1 Impact before mitigation

The species and the number of specimens inside the project are detailed in the table below.

Items	Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the project footprint	Comments
Plant species of medium sensitivity: 13 species (in red, species expected to be impacted by the project)	*Adiantum rhizophorum*, *Camptocarpus sphenophyllus*, *Cyperus iria*, *Mathurina penduliflora*, *Nephrolepis biserrata*, *Pandanus heterocarpus*, *Paspalidium geminatum*, *Phymatosorus scolopendria*, *Pleurostylia putamen*, *Rhizophora mucronata*, *Sarcanthemum coronopus*, *Secamone rodriguesiana*, *Tournefortia argentea.*	118*	27*	Some of these species will be massively destroyed by the project and are locally protected (Pandanus heterocarpus) Two ferns locally protected (*Nephrolepis biserrata/Adiantum rhizophorum*)

The impact is the loss of native trees of a medium sensitivity for the island of Rodrigues.

The impact severity is high. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium**.

7.3.2.2.11.2 Mitigation measure and impact after mitigation

Avoidance measure BioT-Av-2: Moving the control tower out of the nature reserve

Reduction measure BioT-Mit-3: Creating an arboretum of endemic species inside the airport landscaping

Reduction measure BioT-Mit-4: Transplant remarkable trees and ferns intended to be cut down during the works phase

Reduction measure BioT-Mit-5: Genetic conservation of populations of impacted rare species

Offset measure BioT-Comp-6: Action plan towards more sustainable agricultural practices for native biodiversity

Offset measure BioT-Comp-7: Ecological restauration within the limits of the Anse Quitor nature reserve

All these measures are presented in the chapter 7.3.2.1 Terrestrial habitat.

The proposed measures result in a high severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.2.12 Impact BioT-Flo-W-Def-12: Impact on other native trees with a low sensitivity for the island of Rodrigues

7.3.2.2.12.1 Impact before mitigation

The species and the number of specimens inside the project are detailed in the table below.

Items	Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the project footprint	Comments
Plant species of low sensitivity: 9 species (in red, species expected to be impacted by the project)	*Dodonaea viscosa, Dracaena reflexa, Elaeodendron orientale, Ficus reflexa, Ficus rubra, Phyllanthus dumentosus, Premna serratifolia, Sarcostemma viminale, Thespesia populnea*	287*	191*	Some of these species will be massively destroyed by the project and are locally protected (Eleodendron orientale). One species has become very rare (Phyllanthus dumentosus). For Elaeodendron orientale, the information obtained from wildlife indicates that the number of plants remaining in Rodrigues is about 500 to 1000. They are present in almost all valleys of the island along the coast. The main threat to them is development. For Phyllanthus dumentosus, the information obtained from wildlife indicates that the species is locally common (> 1000 plants). Their localisation is : Ile Aux Cocos, Port Mathurin, possibly other coastal areas. The main threat to them is the development of Port Mathurin.

The impact is the loss of native trees of a low sensitivity for the island of Rodrigues.

The impact severity is high. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.3.2.2.12.2 Mitigation measure and impact after mitigation

Avoidance measure BioT-Av-1: Avoid remarkable trees located at the edge of the project

Avoidance measure BioT-Av-2: Moving the control tower out of the nature reserve

Reduction measure BioT-Mit-3: Creating an arboretum of endemic species inside the airport landscaping

Reduction measure BioT-Mit-4: Transplant remarkable trees and ferns intended to be cut down during the works phase

Reduction measure BioT-Mit-5: Genetic conservation of populations of impacted rare species

Offset measure BioT-Comp-6: Action plan towards more sustainable agricultural practices for native biodiversity

Offset measure BioT-Comp-7: Ecological restauration within the limits of the Anse Quitor nature reserve

All these measures are presented in the chapter 7.3.2.1 Terrestrial habitat.

The proposed measures result in a high severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.3.2.2.13 Summary

Table 107: Permanent impact during Construction - Biological Environment - Terrestrial Flora

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
BioT-Flo-W-Def-12	Impact on *Hyophorbe verschaffeltii*	Adverse	High	BioT-Av-1	Avoid remarkable trees located at the edge of the project Targeted species*: Antirhea bifurcata , Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	Low
				BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	
				BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	
				BioT-Mit-5	Genetic conservation of populations of impacted rare species : production and reintroduction of clones and genetic ancestors of these species	
				BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	
				BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
BioT-Flo-W-Def-2	*Impact on Polyscias rodriguesiana*	Adverse	Negligible	None	None	Negligible
BioT-Flo-W-Def-3	*Impact on Antirhea bifurcata*	Adverse	Major	BioT-Av-1	Avoid remarkable trees located at the edge of the project Targeted species*: Antirhea bifurcata , Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	Low
				BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	
				BioT-Mit-5	Genetic conservation of populations of impacted rare species : production and reintroduction of clones and genetic ancestors of these species	
				BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
				BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
BioT-Flo-W-Def-4	*Clerodendrum laciniatum* Impact on	Adverse	Negligible	None	None	Negligible
BioT-Flo-W-Def-5	*Impact on Diospyros diversifolia*	Adverse	Major	BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	Low
				BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	
				BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	
				BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
BioT-Flo-W-Def-6	*Impact on Fernelia buxifolia*	Adverse	High	BioT-Av-1	Avoid remarkable trees located at the edge of the project Targeted species*: Antirhea bifurcata , Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	Low
				BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	
				BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	
				BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
BioT-Flo-W-Def-7	*Impact on Foetidia rodriguesiana*	Adverse	High	BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	Low
				BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	
				BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity.	
				BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
BioT-Flo-W-Def-8	*Impact on Latania verschaffeltii*	Adverse	Negligible	None	None	Negligible
BioT-Flo-W-Def-9	*Impact on Terminalia bentzoe subsp. Rodriguesensis*	Adverse	High	BioT-Av-1	Avoid remarkable trees located at the edge of the project Targeted species*: Antirhea bifurcata , Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	Low
				BioT-Av-2	Moving the control tower out of the nature reserve	
				BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	
				BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	
				BioT-Mit-5	Genetic conservation of populations of impacted rare species	
				BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	
				BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
BioT-Flo-W-Def-10	*Impact on Zanthoxylum paniculatum*	Adverse	Negligible	None	None	Negligible
BioT-Flo-W-Def-11	*Impact on plant species with medium sensitivity: Adiantum rhizophorum, Camptocarpus sphenophyllus, Cyperus iria, Mathurina*	Adverse	Medium	BioT-Av-2	Moving the control tower out of the nature reserve	Low
				BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
	penduliflora, Nephrolepis biserrata, Pandanus heterocarpus, Paspalidium geminatum, Phymatosorus scolopendria, Pleurostylia putamen, Rhizophora mucronata, Sarcanthemum coronopus, Secamone rodriguesiana, Tournefortia argentea.			BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	
				BioT-Mit-5	Genetic conservation of populations of impacted rare species	
				BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity.	
				BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	
BioT-Flo-W-Def-12	*Impact on plant species with low sensitivity : Dodonaea viscosa, Dracaena reflexa, Elaeodendron orientale, Ficus reflexa, Ficus rubra, Phyllanthus dumentosus, Premna serratifolia, Sarcostemma*	Adverse	Low	BioT-Av-1	Avoid remarkable trees located at the edge of the project Targeted species*: Antirhea bifurcata , Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	Low
				BioT-Av-2	Moving the control tower out of the nature reserve	
				BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	
				BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
	viminale, *Thespesia populnea*			BioT-Mit-5	Genetic conservation of populations of impacted rare species	

*refers to non-exhaustive counts

7.3.2.3 Terrestrial fauna

Loss of the vegetation cover from the site will result in the loss of habitat for a range of species and will reduce the ecosystem services provided. Ecosystem services particularly affected will be retention of soil, sediment control, water retention and gradual release.

Based on qualitative field observations completed during the field campaigns, the area within the proposed airstrip extension appears unlikely to support ecologically significant Rodrigues bird and reptile species. It is likely that isolated indigenous faunal species (e.g. *Lygodactylus lugubris*) do exist within the limits of the project footprint; however, the presence of these individuals in numbers that would be considered a viable community is considered unlikely. Species such as *Tropidophora ssp*. are widely present in the area of influence and the "endangered" status of *Tropidophora articulata* makes it a particularly sensitive point here. The impacts of the destruction of individuals of these 2 species could be important without mitigation measures.

The impact sensitivity and magnitude are exposed below.

The overall impact magnitude on native fauna loss is assessed at medium level.

7.3.2.3.1 Impact BioT-Fau-W-Def-1: Impact on *Pteropus rodricensis (Chiroptera)*

7.3.2.3.1.1 Impact before mitigation

For this species, the number of specimens inside the area of influence is higher than 10, and the number of specimens inside the project footprint is considered 0.

The dry forest sectors favourable to *Pteropus rodricensis* around the area of influence cover an area of about 17.5 ha but will not be challenged by the project.

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.3.2.3.1.2 Mitigation measure and impact after mitigation

No measure is necessary.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.3.2 Impact BioT-Fau-W-Def-2: Impact on Tropidophora articulata (Gastropoda)

7.3.2.3.2.1 Impact before mitigation

For this species, the number of specimens inside the area of influence or inside the project footprint is unknown. The impact is the loss of native gasteropoda individuals and their foraging habitat. However, only empty shellswere found on the site.

The impact severity is high. Considering the receptor sensitivity assessed as medium to high, **the impact magnitude is medium to high**.

7.3.2.3.2.2 Mitigation measure and impact after mitigation

<u>Reduction measure BioT-Mit-8</u>: Collect arthropods from the T*ropiphodora* genus before and during earthwork

This measure consists in collecting living individuals of *Tropiphodora* within the project footprint boundaries.

Several campaigns will be conducted before the works phase and during earthwork. Sampling planning will allow the entire project area to be visited in an equivalent manner. If species are more abundant in some areas, these areas will be collected more thoroughly.

Implementation conditions / Points of vigilance : Learn how to distinguish the two different species recorded on site.

The responsible person or structure for this measure could be the contractor or ARL, and the potential partners: Vincent Florens (Department of Biosciences, University of Mauritius, Réduit, Mauritius).

The proposed measures result in a high severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.3.3 Impact BioT-Fau-W-Def-3: Impact on *Tropidophora eugeniae (Gastropoda)*

7.3.2.3.3.1 Impact before mitigation

For this species, the number of specimens inside the area of influence or inside the project footprint is unknown. The impact is the loss of native gasteropoda individuals and their foraging habitat.

The impact severity is high. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.3.2.3.3.2 Mitigation measure and impact after mitigation

No measure is necessary.

The proposed measures result in a high severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.3.4 Impact BioT-Fau-W-Def-4: Impact on *Lygodactylus lugubris (Reptilia)*

7.3.2.3.4.1 Impact before mitigation

For this species, the number of specimens inside the area of influence or inside the project footprint is unknown (at least 3).

Figure 177: Isolated Lygodactylus lugubris on a Latania vershaffeltii near the airport

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.3.2.3.4.2 Mitigation measure and impact after mitigation

No measure is necessary.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.3.5 Summary

Table 108: Permanent impact during Construction - Biological Environment - Terrestrial Fauna

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
BioT-Fau-W-Def-1	Impact on *Pteropus rodricensis (Chiroptera)*	Adverse	Low	None	None	Low
BioT-Fau-W-Def-2	Impact on *Tropidophora articulata (Gastropoda)*	Adverse	Medium/High	BioT-Mit-8	Collect arthropods from the Tropiphodora genus before and during earthwork	Low
BioT-Fau-W-Def-3	Impact on *Tropidophora eugeniae (Gastropoda)*	Adverse	Low	None	None	Low
BioT-Fau-W-Def-4	Impact on *Lygodactylus lugubris (Reptilia)*	Adverse	Low	None	None	Low

7.3.2.4 Marine habitats

The main potential direct impacts on marine ecology in the works phase are the:

Destruction of natural habitats and associated species;
Modification of the physical functioning of habitats induced by the facilities (hydrosedimentary modification, current change…).
The construction works (backfilling at sea for the construction of the new runway and the boat house and jetty facilities) are the primary potential source of these potential impacts.

7.3.2.4.1 Impact BioM-Hab-W-Def-1: Destruction of natural habitats

7.3.2.4.1.1 Impact before mitigation

All marine habitats and species in the footprint of offshore embankment will be lost through the new runway construction (total marine right-of-way of 24112 m²).

Among the habitats inventoried in July 2019, this represents a habitat loss of :

1391m² for the lagoon sedimentary plain, sandy facies (stations 20 at 22 and 40);
22721 m² for the sublittoral rocks dominated by photophilic algae (stations 11 at 14, 23 and 51).
These habitats remain widely represented on an island scale. The shallow rocky areas facilitate the development of some isolated coral colonies (*Acropora formosa*, *Porites* sp.) in the whole stations (stations n°11 to n°14) with many associated mobile species but with a weak species richness (*Epinephelus merra, Gymnothorax griseus, Cheilodipterus quinquelineatus, Ostracion cubicus* for fishes).

Figure 178: Isolated coral colonies with *Acropora formosa* at station n°12 (on the left) and *Porites* sp. at station n°13 (on the right)

The impact severity is high. Considering the receptor sensitivity assessed as high (coral reef), **the impact magnitude is high.**

7.3.2.4.1.2 Mitigation measure and impact after mitigation

As the magnitude is high, a mitigation measure is proposed.

Avoidance measure (BioM-Av-3): Avoid coral heads located at the edge of the project

This measure consists in avoiding the destruction of isolated coral colonies located at the boundaries of the project footprint. Thus, it is proposed to identify and mark out all the coral heads located in the maritime right-of-way of the future runway.

If feasible, the corals will be moved to the South East Marine Protected Area (SEMPA).

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

The rating may be revised based on final design and method statements.

7.3.2.4.2 Impact BioM-Hab-W-Def-2: Modification of the physical functioning of habitats

7.3.2.4.2.1 Impact before mitigation

The developments of the project at sea will induce discharges into the marine environment, ie hydrosedimentary modification, current change. These changes are not significant for the project.

The impact severity is not significant. Considering the receptor sensitivity assessed as low **the impact magnitude is negligible**.

7.3.2.4.2.2 Mitigation measure and impact after mitigation

No mitigation measure is proposed.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.3.2.4.3 Summary

Table 109: Permanent impact during Construction - Biological Environment - Marine Habitats

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
BioM-Hab-W-Def-1:	Destruction of natural habitats including areas characterized by presence of Acropora formosa	Adverse	High	BioM-Av-3	Avoid coral heads located at the edge of the project Relocate corals in the SEMPA if feasible	Low
BioM-Hab-W-Def-2:	Modification of the physical functioning of habitats	Adverse	Negligible	none	-	-

7.3.2.5 Marine species

The main potential impact on marine species in the marine works phase is the destruction of marine species.

7.3.2.5.1 Impact BioM-Spe-W-Def-1: impact on soft bottom species

7.3.2.5.1.1 Impact before mitigation

Topaze Bay is dominated by a mixed soft substrate, which locally shelters seagrass and macroalgae. This type of habitat remains important in Rodrigues's lagoon (about 30%). This environment is the habitat of common species, dominated by echinoderms (holothurians, sea urchins...), other small invertebrates (annelids...) or fish (herbivores or eaters of small invertebrates).

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.3.2.5.1.2 Mitigation measure and impact after mitigation

No mitigation measure is proposed.

7.3.2.5.2 Impact BioM-Spe-W-Def-2: impact on mobile species

7.3.2.5.2.1 Impact before mitigation

However, mobile species (ichtyofauna, marine mammals, marine turtles) have the ability to avoid these exposures by maintaining a certain distance from overly turbid waters and/or areas of works that are too noisy.

The species present around the settlement area and further along the coast are adapted to the usual variations in turbidity and noise in the area (natural conditions, fishing gear, etc.).

The impact severity is low. Considering the receptor sensitivity assessed as low (ichtyofauna and marine mammals) and high (marine turtles), **the impact magnitude is low**.

7.3.2.5.2.2 Mitigation measure and impact after mitigation

No mitigation measure is proposed.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.2.5.3 Summary

Table 110: Permanent impact during Construction - Biological Environment - Marine Species

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
BioM-Spe-W-Def-1	Impact on soft bottom species	Adverse	Low	none	-	Low
BioM-Spe-W-Def-2	Impact on mobile species	Adverse	Low	none	-	Low

7.3.3 Transport network, electricity supply and waste management

No permanent and irreversible impacts during Construction Phase.

7.3.4 Socio-economic environment

7.3.4.1 Impacts on demographics and social dynamics

7.3.4.1.1 Impact SE-Demo-W-Def-1: Physical displacement of the population affected by the project

Source of the impact: Construction of the runway and airport infrastructures

7.3.4.1.1.1 Impact before mitigation

The construction of the runway and the infrastructure of the airport will cause the involuntary displacement of the inhabitants of the village of Sainte Marie.

This impact will have consequences on lifestyles related to proper practices in particular in relation to agricultural and livestock breeding activities.

The project will inevitably and irreversibly lead to change in this specific lifestyle and the necessary adaptation in the resettlement area.

The inhabitants of Sainte Marie, as well as those of the resettlement location, are high-sensitivity receptors because they will have to be discerning as to the proper organisation of social relations and particularly with regard to good integration of agro-pastoral systems.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.3.4.1.1.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a Resettlement Action Plan (RAP) that respects the commitments to relocate and restore livelihoods and complies with IFC standards. (Measure SE-Comp-1):
Organize information meetings at the level of the towns affected by the project
Use an effective and transparent complaint management mechanism at project level and communicate this mechanism to the authorities and towns impacted by the project activities
Conduct consultations with potentially impacted villages to prepare for the implementation of the Resettlement Action Plan
Establish a complaint management mechanism that is widely known to local stakeholders (local authorities and populations affected directly or indirectly by the project) and works in an efficient and transparent manner
Ensure that the implementation of the Resettlement Action Plan (RAP) is in line with the project's commitments for the resettlement and restoration of livelihoods and IFC standards
Clarify the delimitation of land boundaries and right-holders prior to the compensation process
Compensate land and infrastructure on the basis of a plan to manage individual and community compensation by land as much as possible, cover losses incurred for both individuals and the community
Develop a Livelihood Restoration Plan for communities that will be affected by "economic displacement" (loss of property and/or livelihoods) and establish a monitoring-assessment program of the socio-economic conditions of displaced people
Compensate for all farmland affected by the project, cover losses incurred on the basis of the economic reality of the study area, both for individual and community right holders

Integrate compensation mechanisms for impacted livestock breeders
Integrate compensation mechanisms for fishermen impacted by the activities of the project
Search for land to accommodate physically displaced people and organise relocation
Replace any social infrastructure that will be destroyed or the method of operation of which will be altered by the project
Create a Resettlement Monitoring Committee for helping the follow up and ensuring the proceedings of activities and procedures
Propose, to the extent possible, replacement farmland permiting displaced populations to have sustainable livelihoods. (Measure SE-Comp-2):
Clarify the delimitation of land boundaries and right-holders prior to the compensation process
Conduct consultations with potentially impacted villages to prepare for the implementation of the Resettlement Action Plan
Organize restitution of farmland areas to the communities of the towns
Compensate land and infrastructure on the basis of a plan to manage individual and community compensation by land as much as possible, cover losses incurred for both individuals and the community
Develop a Livelihood Restoration Plan for communities that will be affected by "economic displacement" (loss of property and/or livelihoods) and establish a monitoring-assessment program of the socio-economic conditions of displaced people
Support the diversification of income-generating economic activities in the context of the Livelihood Restoration Plan so that people affected by the project can regain sustainable livelihoods and possibly invest in these activities a part of the financial indemnifications resulting from the RAP
Compensate for all farmland affected by the project, cover losses incurred on the basis of the economic reality of the study area, both for individual and community right holders
Search for, to the extent possible, replacement farmland to permit displaced populations to have sustainable livelihoods
Create a Resettlement Monitoring Committee for helping the follow up and ensuring the proceedings of activities and procedures
Implement a communication plan (including complaint management) and internal support for all displaced residents and those in the towns of the proposed relocation areas. (Measure SE-Mit-3 – see 7.2.4.2.1.2)
These mitigation measures will limit the magnitude of the impact to a medium level as relocation may remain a disturbance until a full adaptation of displaced population as well as host population.

The proposed measures result in a major severity mitigated impact. Thus, The residual impact is of **medium magnitude**.

7.3.4.1.2 Impact SE-Demo-W-Def-2: Involuntary economic and physical displacement of the active and non-resident population affected by the project

Source of the impact: Construction of the runway and airport infrastructures

7.3.4.1.2.1 Impact before mitigation

The construction of the runway will also induce involuntary displacement of the active and non-resident population of the area. This impact will focus on livestock breeders and fishermen in the area who have to adapt to new social conditions for managing their activities.

The project will irreversibly lead to the displacement of the fishing infrastructures and that of the herds of the livestock breeders, which must find new grazing areas.

This impact will have significant consequences for fishermen and especially livestock breeders whose sensitivity is related to the availability of pasture surfaces.

The impact severity is major. Considering the receptor sensitivity assessed as major **the impact magnitude is major**.

7.3.4.1.2.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a Resettlement Action Plan (RAP) that respects the commitments to relocate and restore livelihoods and complies with IFC standards. (Measure SE-Comp-1 – see 7.3.4.1.1.2)
Propose, to the extent possible, pasture and alternative fishing facilities to permit displaced populations to have sustainable livelihoods. (Measure SE-Comp-4):
Clarify the delimitation of land boundaries and right-holders prior to the compensation process
Conduct consultations with potentially impacted villages to prepare for the implementation of the Resettlement Action Plan
Organize restitution of farmland areas to the communities of the towns
Compensate land and infrastructure on the basis of a plan to manage individual and community compensation by land as much as possible, cover losses incurred for both individuals and the community
Develop a Livelihood Restoration Plan for communities that will be affected by "economic displacement" (loss of property and/or livelihoods) and establish a monitoring-assessment program of the socio-economic conditions of displaced people
Support the diversification of income-generating economic activities in the context of the Livelihood Restoration Plan so that people affected by the project can regain sustainable livelihoods and possibly invest in these activities a part of the financial indemnifications resulting from the RAP
Integrate compensation mechanisms for impacted livestock breeders
Integrate compensation mechanisms for fishermen impacted by the activities of the project
Search for land to accommodate physically displaced people and organise relocation
Implement a communication plan (including complaint management) and internal support for all displaced residents and those in the towns of the proposed relocation areas. (Measure SE-Mit-3 – see 7.2.4.2.1.2)
These mitigation measures will permit the limitation of the magnitude of the impact to a medium level as relocation may remain a disturbance until full adaptation of displaced as well as host population.

The proposed measures result in a major severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.3.4.1.3 Summary

Table 111: Permanent impact during Construction - Socio-Economic Environment - Demographics & Social Dynamics

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Demo-W-Def-1	Physical and economic involuntary displacement of active and non-resident population affected by the project	Adverse	Major	SE-Comp-1	Compensation - Resettlement Action Plan (RAP).	Medium
				SE-Comp-2	Compensation - Availability of farmland.	
				SE-Mit-3	Mitigation - Communication plan, complaint management and internal support for relocation.	
SE-Demo-W-Def-2	Physical and economic involuntary displacement of active and non-resident population affected by the project	Adverse	Major	SE-Comp-1	Compensation - Resettlement Action Plan (RAP).	Medium
				SE-Comp-4	Compensation - Provision of pasture areas and new fishing infrastructures.	
				SE-Mit-3	Mitigation - Communication plan, complaint management and internal support for relocation.	

Figure 179: Impact lands and buildings

Figure 180: Proposed habitations relocation zone

7.3.4.2 Impacts on land

7.3.4.2.1 Impact SE-Land-W-Def-1: Loss of houses or infrastructure due to involuntary displacement of the population affected by the project

Source of the impact: Construction of the runway and airport infrastructures

7.3.4.2.1.1 Impact before mitigation

The Sainte Marie villagers as well as users of the impacted area are irreversibly affected by the loss of their homes, various infrastructures and land that they have known throughout their lives. Village houses as well as fishing infrastructures have sentimental value and some people feel that these houses built in coral blocks are stronger than those of today.

Affected communities are therefore very sensitive to infrastructural and land loss, which is obviously a major impact.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.3.4.2.1.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a Resettlement Action Plan (RAP) that respects the commitments to relocate and restore livelihoods and complies with IFC standards. (Measure SE-Comp-1 – see 7.3.4.1.1.2)
Propose, to the extent possible, replacement farmland permiting displaced populations to have sustainable livelihoods. (Measure SE-Comp-2 – see 7.3.4.1.1.2)
Implement a communication plan (including complaint management) and internal support for all displaced residents and those in the towns of the proposed relocation areas. (Measure SE-Mit-3 – see 7.2.4.2.1.2)
These mitigation measures will limit the magnitude of the impact to a medium level as displaced inhabitant may retrieve new houses built in cement blocks.

The proposed measures result in a major severity mitigated impact. Thus, The residual impact is of **medium magnitude**.

7.3.4.2.2 Summary

Table 112: Permanent impact during Construction - Socio-Economic Environment - Land

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Land-W-Def-1	Loss of habitats or infrastructures used due to involuntary displacement of the affected population	Adverse	Major	SE-Comp-1	Compensation - Resettlement Action Plan (RAP).	Medium
				SE-Comp-2	Compensation - Availability of farmland.	
				SE-Mit-3	Mitigation - Communication plan, complaint management and internal support for relocation.	

7.3.4.3 Impacts on agriculture and livestock

7.3.4.3.1 Impact SE-Agri-W-Def-1: Loss of farmland and pasture in the construction area

Source of the impact: Construction of the runway and airport infrastructures

7.3.4.3.1.1 Impact before mitigation

This direct impact concerns the Sainte Marie village community and that of the Bangélique area livestock breeders. They currently use the area for extensive grazing of their herds as well as to produce vegetables and other annual plants in fields near their homes.

The project will inevitably and irreversibly lead to the loss of fields and grazing areas.

The Sainte Marie inhabitants (and to a lesser extent the non-resident Bangélique livestock breeders) are highly sensitive receptors for this impact because their socio-economic functioning system is mainly based on agriculture and livestock breeding practices.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.3.4.3.1.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a Resettlement Action Plan (RAP) that respects the commitments to relocate and restore livelihoods and complies with IFC standards. (Measure SE-Comp-1 – see 7.3.4.1.1.2)
Propose, to the extent possible, replacement farmland permitting displaced populations to have sustainable livelihoods. (Measure SE-Comp-2 – see 7.3.4.1.1.2)
Propose a plan monitoring agricultural and livestock breeding communities facilitating the integration of significantly different agricultural and livestock breeding methods. (Measure SE-Mit-9 – see 7.2.4.3.2.2)
These mitigation measures will limit the magnitude of the impact to a medium level as farmland and pastures will remain an important concern for the villagers.

The proposed measures result in a major severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.3.4.3.2 Impact SE-Agri-W-Def-2: Loss of perennial crops

Source of the impact: Construction of the runway and airport infrastructures

7.3.4.3.2.1 Impact before mitigation

This direct impact concerns only the Sainte Marie village community. Within their fields and surrounding their homes, the Sainte Marie inhabitants have planted fruit trees bringing them seasonal fruit production.

The project will inevitably and irreversibly lead to the loss of these perennial crops.

The Sainte Marie inhabitants are receptors that are rather sensitive to this impact for the fact that fruit trees take some time to bring back their fruits and constitute a form of investment over time. The fruit production in Sainte Marie is most often presented as a very popular pleasure plant.

The impact severity is major. Considering the receptor sensitivity assessed as medium, **the impact magnitude is high**.

7.3.4.3.2.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a Resettlement Action Plan (RAP) that respects the commitments to relocate and restore livelihoods and complies with IFC standards. (Measure SE-Comp-1 – see 7.3.4.1.1.2)
These mitigation measures will limit the magnitude of the impact to a medium level as perennial crops represent an appreciated component of local farmlands.

The proposed measures result in a major severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.3.4.3.3 Impact SE-Agri-W-Def-3: Loss of farmland (cumulative impact)

Source of the impact: Involuntary displacement of the populations affected by the project.

7.3.4.3.3.1 Impact before mitigation

The loss of farmland only concerns the Sainte Marie community. These lands have been enriched over the years by the Sainte Marie inhabitants who then made production of annual plants possible because of their agriculture/livestock association methods.

The relocation of the Sainte Marie inhabitants will inevitably lead to the need to rehabilitate soils in order to make them more fertile.

If agricultural productions do not represent the main activity of the inhabitants of Sainte Marie, they are an integral part of their socio-economic functioning and thus represent a considerable stake.

The impact severity is high. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.3.4.3.3.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a Resettlement Action Plan (RAP) that respects the commitments to relocate and restore livelihoods and complies with IFC standards. (Measure SE-Comp-1 – see 7.3.4.1.1.2)
Propose, to the extent possible, replacement farmland permiting displaced populations to have sustainable livelihoods. (Measure SE-Comp-2 – see 7.3.4.1.1.2)
Propose a plan to monitor agricultural and livestock breeding communities facilitating the integration of significantly different agricultural and livestock breeding methods. (Measure SE-Mit-9 – see 7.2.4.3.2.2)
These mitigation measures will limit the magnitude of the impact to a medium level as farmlands are a main socio-economic component.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.3.4.3.4 Impact SE-Agri-W-Def-4: Change in animal husbandry and agricultural practices (cumulative impact)

Source of the impact: Loss of farmland

7.3.4.3.4.1 Impact before mitigation

This will directly impact the Sainte Marie village community, the Bangélique livestock breeders but also the farmers/livestock breeders in the proposed relocation area. The total number of animals accounted for by all affected people can become sizeable in the same area.

The currently very extensive grazing procedures in the construction area will most likely have to evolve in such a way as to remain viable. Likewise for the plantations, resettled people will probably not be able to keep the farm activity close to home.

The issues for the populations mentioned here are paramount. The sensitivity of these issues is therefore major, because their socio-economic operational system is mainly based on agriculture and livestock breeding practices.

The impact severity is medium. Considering the receptor sensitivity assessed as major, **the impact magnitude is high**.

7.3.4.3.4.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Implement support measures in terms of agricultural techniques and practices and possibly measures of community financial support during their period of adaptation and integration into their new environment. (Measure SE-Mit-9 – see 7.2.4.3.2.2)
Establish a visit and consultation timetable for the communities in regard to specific integration topics of the displaced herds in their new environment and the evolution of the agro-pastoral system. (Measure SE-Mit-11 – see 7.2.4.4.2.2)
These mitigation measures limit the magnitude of the impact to a low level.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **low magnitude**.

7.3.4.3.5 Summary

Table 113: Permanent impact during Construction - Socio-Economic Environment - Agriculture & Livestock

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Agri-W-Def-1	Loss of farmland and pasture in the construction area	Adverse	Major	SE-Comp-1	Compensation - Resettlement Action Plan (RAP).	Medium
				SE-Comp-2	Compensation - Availability of farmland.	
				SE-Mit-9	Mitigation - Agricultural technical support plan.	
SE-Agri-W-Def-2	Loss of perennial crops	Adverse	High	SE-Comp-1	Compensation - Resettlement Action Plan (RAP).	Medium
SE-Agri-W-Def-3	Loss of farmland	Adverse	High	SE-Comp-1	Compensation - Resettlement Action Plan (RAP).	Medium
				SE-Comp-2	Compensation - Availability of farmland.	
				SE-Mit-9	Mitigation - Agricultural technical support plan.	
SE-Agri-W-Def-4	Change in animal husbandry and agricultural practices	Adverse	High	SE-Mit-9	Mitigation - Agricultural technical support plan.	Low
				SE-Mit-11	Mitigation - Community consultation plan for monitoring the evolution of the agro-pastoral system.	

7.3.4.4 Impacts on fishing

7.3.4.4.1 Impact SE-Fish-W-Def-1: Loss of direct access to the fishermen landing sites

Source of the impact: Construction of the runway and airport infrastructures

7.3.4.4.1.1 Impact before mitigation

The communities directly impacted are some Sainte Marie individual fishermen as well as non-resident fishermen currently using fishing posts for their main activity of drag net fishing.

The project will inevitably and irreversibly lead to the inaccessibility to the water.

Fishing is an integral part of the socio-economic model of these communities, which is a major issue for a highly sensitive receptor population.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.3.4.4.1.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a Resettlement Action Plan (RAP) that respects the commitments to relocate and restore livelihoods and complies with IFC standards. (Measure SE-Comp-1 – see 7.3.4.1.1.2)
Establish a monitoring and consultation plan for fishing communities considering their possible grievances due to the inaccessibility to the fishermen landing sites. (Measure SE-Mit-13):
Organize information meetings at the level of the towns affected by the project
Use an effective and transparent complaint management mechanism at project level and communicate this mechanism to the authorities and towns impacted by the project activities
Develop and adopt a continuous and transparent communication strategy concerning the issues of displacement and relocation
Establish a complaint management mechanism that is widely known to local stakeholders (local authorities and populations affected directly or indirectly by the project) and works in an efficient and transparent manner
These mitigation measures will limit the magnitude of the impact to a medium level as fishing still remains a sensitive element for locals.

The proposed measures result in a major severity mitigated impact. Thus, The residual impact is of **medium magnitude**.

7.3.4.4.2 Impact SE-Fish-W-Def-2: Loss of fishing infrastructures

Source of the impact: Construction of the runway and airport infrastructures

7.3.4.4.2.1 Impact before mitigation

The sites in the airport area will directly impact the community of non-resident fishermen who use fishing posts as fishing infrastructures.

The project will irreversibly lead to the destruction of these infrastructures.

For fishermen's communities, this is a major impact on their main activity and source of income.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.3.4.4.2.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:
Implement a Resettlement Action Plan (RAP) that respects the commitments to relocate and restore livelihoods and complies with IFC standards. (Measure SE-Comp-1 – see 7.3.4.1.1.2)
Establish a monitoring and consultation plan for fishing communities considering their possible grievances to ensure that the changes imposed do not negatively affect the results of the fishery. (Measure SE-Mit-13 – see 7.3.4.4.1.2)
These mitigation measures will limit the magnitude of the impact to a low level.

The proposed measures result in a major severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.3.4.4.3 Impact SE-Fish-W-Def-3: Increased distances and travel times to fishermen landing sites

Source of the impact: Involuntary displacement of the populations affected by the project

7.3.4.4.3.1 Impact before mitigation

The displacement of the inhabitants and the fishing communities also implies a modification of the distances to reach the new fishermen landing sites. Some fishermen will probably encounter longer travel distances to their boat's mooring site.

The increase can affect the fishing times and therefore their incomes.

The impact severity is medium. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium**.

7.3.4.4.3.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a Resettlement Action Plan (RAP) that respects the commitments to relocate and restore livelihoods and complies with IFC standards. (Measure SE-Comp-1 – see 7.3.4.1.1.2)
Establish a monitoring and consultation plan for fishing communities considering their possible grievances to ensure that the changes imposed do not negatively affect the results of the fisheries and permit the proposal of solutions. (Measure SE-Mit-13 – see 7.3.4.4.1.2)
These mitigation measures will limit the magnitude of the impact to a low level.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **low magnitude**.

7.3.4.4.4 Impact SE-Fish-W-Def-4: Increased time and distance to preferred fishing areas (cumulative impact)

Source of the impact: Loss of direct access to the sea

7.3.4.4.4.1 Impact before mitigation

Relocation of fishermen from the impacted area will irrevocably imply an increase in the distance and navigation time from the mooring site to the usual fishing areas. In addition to this, motorised navigation may be necessary and therefore will have a sizeable impact on the costs of the activity.

Therefore, the sensitivity of the fishermen of Sainte Marie and Bangélique can be described as high.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.3.4.4.4.2 Mitigation measures and impact after mitigation

To mitigate this impact, it is proposed to:

Ensure the follow-up and proper establishment of the Resettlement Action Plan (RAP) respecting the resettlement and livelihood restoration commitments and complying with IFC standards. (Measure SE-Mit-10 – see 7.2.4.4.1.2)
Establish a monitoring and consultation plan for fishing communities considering their possible grievances to ensure that the changes imposed do not negatively affect the results of the fisheries and permit the proposal of solutions. (Measure SE-Mit-13 – see 7.3.4.4.1.2)
These mitigation measures will limit the magnitude of the impact to a medium level as distance from fishing areas will still involve potential fuel expenses.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.3.4.4.5 Summary

Table 114: Permanent impact during Construction - Socio-Economic Environment - Fishing

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Fish-W-Def-1	Loss of direct access to the fishermen landing sites	Adverse	Major	SE-Comp-1	Compensation - Resettlement Action Plan (RAP).	Medium
				SE-Mit-13	Mitigation - Support and fishermen's complaint management plan	
SE-Fish-W-Def-2	Loss of fishing infrastructures	Adverse	Major	SE-Comp-1	Compensation- Resettlement Action Plan (RAP).	Low
				SE-Mit-13	Mitigation - Support and fishermen's complaint management plan.	
SE-Fish-W-Def-3	Increased distances and travel times to fishermen landing sites	Adverse	Medium	SE-Comp-1	Compensation - Resettlement Action Plan (RAP).	Low
				SE-Mit-13	Mitigation - Support and fishermen's complaint management plan.	
SE-Fish-W-Def-4	Increased time and distance to preferred fishing areas	Adverse	High	SE-Mit-10	Mitigation - RAP follow-up plan	Medium
				SE-Mit-13	Mitigation - Support and fishermen's complaint management plan.	

7.3.4.5 Impacts on community mobility

7.3.4.5.1 Impact SE-Mob-W-Def-1: Resettlement of displaced people from the main road line

Source of the impact: Construction of the runway and airport infrastructures

7.3.4.5.1.1 Positive impact

The construction of the runway and the airport infrastructures will lead to the Sainte Marie villager's relocation which is an isolated town of the region of Plaine Corail. The relocation of the villagers to the proposed areas will result in their being closer to the main road exiting the airport.

The inhabitants of the village are sensitive receptors since they are directly impacted and the consequences of this resettlement represent a significant opportunity for them because of the time savings obtained when travelling to the service infrastructures available.

This positive impact does not imply the need for specific improvement measures to be established.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium.**

7.3.4.5.2 Impact SE-Mob-W-Def-2: Reduction of the travel time to health and education infrastructures (cumulative impact)

Source of the impact: Resettlement of displaced people closer to the main road

7.3.4.5.2.1 Positive impact

The resettlement of the villagers of Sainte Marie closer to the main traffic road inevitably implies the shortening of transport times to schools for children or health centres for all the villagers.

The decrease in travel times is a positive impact for the villagers of Sainte Marie, proposed for relocation, who are receptors demonstrating distinct sensitivity to this closer relocation.

This positive impact does not imply the need for specific improvement measures to be established.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.3.4.5.3 Summary

Table 115: Permanent impact during Construction - Socio-Economic Environment - Community Mobility

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Mob-W-Def-1	Resettlement of displaced people closer to the main road	Positive	Medium		No improvement measure to undertake	Medium
SE-Mob-W-Def-2	Reduced travel time to health and education infrastructures	Positive	High		No improvement measure to undertake	High

7.3.5 Air quality and noise

None.

7.3.6 Heritage resources and visual environment

7.3.6.1 Paleonthology

Impacts and measures on paleonthology are associated and therefore addressed in the karst chapter 7.3.1.3 Geotechnics and Hydrogeology.

7.3.6.2 Landscape and visual environment

7.3.6.2.1 Impact Vis-W-Def-1: alteration of the living environment

7.3.6.2.1.1 Impact before mitigation

Sources of permanent and irreversible impact associated with the construction phase may include:

Permanent earthworks;
The disappearance of Mont Sainte Marie landform;
Demolition of residential buildings;
Construction of airport buildings and airport infrastructures.
The landform and coastline are very attractive landscapes with highly valued and untouched features. In history, natural environments have been severely degraded and modified. But impacts on the landform and coast are unprecedented in Rodrigues.

General sensitivity to alteration of the living environment of main landscape features can therefore be considered high.

Impacts listed before are likely to occur with an absolute certainty.

Loss of Mount Sainte Marie landform, population shift and change in coastline are a permanent loss to key elements of the landscape character, which results in fundamental change.

The impact severity is major. Considering the receptor sensitivity assessed as high, **the impact magnitude is major**.

7.3.6.2.1.2 Mitigation measure and impact after mitigation

A series of mitigation measures will help to minimize the landscape and visual impacts of construction activities. These measures will be:

Permanent fences and earthworks will be arranged to reduce visual intrusion on neighboring homes;
Plantings (trees and bushes) will be designed and arranged to form visual screening to mitigate visual impacts from nearby roads and homes;
Early planting needed for efficient screens when construction works starts.
Screen planting does contribute to construction acceptance and generally speaking planting contributes to a positive perception of the construction phase; Screen planting is described in Chapter 7.4.6.2.
Those mitigation measures will limit the landscape impact at a high change.
There is a risk on living environment of considering visual and aesthetic measures as secondary or unnecessary.

The proposed measures result in a major severity mitigated impact. Thus, The residual impact is of **high magnitude**.

7.3.6.2.2 Impact Vis-W-Def-2: increasing pressure on island landscape

7.3.6.2.2.1 Impact before mitigation

Sources of permanent and indirect impacts associated with the construction phase may include:

Problems related to the densification, or even concentration of habitat due to workers accommodation building and construction activity,
Acceleration of natural spaces consumption.
Population shift might reflect in dispersed buildings or new community settlements. The impacts on the landscape will depend on actual landscape tolerance to changes. Natural environments and landscapes have been severely degraded and modified.

General sensitivity to pressure increase on the island's landscapes can therefore be considered medium.

Indirect impacts have moderate to high chances to occur.

Loss of elements of the landscape character, or alteration to key elements of the landscape character, might result in noticeable to partial change of character.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.3.6.2.2.2 Mitigation measure and impact after mitigation

Two mitigation measures will help to minimize the landscape and visual impacts of construction activities:

Establishment of an Airport Urban Development Master Plan to monitor and frame urban development related to airport activity and ensure sustainable good living conditions;
Early street planting prior to urban development and building construction.
Rodrigues environment and landscape are altered and fragile. These mitigation measures will permit the limitation of the magnitude of the impact to a medium level.

The proposed measures result in a high severity mitigated impact. Thus, The residual impact is of **medium magnitude**.

7.3.6.2.3 Summary

Table 116: Permanent impact during Construction - Visual & Landscaping

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Vis-W-Def-1	Alteration of the living environment	Adverse	Major	Land-Mit-7	Permanent fences and earthworks will be arranged to reduce visual intrusion on neighboring homes	High
				Land-Mit-9	Plantings are designed and arranged to form visual screens	
Vis-W-Def-2	Increasing pressure on the island's landscape	Adverse	High	Land-Mit-14	Establishment of an Airport Urban Development Master Plan to monitor and frame urban development related to airport activity and ensure sustainable good living conditions	Medium
				Land-Mit-13	Community support in construction process	

7.4 Impacts during operation phase

The project aims to enable Rodrigues Island to develop tourism and aerial cargo. Tourism development might have significant impacts on th environment.

However, this ESIA only aims to address the impacts of the infrastructure. Thus, the sio-cio-economic development and changes that could be expected due to te air access improvement are not part of this ESIA scope.

Impacts of the airport extension on tourism and socio-economics on an island scale are addressed in other studies carried out under RRA's control.

7.4.1 Physical environment

7.4.1.1 Marine physical environment: shores, currents, turbidity and sedimentation

The main impacts during operational phase on the marine physical environment are:

Accidental spillage;
Uncontrolled wastewater discharges.

7.4.1.1.1 Impact Phy-Mar-Op-1

7.4.1.1.1.1 Impact before mitigation

The activities of the airport and the jetty facilities will not impact the marine physical environment on their normal operational phase. However, airport operational activities use various chemicals and dangerous substances. Accidental spills or leaks of solid or liquid waste into the surroundings of the airplane or jetty during operations might occur and result in marine water contamination.

The main receptor affected by this action may be the seawater quality.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**

7.4.1.1.1.2 Mitigation measure and impact after mitigation

Mitigation measures to reduce adverseimpact of the spilling are:

Prevent spills and accidents by training staff to avoidance of spills;
Implementing a protocol for depollution in case of spill;
Implementing methodologies for quick confining and treatment of pollutants.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.4.1.1.2 Impact Phy-Mar-Op-2

7.4.1.1.2.1 Impact before mitigation

Three discharge points are releasing collected rainwater from the runway and the upstream watershed. An extra release point is located North of the boathouse and is discharging treated used water and rainwater, previously transiting by an oil separator and a buffer storage unit, in

case of water surplus during extreme event. (See Water Resource and Waste water management part.)

These discharges represent a small volume of fresh water input to the ocean compared to the water runoff naturally present due to the downward slope. Their impacts on the hydrodynamic circulation are marginal.

Treatment devices are, under normal circumstances, minimizing the level of contaminant in the water released into the ocean. During extreme events, pollution is diluted in large volumes of rainwater.

The main receptor affected by this action may be the seawater quality.

The impact severity is low. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.4.1.1.2.2 Mitigation measure and impact after mitigation

As the impact magnitude is low, no mitigation measure is necessary.

7.4.1.1.3 Summary

Table 117: Impact during Operation - Physical Environment- Marine Environment

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Phy-Mar-Op-1	Accidental spillage	Adverse	Major	Phy-Mar-Mit-6	Prevent spills and accidents : train staff to avoidance of spills	Low
				Phy-Mar-Mit-7	Implementing methodologies for quick confining and treatment of pollutants and protocol for depollution in case of spill	
Phy-Mar-Op-2	Uncontrolled waste water discharges	Adverse	Low	None	-	-

7.4.1.2 Hydrology

The project involves significant movement of excavated soil and fill, significantly altering the natural watersheds on the southern part of the existing facilities. The map below shows the current and post-development sub-watersheds and highlights the right-of-way of the modified watersheds and runoff axes.

Figure 181: Evolution of the catchment areas after development

The main potential impacts of the project on hydrology are the following:

Changes in the general topography of the site can result in changes in runoff flow dynamics and threaten to flood the airport facilities themselves or downstream issues.
Resloping and flow concentration can increase soil erosion in non-sealed watersheds and increase the transfer of materials to the lagoon.
Leaching of runways, car parks and taxiways by stormwater creates chronic pollution towards the surrounding natural environment. In addition to this risk of chronic pollution, there is also a risk of accidental pollution created by the discharge of pollutants or water from firefighting.

7.4.1.2.1 Impact Phy-Hyd-Op-1: Stormwater management

7.4.1.2.1.1 Impact before mitigation

Sources of permanent impact of the project include flooding of facilities that could interrupt the proper functioning of the airport: buildings, technical installations and runway.

The construction of the runway requires the creation of a large excavation to the North of the runway. The water flowing on this artificial hillside flows by gravity towards the runway, creating

a risk of flooding the runway. On the southern part of the runway, the topography slopes down towards the ocean, thus allowing gravitational water runoff without impacting the runway.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.4.1.2.1.2 Mitigation measure and impact after mitigation

To mitigate these impacts, the stormwater networks will be sized to collect at least the flows generated by a 50-year return rainfall period:

Runway: a large ditch located at the bottom of the artificial hillside and below the runway will allow the drainage of hillside runoff (cut-off drain) and runway water over and above the capacity of the network collecting the first runoff water,
Extension of the existing airport facilities, to the North of the new runway: the networks will collect the runoff to the new buffer pond.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.4.1.2.2 Impact Phy-Hyd-Op-2: Flooding of issues downstream of airport facilities

7.4.1.2.2.1 Impact before mitigation

Mitigation measure Phy-Hyd-Mit-1

Soil sealing (extension of existing buildings, new buildings, car parks, taxiways and runways) and to a lesser extent the modification of the topography of the natural terrain (with a local increase in flow slopes) lead to an increase in the runoff flows on the site and discharged downstream.

Since discharge is done directly into the sea, the increase in runoff flows does not threaten any built environment.

However, the earthworks slightly modify the watershed draining the water towards the cave of Petit Lac, above Anse Quitor. However, the change in flow rates induced to this site remains unsignificant.

The impact severity is not significant. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.4.1.2.2.2 Mitigation measure and impact after mitigation

Mitigation measure Phy-Hyd-Mit-2

To mitigate the impact on the caves, the stormwater ditch located north of the runway is positioned to restore the boundary of the existing watershed draining water to the cave of Petit Lac.

Mitigation measure Phy-Hyd-Mit-3

To address climate change adaptation for the reduction of peak flows and run off, mitigation measures include:

A buffering storage at the outlet of the drainage network located north of the runway, sized for a 2-year return rainfall period,

Works facilitating infiltration: large vegetated ditch to reduce flow speed, hillside vegetation.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.4.1.2.1 Impact Phy-Hyd-Op-3: Transfer of pollution to the natural environment

7.4.1.2.1.1 Impact before mitigation

The leaching of runways, car parks and taxiways by rainwater creates chronic pollution towards the surrounding natural environment. In addition to this risk of chronic pollution, there is also a risk of accidental pollution created by the discharge of pollutants or water from firefighting.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.4.1.2.1.2 Mitigation measure and impact after mitigation

Mitigation measure Phy-Hyd-Mit-4

The aim of the proposed mitigation measures is to treat chronic or accidental sources of pollution before release into the natural environment. They include:

To the North of the new runway, the outlet of the roads, parkings and taxiways watertight stormwater network will be equipped with an oil separator and sedimentation works designed to collect and treat up to 20% of the flow generated by a 2-year return period rainfall. The outlet of this network is also to be equipped with initial storage works associated with a valve to isolate the flow from the natural environment in the event of accidental pollution (leakage of polluting liquids, fire fighting, etc.).
The stormwater drainage of the **new runway** and associated taxiways is designed to collect the first flows of runoff loaded with potential pollutants in a waterproof network, connected with oil separators and sedimentation works. The outlet of this network is also equipped with storage works associated with a valve to isolate the flow from the natural environment in the event of pollution (leakage of polluting liquids, water from fire fighting, etc.). All these structures will be designed to collect and treat up to 20% of the flow generated by a 2-year return period rainfall.

Over and above these first flows, the water is to be evacuated away from the runway to avoid any risk of flooding.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.4.1.2.2 Impact Phy-Hyd-Op-4: Transfer of sediments to the lagoon

7.4.1.2.2.1 Impact before mitigation

The project can increase the supply of materials to the lagoon, destabilizing the ecosystem:

Changing the topography of the site associated with the concentration of flows can create erosion of the natural terrain,
Leaching of artificial soils may result in the discharge of more or less polluting suspended solids.

The impact severity is high. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.4.1.2.2.2 Mitigation measure and impact after mitigation

Mitigation measure Phy-Hyd-Mit-5

The aim of the proposed mitigation measures is to avoid erosion on hillsides and drains concentrating the collected flows, and the discharge of suspended solids from the runway, taxiways and parking. They include:

Vegetation of slopes and ditches,
Collection of runway, taxiway and parking runoff in watertight networks equipped with sedimentation works at their outlets.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.4.1.2.3 Summary

Table 118: Impact during Operation - Physical Environment- Hydrology

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Phy-Hyd-Op-2	Flooding of issues downstream of airport facilities	Adverse	Major	Phy-Hyd-Mit-2	Stormwater network sized to collect at least the flows generated by a 50-year return rainfall period	Low
Phy-Hyd-Op-2	Transfer of pollution to the natural environment	Adverse	Low	Phy-Hyd-Mit-3	Restore the boundary of the existing watershed draining water to the cave of Petit Lac	Negligible
				Phy-Hyd-Mit-4	Creation of buffering storage and works facilitating infiltration	
Phy-Hyd-Op-3	Increase of the supply of materials to the lagoon	Adverse	Major	Phy-Hyd-Mit-5	Watertight stormwater network equipped with: Oil separator and sedimentation works designed to collect and treat up to 20% of the flow generated by a 2-year return period rainfall. Gates and tanks to isolate accidental pollution, including water from firefighting.	Low
Phy-Hyd-Op-4	Flooding of issues downstream of airport facilities	Adverse	Major	Phy-Hyd-Mit-6	Vegetation of slopes and ditches, Collection of runway, taxiway and parking runoff in watertight networks equipped with sedimentation works at their outlets.	Low

7.4.1.3 Geotechnics and Hydrogeology

7.4.1.3.1 Impact Phy-Kar-Op-1: Collapse / Erosion

7.4.1.3.1.1 Impact before mitigation

Erosion and collapse/settlement risks are applicable to both the construction and operation phase of the new runway. These are controlled by the erosive potential of the in situ ground formations (calcarenites, weathered basalts) in relation with karstic network activity.

The impact severity is high. Considering the receptor sensitivity assessed as major, **the impact magnitude is high**.

7.4.1.3.1.2 Mitigation measure and impact after mitigation

Management will be required throughout the construction and during operations in accordance with BS 6031:2009 requirements.

Additional ground investigations need to be performed to better understand the geological and geotechnical characteristics inside and outside the project area, especially supplementary geotechnical and geophysical investigations to characterize the karstic network (caves and voids), by in situ investigation diagnostic of infilled cavities (televisual cavity inspections).

Rock testing (Aggregate Testing) additional laboratory studies will be needed to inform of consolidation and settlement potential within the Rodrigues Airport new runway project area.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.4.1.3.2 Phy-Kar-Op-2: Access to caves

7.4.1.3.2.1 Impact before mitigation

During the airport's operational phase, impacts focus on accessibility to the caves if they have not been filled and sealed. That is, a protection structure would then have been installed to allow controlled access by airport authorities. This scenario is only valid if the cave entrance is not in the direct area of the airstrip.

The impact severity is high. Considering the receptor sensitivity assessed as, **the impact magnitude is high**.

7.4.1.3.2.2 Mitigation measure and impact after mitigation

Reference and check all caves and caverns entries within the footprint of the runway project. A protective formwork needs to be planned, or in any manner, access to airport must be restricted to necessary construction and operations staff.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.4.1.3.3 Phy-Kar-Op-3: Pollution of groundwater

7.4.1.3.3.1 Impact before mitigation

Potential impacts on groundwater contamination have been addressed in sections 7.2.1.3 Geotechnics and Hydrogeology of the karstic system, 7.2.1.4 Water resource and waste water

management, 7.3.1.3 Geotechnics and Hydrogeology and 7.3.1.4 Water resource and waste water management for the works phase.

During the airport's operating period, it is the fuel filling operations of aircraft and other service vehicles that present the greatest risk of contamination. These operations must therefore take place in specially developed sites with appropriate means of restraint in the event of a spill.

At this stage of the study, there is not enough data to assess groundwater quality. Therefore, when the airport is operational, a network of observation wells will have to be installed and a water quality monitoring program will have to be implemented.

According to the possible construction options, there is no catchment work planned downstream of the airport infrastructure. There are therefore no specific measures to be implemented at this level.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium**.

7.4.1.3.3.2 Mitigation measure and impact after mitigation

Impact mitigation consists mainly of the application of an emergency plan in the event of a spill of hydrocarbons or other liquids presenting a risk of a change in the quality of groundwater in Plaine Corail.

The proposed measures result in low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.4.1.3.4 Summary

Table 119: Impact during Operation - Physical Environment- Karstic Environment

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Phy-Kar-Op-1	Collapse and settlements	Adverse	High	Phy-Kar-Av-22	Supplementary geotechnical and geophysical investigations to characterize the karstic network (caves and voids)	Low
				Phy-Kar-Mit/Comp-23	In situ investigation diagnostic of infilled cavities (televisual cavity inspections)	
				Phy-Kar-Mit/Comp-24	Additional laboratory testings (Aggregate testings) to characterize the erosive potential of in situ geological formations	
Phy-Kar-Op-3	Access to caves	Adverse	High	Phy-Kar-Av-16	restrict access to airport to necessary construction and operations staff	Low
Phy-Kar-Op-4	Pollution of groundwater	Adverse	Medium	Phy-Kar-Av-25	All operations involving hydrocarbons must comply with current standards to prevent spills and, if necessary, implement emergency measures.	Low
				Phy-Kar-Mit-26	Do not allow groundwater use downstream of airport infrastructure	

7.4.1.4 Water resource and domestic waste water

7.4.1.4.1 Impacts Phy-Wat-Op-1 and Phy-Wat-Op-2 associated to stormwater drainage

7.4.1.4.1.1 Impact before mitigation

This project of a new runway, at the Preliminary Design stage, includes an infiltration drainage network along the runway to address the stormwater issue, associated with oil separators before discharge into the environment. However, no buffering is included to reduce the peak flows. The Preliminary Design does not propose the reuse of the stormwater collected and pre-treated. The resulting potential environmental impacts are:

Major impact due to:

Pollution of the soil due to direct infiltration of stormwater without prior oil separation.
Pollution also due to an eventual firefighting operation on the runway with no possibility of confining the effluents generated.
Major impact due to no reduction of peak flow, runoff and soil erosion, leading to increasing sedimentation of water bodies including lagoons, thus threatening biodiversity, corals and white sandy beaches.

The impact severity is high. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.4.1.4.1.2 Mitigation measure and impact after mitigation

A non infiltrating drainage network will be implemented to convey the stormwater to oil separators for pre-treatment and then to a buffer storage for reuse within the framework of an integrated water management plan. This will enable to address and **avoid** the above mentioned impacts, bringing them to **negligible**.

The proposed measures result in a not significant mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.4.1.4.2 Impact Phy-Wat-Op-3 associated to the waste water management

7.4.1.4.2.1 Impact before mitigation

This project of a new runway, at the Preliminary Design stage, includes a new sewer network associated with a Water Treatment Plant to cater for the domestic wastewater of the airport, including the new control tower and the fire and rescue services. The treated wastewater is to be discharged at sea after proper treatment to the required corresponding standards. The Preliminary Design does not propose the reuse of the treated wastewater which will then require a higher level of treatment. The resulting potential environmental impact is a **low impact** on the environment (sea) in which the treated water is discharged according to basic minimum standards.

The impact severity is low. Considering the receptor sensitivity assessed as high, **the impact magnitude is low**.

7.4.1.4.2.2 Mitigation measure and impact after mitigation

The implementation of a Water Treatment Plant within the framework of an integrated water management plan with the reuse of the treated wastewater, and with an objective of zero discharge, leads to a higher level of treatment. This will enable to address and **mitigate** the above mentioned impact, bringing it to **negligible**.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.4.1.4.3 Impact Phy-Wat-Op-4 : Water supply management

7.4.1.4.3.1 Impact before mitigation

This project of a new runway, at the Preliminary Design stage, includes a Water supply network associated with water tanks connected to the existing public network which is non performant. No alternative proposed. The resulting potential environmental impact is:

High impact due to an extra burden on the water supply public network requirements due to an increased volume required.

The impact severity is major. Considering the receptor sensitivity assessed as medium, **the impact magnitude is high**.

7.4.1.4.3.2 Mitigation measure proposed and attenuated impact after mitigation

The implementation of an integrated water management plan with the reuse of the treated wastewater and stormwater collected, leads to the **mitigation** of the above mentioned impact, bringing it to **low**.

The proposed measures result in a high severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.4.1.4.4 Summary

Table 120: Impact during Operation - Physical Environment- Water & Wastewater

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Phy-Wat-W-Def-1	Pollution of soil and surface water	Adverse	Major	Phy-Wat-Av-6	Integrated water management plan	Negligible
Phy-Wat-W-Def-2	Peak flows resulting in increasing soil erosion	Adverse	Major	Phy-Wat-Av-6	Integrated water management plan	Negligible
Phy-Wat-W-Def-3	Pollution of marine water	Adverse	Low	Phy-Wat-Mit-7	Water treatment plant	Negligible
Phy-Wat-W-Def-4	Extra burden on the water supply public network	Adverse	High	Phy-Wat-Mit-8	Reuse water plan	Low

7.4.2 Biological environment

7.4.2.1 Terrestrial biodiversity

None.

7.4.2.2 Marine habitats

The main potential direct impacts on marine ecology in the operational phase are the:

Modification of ecological functionality;
Modification of the physical functioning of habitats induced by the facilities (hydrosedimentary modification, current change…).

7.4.2.2.1 Impact BioM-Hab-Op-1: Modification of ecological functionality

7.4.2.2.1.1 Impact before mitigation

The operations at the airport, including vehicular movements and new aircraft flight paths, are the primary potential sources of these impacts.

Marine habitats not destroyed by construction activities may be impacted by operational activities, including the movement of operational ships through maintenance activities during the operational phase. In the maritime environment, these maintenance operations will be reduced. Rotations will provide an initial response and undertake routine patrols of the immediate area.

Stormwater and wastewater discharges will be done in Anse Quitor (new runway) and in the offshore area near the Boat House. Nevertheless, the water will be treated before discharge. An oil separator will be installed in a buffer tank. The risk of degradation of the water quality of the environment is therefore limited.

The impact severity is not significant. Considering the receptor sensitivity assessed as low or high, **the impact magnitude is negligible**.

7.4.2.2.1.2 Mitigation measure and impact after mitigation

No measure is proposed.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.4.2.2.2 Impact BioM-Hab-Op-2: Modification of the physical functioning of habitats

7.4.2.2.2.1 Impact before mitigation

The development of the project at sea will induce discharges into the marine environment, ie hydrosedimentary modification, current change. These changes are not significant for the project.

The impact severity is not significant. Considering the receptor sensitivity assessed as low or high, **the impact magnitude is negligible**.

7.4.2.2.2.2 Mitigation measure and impact after mitigation

No mitigation measure is proposed.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.4.2.2.3 Summary

Table 121: Impact during Operation - Biological Environment – Marine Habitats

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
BioM-Hab-Op-1	Modification of ecological functionality	Adverse	Negligible	none	-	Negligible
BioM-Hab-Op-2	Modification of the physical functioning of habitats	Adverse	Negligible	none	-	Negligible

7.4.3 Transport network, electricity supply and waste management

7.4.3.1 Transport network

7.4.3.1.1 Trspt-Op-1: Impact on the transport network

7.4.3.1.1.1 Impact before mitigation

Road

The road infrastructure arround the study area will be modified by the project. As the objective of the project is to develop tourism and supply to the island, it will in turn increase road traffic on the island, to and from the airport, but also throughout the island. Tourist sites and the largest cities will be the most affected.

Air

The objective of the project is to increase the current airport's capacity.

Maritime routes

None

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.4.3.1.1.2 Mitigation measure and impact after mitigation

The road network around the airport will be restored through the construction of a new road.

The proposed measures result in a low severity mitigated impact. Thus The residual impact is of **low magnitude**.

7.4.3.2 Electricity supply

7.4.3.2.1 Impact Elect-Op-1: Impact on electricity supply

7.4.3.2.1.1 Impact before mitigation

The new airport may have a slightly higher energy consumption, in particular due to the expansion or arrival of new equipment.

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.4.3.2.1.2 Mitigation measure and impact after mitigation

This increase in consumption can be supported by the current network. No measures are necessary.

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.4.3.3 Solid waste management

7.4.3.3.1 Impact Sol-Wst-Op-1: Impact on the solid waste

7.4.3.3.1.1 Impact before mitigation

During the operational phase, additional waste production can be expected due to the increase of airport passengers and tourists on the island.

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

7.4.3.3.1.2 Mitigation measure and impact after mitigation

The solid waste will be managed with the rest of the island's waste, therefore no special measures are required

The proposed measures result in a low severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.4.3.4 Summary

Table 122: Impact during Operation – Transport Network, Electricity Supply & Waste Management

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Trspt-Op-1	Impact on the transport network	Adverse	Low	Inf-Mit-7	Restore road connections	Low
Elec-Op-1	Impact on electricity supply	Adverse	Low	None	None	Low
Sol-Wst-Op-1	Impact on the solid waste	Adverse	Low	None	None	Low

7.4.4 Socio-economic environment

7.4.4.1 Impacts on power, governance and civil society

Source of the impact: Launching local development initiatives

7.4.4.1.1 Impact SE-Gov-Op-1: Improved relations with directly and indirectly impacted communities (cumulative impact)

Source of the impact: Launching local development initiatives

7.4.4.1.1.1 Positive impact

The project for the construction of airport infrastructures represents an opportunity leading to local development potential, the initiatives of which will permit an improvement of the social climate within the communities if they are adequately organized.

All of the surrounding communities of the airport project are directly affected by this type of impact that can have a significant socio-economic impact on the different phases of the project.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium**.

7.4.4.1.1.2 Improvement measure and impact after improving

Improvement (bonus) measures help to increase the significance or value of the positive impacts of the project. In accordance with the same objectives of mitigating or or compensating for negative impacts. Improvement or bonus measures can be integrated into the project to:

Implement regular meetings and consultations to measure the expectations and needs of impacted communities with regard to the initiatives they would like to integrate into the development of the area. (Measure SE-5 - see 7.2.4.1.1.2)
Establish a local development plan in collaboration with the communities in the area following the results obtained from the joint consultations in order to propose compatible and adequate support measures in relation to the expectations formulated. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
These improvement measures will permit the achievement of an impact magnitude at a high level as this represents a regular mention expressed by communities.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **high magnitude**.

7.4.4.1.2 Summary

Table 123: Impact during Operation - Socio-Economic Environment – power, governance and civil society

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Gov-Op-1	Improved relations with directly and indirectly impacted communities	Positive	Medium	SE-Mit-5	Mitigation – Communication plan for the integration of external workers.	High
				SE-Mit-15	Economic support plan for households.	

7.4.4.2 Impacts on land

7.4.4.2.1 Impact SE-Land-Op-1: Increase of social tensions in relation to the land resource

Source of the impact: Involuntary displacement of the populations affected by the project

7.4.4.2.1.1 Impact before mitigation

The risk of the emergence of social tensions in relation to the use of land resources is a potential problem to be taken into consideration between the communities that will need to be displaced and the communities in the proposed areas for relocations. In addition to the habitat, it involves particularly the land use sharing related to agriculture and pastures that may be at the source of these potential tensions.

All of the communities in the area directly impacted by the construction project as well as that of the towns proposed for relocation are the direct receptors of this potentially major impact of pressure on agro-pastoral systems. Support measures must be taken into consideration on this aspect.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.4.4.2.1.2 Mitigation measure and impact after mitigation

To mitigate this impact, it is proposed to apply an internal communication and support plan for all villagers and displaced users and residents of the towns of the proposed relocation areas. This plan must incorporate a regular consultation process to collect the sources of dissatisfaction and to obtain proposals for solutions formulated by the communities themselves. (Measure SE-3 – see 7.2.4.2.1.2)

These mitigation measures will permit the limitation of the magnitude of the impact to a medium level as land sharing, especially concerning pastures, remains a major concern.

The proposed measures result in a major severity mitigated impact. Thus, The residual impact is of **medium magnitude**.

7.4.4.2.2 Impact SE-Land-Op-2: Evolution of land management procedures

Source of the impact: Involuntary displacement of the populations affected by the project

7.4.4.2.2.1 Impact before mitigation

The involuntary displacement of the populations affected by the construction project will entail a necessary adaptation of the different communities to the use of spaces. Indeed, the relocation of the villagers of Sainte Marie in the proposed areas of resettlement will call for a necessary organisation and agreements in connection with the village communities already present. This is particularly relevant for agricultural land and in particular livestock breeding, the main activity of all the inhabitants of the area.

The main receptors of this irreversible impact on livestock-related land management are the inhabitants of the towns proposed for the relocation and of course the villagers of Sainte Marie, the livestock breeders of the Bangélique area.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.4.4.2.2.2 Mitigation measure and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a communication plan (including a complaint management plan) and internal support to all villagers and displaced users and residents of the towns of the proposed relocation areas. This plan must incorporate a regular consultation process to collect the sources of dissatisfaction and to obtain proposals for solutions formulated by the communities themselves. (Measure SE-Mit-3 – see 7.2.4.2.1.2)
Implement integrated technical support measures to facilitate specific adaptation to new agricultural management and pasture parcels. (Measure SE-Mit-9 – see 7.2.4.3.2.2)
These mitigation measures will permit the limitation of the magnitude of the impact to a medium level as land sharing out, especially concerning pastures, remains a major concern.

The proposed measures result in a major severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.4.4.2.3 Summary

Table 124: Impact during Operation - Socio-Economic Environment – Land

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Land-Op-1	Increasing social tensions in relation to the land resource	Adverse	Major	SE-Mit-3	Mitigation - Communication plan, complaint management and internal support for relocation.	Medium
SE-Land-Op-2	Evolution of land management procedures	Adverse	Major	SE-Mit-3	Mitigation - Communication plan, complaint management and internal support for relocation.	Medium
				SE-Mit-9	Mitigation - Agricultural technical support plan.	

7.4.4.3 Impacts on agriculture and livestock

7.4.4.3.1 Impact SE-Agri-Op-1: Change in livestock breeding procedures and farming methods (cumulative impact)

Source of the impact: Involuntary displacement of the user populations of the area affected by the project

7.4.4.3.1.1 Impact before mitigation

This will directly impact the village community of Sainte Marie, the Bangélique livestock breeders but also the farmers/livestock breeders in the proposed area of relocation. The total number of animals accounted for by all affected people can become sizeable in the same area.

The currently very extensive grazing procedures in the construction area will most likely have to evolve in such a way as to remain viable. Likewise for the plantations, resettled people will probably not be able to keep the farm activity close to home as it is nowadays.

The issues for the populations mentioned here are paramount. The sensitivity of these issues is therefore major, because their socio-economic operational system is mainly based on agriculture and livestock breeding practices.

The impact severity is medium. Considering the receptor sensitivity assessed as major, **the impact magnitude is high**.

7.4.4.3.1.2 Mitigation measure and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a communication plan (including a complaint management plan) as well as methods of agricultural technical and possibly financial support of the communities during their period of adaptation and integration into their new environment. (Measure SE-Mit-9 – see 7.2.4.3.2.2)
Promote the establishment of a timetable of visits and consultations of all the communities in the area in relation to the specific topics of integration of the displaced herds in their new environment and the evolution of the agro-pastoral system. (Measure SE-Mit-11 – see 7.2.4.4.4.2)
These mitigation measures will permit the limitation of the magnitude of impact to a medium level as farming and especially breeding will remain a cultural concern for local communities.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.4.4.3.2 Impact SE-Agri-Op-2: Need to regenerate the farmland

Source of the impact: Involuntary displacement of the populations affected by the project.

7.4.4.3.2.1 Impact before mitigation

The regeneration of new farmland exclusively concerns the community of Sainte Marie. The environment remains quite rough in the region in order to permit very productive agriculture, especially with frequent limestone resurgences and therefore shallow soils. The inhabitants of Sainte Marie have permitted the production of annual plants in their area thanks to their

agriculture/livestock association methods which allowed them to build a cultivatable stratum due to regular modifications of the organic matter.

The relocation of the inhabitants of Sainte Marie will inevitably lead to the need to regenerate soils in order to make them more fertile.

If agricultural productions do not represent the main activity of the inhabitants of Sainte Marie, they are an integral part of the means of their socio-economic functioning and thus represent a major issue.

The impact severity is high. Considering the receptor sensitivity assessed as major, **the impact magnitude is high**.

7.4.4.3.2.2 Mitigation measure and impact after mitigation

To mitigate this impact, it is proposed to:

Establish a follow-up and support plan for farmers in different communities in relation to the establishment of semi-intensive farming and livestock methods in order to promote the integration of organic materials into the land parcels and contribute to the regeneration of the soil fertility. (Measure SE-9 – see 7.2.4.3.2.2)
Promote the establishment of a timetable for visits and consultations of all the communities in the area in relation to specific topics concerning the evolution of agro-pastoral systems. (Measure SE-Mit-11 – see 7.2.4.4.4.2)
These mitigation measures will permit the limitation of the magnitude of impact to a medium level as soil fertility is one of the main conditions for the success of the communities' establishment.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.4.4.3.3 Impact SE-Agri-Op-3: Decrease in livestock breeding activity

Source of the impact: Involuntary displacement of the populations affected by the project.

7.4.4.3.3.1 Impact before mitigation

The relocation of the villagers of Sainte Marie and the Bangélique livestock breeders will potentially lead to a direct impact on the livestock activity. The majority of the livestock breeding in the area currently planned for construction will be located in the vicinity of the proposed relocation area, in addition to the herds already present. This could lead to an overgrazing of the area and an obligation for livestock breeders to restrict herds, if livestock breeding methods do not adapt.

However, the probability of declining livestock breeding is not too high, if adequate support measures are taken. These measures must, however, be taken into consideration, because livestock breeding is a major issue for the communities concerned.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.4.4.3.3.2 Mitigation measure and impact after mitigation

To mitigate this impact, it is proposed to:

Support livestock breeders from different communities in the establishment of semi- intensive farming methods in order to maintain herd sizes. (Measure SE-Mit-12 – see 7.2.4.4.4.2)
Promote the establishment of a timetable of visits and consultations of all the communities in the area in relation to the specific topics of integration of the displaced herds in their new environment and the evolution of the agro-pastoral system. (Measure SE-Mit-11 – see 7.2.4.4.4.2)
These mitigation measures will permit the limitation of the magnitude of impact to a medium level as livestock represents a major socio-economic component for local communities.

The proposed measures result in a major severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.4.4.3.4 Impact SE-Agri-Op-4: Change of the livestock breeding procedures (cumulative impact)

Source of the impact: Decrease in livestock breeding activity

7.4.4.3.4.1 Impact before mitigation

The villagers of Sainte Marie and the livestock breeders of the Bangélique area will have to raise their cattle on the proposed areas close to the town of Plaine Corail. The fact that these spaces are already used as pastureland by other livestock breeders could lead to a general change in the way cattle are managed. It is to be envisaged that the extensive management as it exists today must be reviewed and the practices must be adapted.

This is a major challenge for livestock breeders and is to be considered because the measures to be taken will condition the future of the livestock breeding of the area.

The impact severity is high. Considering the receptor sensitivity assessed as major **the impact magnitude is high**.

7.4.4.3.4.2 Mitigation measure and impact after mitigation

To mitigate this impact, it is proposed to:

Support livestock breeders from different communities in the establishment of semi- intensive farming methods in order to maintain herd sizes. (Measure SE-Mit-12 – see 7.2.4.4.4.2)
Promote the establishment of a timetable of visits and consultations of all the communities in the area in relation to the specific topics of integration of the displaced herds in their new environment and the evolution of the agro-pastoral system. (Measure SE-Mit-11 – see 7.2.4.4.4.2)
These mitigation measures will permit the limitation of the magnitude of the impact to a low level.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **low magnitude**.

7.4.4.3.5 Impact SE-Agri-Op-5: rehabilitation period of agricultural soils and surfaces (cumulative impact)

Source of the impact: Decrease in livestock breeding activity

7.4.4.3.5.1 Impact before mitigation

The decrease in livestock activity decreases at the same time the contribution of organic matter from animal origins, limiting the changes of cultivated soils and therefore can extend the period necessary for the regeneration of soils for crops.

Soil fertility is an important issue for local communities where agricultural plants represent a significant part of the economic and social functioning.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high.**

7.4.4.3.5.2 Mitigation measure and impact after mitigation

To mitigate this impact, it is proposed to:

Support livestock breeders from different communities in the establishment of semi- intensive farming methods in order to maintain herd sizes. (Measure SE-Mit-12 – see 7.2.4.4.4.2)
Promote the establishment of a timetable of visits and consultations of all the communities in the area in relation to the specific topics of integration of the displaced herds in their new environment and the evolution of the agro-pastoral system. (Measure SE-Mit-11 – see 7.2.4.4.4.2)
These mitigation measures will permit the limitation of the magnitude of the impact to a medium level as soil fertility is one of the main conditions for the success of the communities' establishment.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.4.4.3.6 Summary

Table 125: Impact during Operation - Socio-Economic Environment – Agriculture & Livestock

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Agri-Op-1	Change in livestock breeding procedures and farming methods	Adverse	High	SE-Mit-9	Mitigation - Agricultural technical support plan.	Medium
				SE-Mit-11	Mitigation - Community consultation plan for monitoring the evolution of the agro-pastoral system.	
SE-Agri-Op-2	Need to regenerate the farmland	Adverse	High	SE-Mit-9	Mitigation - Agricultural technical support plan	Medium
				SE-Mit-11	Mitigation - Community consultation plan for monitoring the evolution of the agro-pastoral system.	
SE-Agri-Op-3	Decrease in livestock breeding activity	Adverse	Major	SE-Mit-11	Mitigation - Community consultation plan for monitoring the evolution of the agro-pastoral system.	Medium
				SE-Mit-12	Mitigation - Support plan concerning livestock breeding techniques.	
SE-Agri-Op-4	Change of livestock breeding practices	Adverse	High	SE-Mit-11	Mitigation - Community consultation plan for monitoring the evolution of the agro-pastoral system.	Low
				SE-Mit-12	Mitigation - Support plan concerning livestock breeding techniques.	
SE-Agri-Op-5	Increase in the rehabilitation time of agricultural surfaces	Adverse	High	SE-Mit-11	Mitigation - Community consultation plan for monitoring the evolution of the agro-pastoral system.	Medium
				SE-Mit-12	Mitigation - Support plan concerning livestock breeding techniques.	

7.4.4.4 Impacts on the local economic context

7.4.4.4.1 Impact SE-Eco-Op-1: Decrease in household incomes (cumulative impact)

Source of the impact: Reduction of agriculture, livestock and fishing activities

7.4.4.4.1.1 Impact before mitigation

The reduction of agricultural and fishing activities in the entire airport area undoubtedly impacts household incomes since these activities are the main and often the only income source of the households.

This is a major socio-economic issue and the sensitivity of all households is definitely very high.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

7.4.4.4.1.2 Mitigation measure and impact after mitigation

To mitigate this impact, it is proposed to:

Ensure the continuation of the timetable of visits and consultations of all the communities in the area in relation to the specific subjects of adaptation of the displaced and host communities to the changes observed in the income-generating activities. (Measure SE-Mit-14 – see 7.2.4.5.1.2)
Maintain agricultural and fishing support measures through the services of the appropriate committees. (Measures SE-Mit-9 – see 7.2.4.3.2.2 and SE-Mit-13 – see 7.3.4.4.1.2)
These mitigation measures will permit the limitation of the magnitude of impact to a medium level as incomes from farming and fishing represent a socio-economic pillar for households.

The proposed measures result in a major severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.4.4.4.2 Impact SE-Eco-Op-2: Increase in local production prices (cumulative impact)

Source of the impact: Reduction of agriculture, livestock and fishing activities

7.4.4.4.2.1 Positive impact

The reduction of activities related to agriculture, livestock and fisheries leads to a decrease in production and a decline in marketed quantities that encourages the increase in local production prices.

This impact can be positive due to the fact that this can help to improve the incomes of producers, livestock breeders and fishermen.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.4.4.4.2.2 Improvement measure and impact after improving

To promote this impact, it is proposed to:

Follow up on a timetable of visits and consultations of all the communities in the area in relation to the specific subjects of adaptation of the displaced and host communities to the changes observed in income-generating activities. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
Maintain a favourable economic framework to enable households to balance income from income-generating activities. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
These improvement measures will permit the achievement of an impact magnitude at a high level.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **high magnitude**.

7.4.4.4.3 Impact SE-Eco-Op-3: Increase in local production prices (cumulative impact)

Source of the impact: Reduction of agriculture, livestock and fishing activities

7.4.4.4.3.1 Impact before mitigation

However, this impact can also be seen as a adverseimpact on households in towns that see their purchasing power decrease. In this regard, the sensitivity of households is highly characterized making it an impact considered as high.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.4.4.4.3.2 Mitigation measure and impact after mitigation

Follow up on the timetable of visits and consultations of all the communities in the area in relation to the specific subjects of adaptation of the displaced and host communities to the changes observed in income-generating activities. (Measure SE-Mit-14 – see 7.2.4.5.1.2)
Create a favourable economic framework to enable households to balance income from income-generating activities. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
These mitigation measures will permit the limitation of the magnitude of impact to a medium level.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.4.4.4.4 Impact SE-Eco-Op-4: Increase in local development initiatives (cumulative impact)

Source of the impact: Reduction of agriculture, livestock and fishing activities

7.4.4.4.4.1 Positive impact

The reduction of agricultural or fishing activities may lead to the establishment and development of other activities to generate sufficient incomes for households in the communities or create opportunities for local entrepreneurship (e.g. through the women's association) that will respond to a growing demographic demand.

This positive impact concerns all the communities in the airport area and its environs and specifically those that will comprise the relocation areas of the villagers of Sainte Marie. This potentiality represents a considerable stake for all the communities.

The impact severity is medium. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium**.

7.4.4.4.4.2 Improvement measure and impact after improving

To promote this impact, it is proposed to:

Follow up on the timetable of visits and consultations of all the communities in the area in relation to the specific subjects of adaptation of the displaced and host communities to the changes observed in income-generating activities. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
Continue the establishment of household support measures to promote the integration of community- based development initiatives into the local economic context. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
These improvement measures will permit the achievement of an impact magnitude at a high level.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **high magnitude**.

7.4.4.4.5 Impact SE-Eco-Op-5: Increase in household incomes (cumulative impact)

Source of the impact: Creation of direct and indirect jobs

7.4.4.4.5.1 Positive impact

The project can promote job creation at the area level and for the benefit of local communities and even for women during the various phases of project management. These job creations will undeniably lead to the increase and possibly the securing of household incomes in the surrounding towns.

This positive impact here concerns all communities around the project and represents a high socio-economic issue for the project area.

The impact severity is medium. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium**.

7.4.4.4.5.2 Improvement measure and impact after improving

To promote this impact, it is proposed to:

Continue the workforce management plan incorporating a transparent recruitment process, promoting the recruitment of young people from the surrounding communities. (Measure SE-Mit-7 – see 7.2.4.1.3.2)
Continue the regular communication plan concerning job opportunities with local communities. (Measure SE-Mit-7 – see 7.2.4.1.3.2)
These improvement measures will permit the achievement of an impact magnitude at a high level.

The proposed measures result in a medium severity mitigated impact. Thus, The residual impact is of **high magnitude**.

7.4.4.4.6 Impact SE-Eco-Op-6: Changing the local economic landscape (cumulative impact)

Source of the impact: Creation of direct and indirect jobs

7.4.4.4.6.1 Impact before mitigation

The creation of direct and indirect jobs implies a potential change in the local economic landscape, including the emergence of various companies creating an interesting economic dynamic in the airport area.

This impact can potentially be considered adverse to a lesser extent if specific support is not provided in order to harmonize future economic developments. While it may be classified as low-magnitude, this potential impact is nonetheless an issue to be taken into consideration.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

7.4.4.4.6.2 Mitigation measure and impact after mitigation

To mitigate this impact, it is proposed to:

Implement a regular communication plan with local communities. (Measure SE-Mit-14 – see 7.2.4.5.1.2)
Implement a management plan for local economic development to propose a harmonisation of community-based initiatives in response to the changing economic environment of the area. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
These mitigation measures will permit the limitation of the magnitude of impact to a negligible level.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **negligible magnitude**.

7.4.4.4.7 Impact SE-Eco-Op-7: Collaborative partnership or operational opportunities (cumulative impact)

Source of the impact: Creation of direct and indirect jobs

7.4.4.4.7.1 Positive impact

The potential for creating direct and indirect jobs can lead to the development of socio-economic projects involving the various parts of the surrounding towns of the airport project. The presence of a favourable economic and social environment triggers opportunities for groupings of skills and thus the creation of partnerships.

This impact permits the establishment and maintenance of a positive socio-economic network within communities and can be an issue of considerable importance.

The impact severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium**.

7.4.4.4.7.2 Improvement measure and impact after improving

To promote this impact, it is proposed to:

Continue the regular communication plan with local communities. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
Implement a management plan for local economic development to propose a harmonisation of community-based initiatives in response to the changing economic environment of the area. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
These mitigation measures will permit the limitation of the magnitude of impact to a medium level.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

7.4.4.4.8 Impact SE-Eco-Op-8: Reinforcement of professional skills (cumulative impact)

Source of the impact: Creation of direct and indirect jobs

7.4.4.4.8.1 Positive impact

New job creation opportunities during the various phases of the project represent a high potential to reinforce the professional skills of the surrounding populations, who will then have the opportunity to have access to certain professions that did not exist up until now in the area and therefore benefit from specific training to meet the demand.

This impact represents a highly positive opportunity for the local people and more evidently for the younger generations, who will complement the local skills palette and the citizens of Rodrigues more generally.

The impact severity is high. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium**.

7.4.4.4.8.2 Improvement measure and impact after improving

To promote this impact, it is proposed to:

Ensure a regular communication plan with local communities. (Measure SE-7 – see 7.2.4.1.3.2)
Continue to identify opportunities for economic development from local initiatives to provide training and support plans to reinforce professional skills. (Measure SE-Mit-15 – see 7.2.4.5.2.2)
These improvement measures will permit the achievement of an impact magnitude at a high level.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **high magnitude**.

7.4.4.4.9 Summary

Table 126: Impact during Operation - Socio-Economic Environment – Local Economy

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Eco-Op-1	Decrease in household incomes	Adverse	Major	SE-Mit-14	Mitigation - Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	Medium
				SE-Mit-9	Mitigation - Agricultural technical support plan.	
				SE-Mit-13	Mitigation - Support and fishermen's complaint management plan.	
SE-Eco-Op-2	Increase in local production prices	Positive	Low	SE-Mit-15	Economic support plan for households.	High
SE-Eco-Op-3	Increase in local production prices	Adverse	High	SE-Mit-14	Mitigation - Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	Medium
				SE-Mit-15	Mitigation - Economic support plan for households.	
SE-Eco-Op-4	Increase in local development initiatives	Positive	Medium	SE-Mit-15	Economic support plan for households.	High
SE-Eco-Op-5	Increase in household incomes	Positive	Medium	SE-Mit-7	Communication and hiring management plan	High
SE-Eco-Op-6	Change of the local economic landscape	Adverse	Low	SE-Mit-15	Mitigation - Economic support plan for households.	Medium
SE-Eco-Op-7	Opportunities for partnerships or cooperative operations	Positive	Medium	SE-Mit-15	Economic support plan for households.	High
SE-Eco-Op-8	Reinforcement of professional skills	Positive	Medium	SE-Mit-7	Communication and hiring management plan	High
				SE-Mit-15	Economic support plan for households.	

7.4.4.5 Impacts on the living environment and landscape

7.4.4.5.1 Impact SE-Liv-Op-1: Noise and sound pollution

Source of the impact: Construction of the runway and airport infrastructures

7.4.4.5.1.1 Impact before mitigation

During the operating phase, noise levels (mainly related to the take-offs and landings of larger air carriers) may be considered disturbing to the surrounding populations.

Some individuals of the receptor village communities have indicated in an informative way a potential sensitivity to the impact of these noise disturbances without attributing to them any real significance.

The impact severity is not significant. Considering the receptor sensitivity assessed as low, **the impact magnitude is negligible**.

No mitigation measures of this impact will be taken.

The proposed measures result in a not significant severity mitigated impact. Thus, the residual impact is of **negligible magnitude**.

7.4.4.5.2 Summary

Table 127: Impact during Operation - Socio-Economic Environment – living environment & Landscape

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
SE-Liv-Op-1	Noise and sound pollution	Adverse	Negligible		No mitigation measures to be undertaken	Negligible

7.4.4.6 Induced impacts

The impacts induced by the project are the impacts that result from all or part of all the potential impacts identified during the various phases of project implementation.

With regard to the induced effects on communities directly and indirectly impacted by the proposed expansion of the airport runway, the main issue of the situation of the socio-economic environment is mainly based on agricultural and livestock breeding activities.

Directly impacted populations such as the villagers of Sainte Marie or the non-resident livestock breeders of Bangélique are still conducting farming and livestock activities with specific methods, which can be considered very extensive. Their involuntary displacement will inevitably lead to changes in their agricultural practices in order to make their activities viable, adapted to the environment, significantly different from their relocation zone.

The agricultural and livestock-related impacts described above present mitigation capacities in close connection with support measures by the relevant regional commissions. The guidelines of the Rodrigues Regional Assembly, aimed at pursuing a policy of sustainable development through ecological preservation initiatives, will most likely have an induction effect on the shaping of the operation and agricultural landscape of the island and especially the area of Plaine Corail.

Thus, in order to cope with the potential pressure of livestock on pasture surfaces and adapt new management methods to make agricultural activities viable as a whole, the integration of techniques according to the principles of agro-ecology is being proposed to meet the island's eco-sustainable development goals.

In this context, the potentially induced impacts will then be closely linked to the gradual implementation of the methods employed, for which the objective is to achieve a social, economic and environmental balance. These potentially induced impacts could be:

Revegetation of the agrarian space: the integration of arboreal and other plant species is one of the conditions for the rehabilitation of soils in an environment, thus representing a positive impact induced by the need to adapt agricultural procedures (including livestock breeding) to the area. This revegetation also implies the participation of appropriate services such as those of agriculture but also of the environment. Indeed, some endemic plant species of the island can be integrated into the agricultural landscape. This revegetation also concerns pastures with the integration of species with high forage values (species already present on the island).
Intensification of livestock breeding: livestock breeding methods will have to evolve in view of the potential increase in livestock in the area. The extensive livestock breeding methods will not be applicable or very difficult to apply. And the sequencing of the livestock breeding areas is to be expected, in particular to avoid straying of animals and plausible damage in the surrounding plantations. Animal husbandry linked to the advent of improved grazing areas will lead to a change in livestock breeding towards a less extensive management method than it currently is.

7.4.5 Air quality and noise

7.4.5.1 Air quality

7.4.5.1.1 Impact Air-Op-1: Deterioration of air quality due to increased airport capacity

7.4.5.1.1.1 Impact before mitigation

The aim of the project is to increase the airport's capacity, both in terms of traffic and aircraft type. The platform currently accommodates small ATR72 aircraft with 1,600 movements per year; in the long term, A320/A321 NEOs and B737-800s will land, with approximately 985 movements per year.

The consequence is a significant increase in pollutant emissions due to air traffic.

It should be noted that A320 NEO and A321 NEO are aircraft with lower fuel consumption compared to aircraft of the same type. As a result, their polluting emissions are reduced.

An increase in road traffic serving the airport is also to be expected, although it is not quantified at this stage. Pollutants emitted by road traffic will also increase. In the same way, the impact of airport activities excluding flights will develop (by a non-quantifiable amount).

The impact of operations is assessed by quantifying the polluting emissions of flights through the emissions inventory. The methodology is the same as that used for the baseline assessment.

Considering the traffic forecasts over the 15-year horizon after commissioning, the results are shown in the following table (based on default LTO cycle). The calculation made for the baseline is recalled for comparison.

Table 128: Emissions inventory

Emissions (kg/year)	CO emitted	HC emitted	NOx emitted	SO_2 emitted	CO_2 emitted	Fuel consumption (kg/year)
Baseline 2017	3 777	470	2 950	324	1 005 020	324 200
After commissioning (30-year average)	6 685	189	7 673	691	2 137 548	678 609

Between the base year and the future projection, the inventory shows emissions are roughly doubled for all pollutants, except for HC which are reduced by about forty percent. This is directly explained by the change of aircraft type using the platform, as B737 and A321 aircrafts are much more powerful (and therefore pollution emitters) than the AT72 type aircrafts. The A321 neo emit little HC, which explains the decrease in emissions for this pollutant.

The emissions inventory does not directly give the concentration of polluting substances in the atmosphere, but it allows the trend between two situations to be assessed. In the light of this calculation, it is clear that air quality will be degraded in the airport environment as a result of

the project. Greenhouse gas emissions and fuel consumption will follow the same trend as air pollutants.

Although the direction of the prevailing winds is favourable to the dispersion of pollution towards the sea, and the area is sparsely populated, the impact severity is judged high.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

7.4.5.1.1.2 Mitigation measure and impact after mitigation

Measures to reduce polluting emissions from aircrafts can only be taken in consultation with the airports authorities because they can have an impact on safety:

If possible, limit the taxiing distance,
Opt for technologies that limit aircraft pollutant emissions during taxiing, such as the use of a diesel - electric tractor for the taxiing of the aircrafts, which can then shut down their engines,
Encourage pilots to shut down unneeded engines when taxiing,
Limit congestion (aircraft queues) by making departures as fluid as possible,
Minimize the use of the APU and GPU,
Consider procedures to limit the use of the thrust reverser.
In parallel, and in view of the very significant increase in pollutant emissions, it seems essential to provide for regular monitoring of air quality around the airport (see chapter 9 Preliminary Environmental and Social Management Plan (ESMP)). Depending on the results, further investigations may be carried out, including modelling of the dispersion of pollutants, which will make it possible to monitor the effect of specific mitigation measures.

Other measures may help to limit pollution from sources other than aircraft:

Make ecological performance a criterion of choice for service vehicles and ground equipment,
Develop an efficient public transport system to limit the use of private vehicles.
As the feasibility and effectiveness of the proposed reduction measures is not quantifiable at this stage, the impact magnitude with mitigation measures is unchanged and still high.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **high magnitude**.

7.4.5.1.2 Summary

Table 129: Impact during Operation - Air Quality

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Air-Op-1	Deterioration of air quality due to increased airport capacity	Adverse	High	Air-Mit-6	If possible, limit the taxiing distance	High
				Air-Mit-7	Opt for technologies that limit aircraft pollutant emissions during taxiing	
				Air-Mit-8	Encourage pilots to shut down unneeded engines when taxiing	
				Air-Mit-9	Limit congestion (aircraft queues) by making departures as fluid as possible	
				Air-Mit-10	Minimize the use of the APU and GPU	
				Air-Mit-11	Develop and implement procedures to limit the use of the thrust reverser	
				Air-Mit-12	Make ecological performance a criterion of choice for service vehicles and ground equipment	
				Air-Mit-13	Develop an efficient public transport system to limit the use of private vehicles	

7.4.5.2 Noise

7.4.5.2.1 Impact Noi-Op-1: Noise impact due to increased airport capacity

7.4.5.2.1.1 Impact before mitigation

The aim of the project is to increase the airport's capacity, both in terms of traffic and aircraft type. The platform currently accommodates small ATR72 aircraft with 1,600 movements per year; in the long term, A320/A321 NEOs and B737-800s will land, with approximately 985 movements per year. The consequence is a significant increase in noise emissions due to air traffic.

It should be noted that A320 NEO and A321 NEO are aircraft with lower noise emissions than standard A320 and A321 aircrafts.

An increase in road traffic serving the airport is also to be expected, although it is not quantified at this stage. Road noise will therefore be higher than the current one. In the same way, the impact of airport activities excluding flights will develop (by a non-quantifiable amount) and certainly generate noise.

The new runway impact is assessed by calculating the noise curves, considering the traffic projected 15 years after the inauguration.

The hypotheses are as follows:

only airborne noise is considered, as it is predominant,
the ground topography has not been taken into account,
traffic has been assigned to the runways based on the data available at this stage (inauguration + 15 years); similarly, the hourly distribution is based on current movements,
at this stage, flight procedures are imprecise and based on approximations.
Since the distribution of traffic during the night period is not precisely known, the analyses focused only on noise levels during a full 24-hour day and not specifically on the night period.

The resulting noise contours around the airport are represented on the map below, indicating the presence of population; thus, this map illustrate the exposure of populations to future aircraft noise.

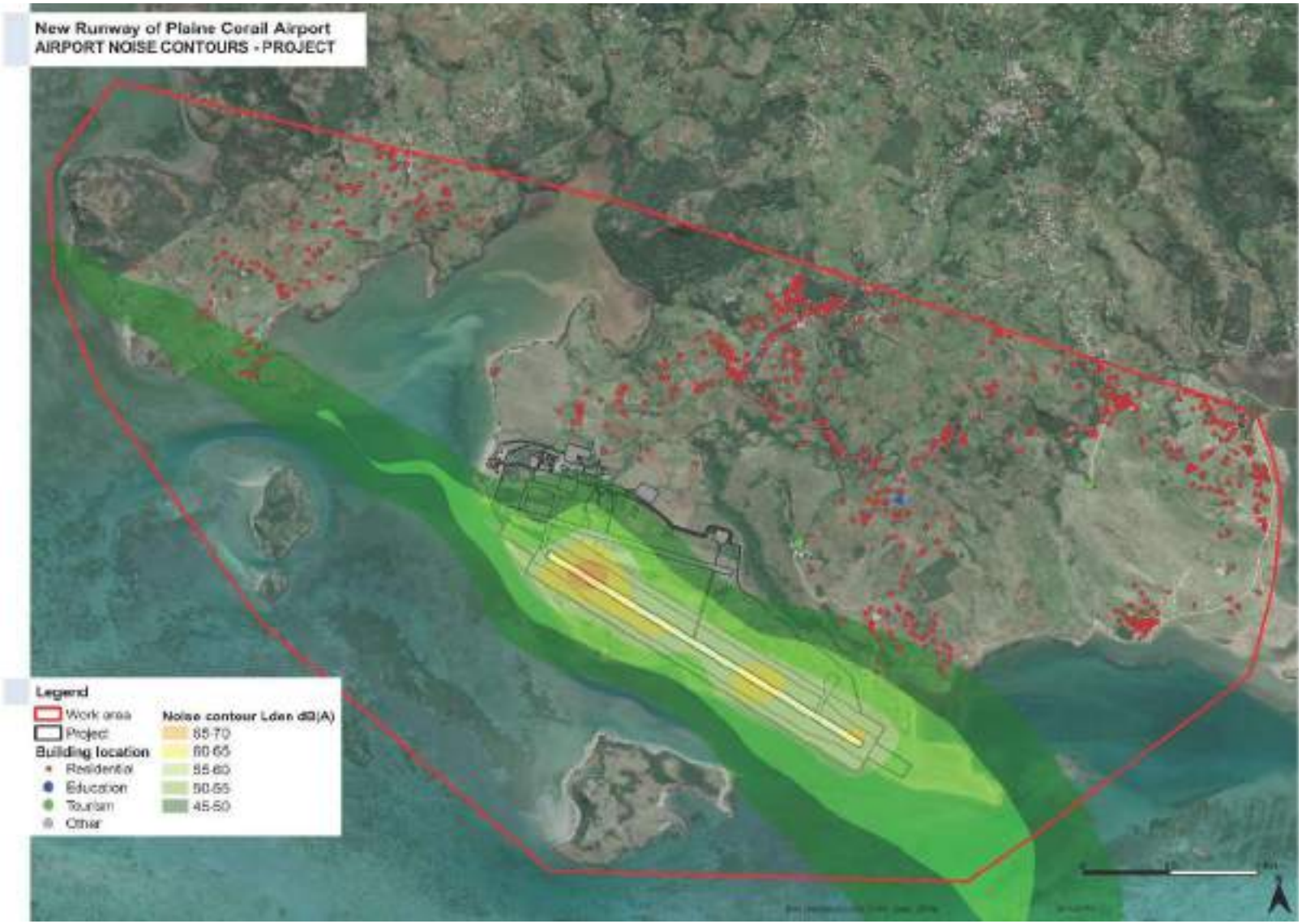
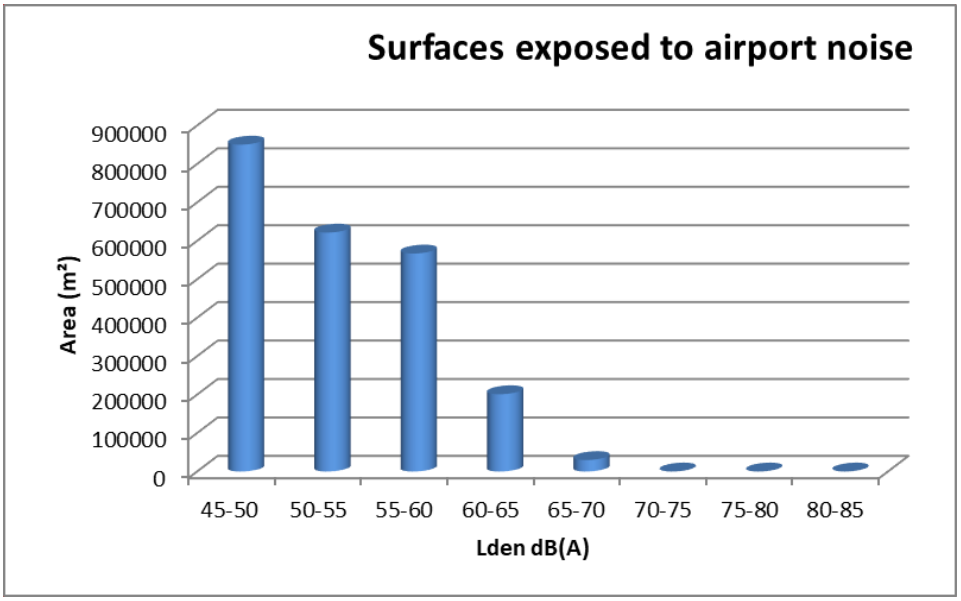


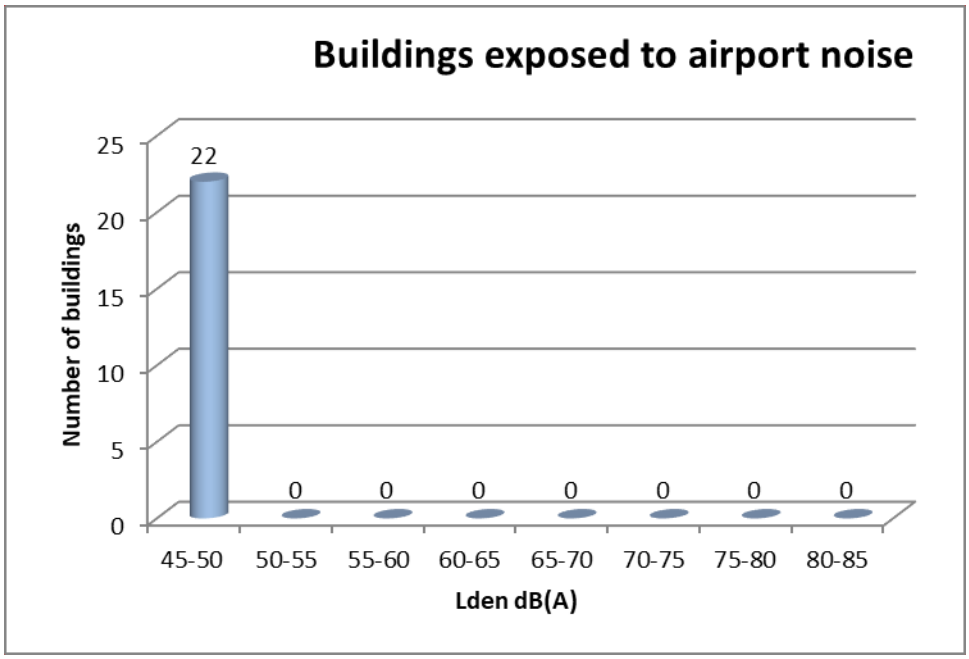
Figure 182: Aiport contours - operational phase

The following table shows the distribution of surfaces, noise sensitive buildings and noise exposed populations by noise level range. It is estimated that the number of inhabitants per household is three.

Table 130: Noise exposure within Lden contours

included in Lden contour (dB(A))	45-50	50-55	55-60	60-65	65-70
Noise-sensitive buildings	**22**	**0**	**0**	**0**	**0**
Populations	**60**	**0**	**0**	**0**	**0**
Area (m²)	**850278**	**621513**	**567050**	**201082**	**29780**





The map and these results show that about 20 buildings will be exposed to noise levels above 45 dB(A), which is the threshold recommended not to be exceeded by the WHO. It is to be

noted that French regulations consider that noise exposure is strong from 62 / 65 dB(A). No building has been identified within this Lden contour. It is to note that areas within the contour 60 dB(A) hardly exceed the airport boundaries.

Noise exposure is considered moderate from 55 / 57 dB(A); within this Lden contour, no houses have been identified.

The south of the island is sparsely populated, however, about 20 buildings will be affected by aircraft noise, while exposure to noise is currently very limited.

Thus, the impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium**.

7.4.5.2.1.2 Mitigation measure and impact after mitigation

The runway alignment, and approach and departure paths are already rather favourable because they limit overflying of populated areas. In addition, the majority of aircraft that will fly on the platform are A320/A321 neo, less noisy than conventional A320/A321.

It is difficult to reduce the impact of aircraft noise. However, some noise reduction measures can be reviewed:

limit traffic at night as much as possible. The use of any noisy equipement, such as engine ground run-ups, should also be limited to safety reasons during night time,
limit the use of reverse thrust if not needed for safety reasons (reverse thrust is used to slow down an aircraft and generates high noise levels),
usually, the descent angle for landing with ILS is 3 degrees (glide slope). It may be considered to raise the ILS glide slope (up to 3.5 degrees maximum) as it reduces slightly the noise emissions during landing,
specific departure procedures can be adopted to minimize noise exposure on the ground.
The last two measures aim at allowing aircraft to approach at higher altitude and to reach high altitude quickly when leaving the airport, in order to reduce noise exposure of nearby residential areas.

The strengthening of house insulation, as practiced in Europe, is not retained as a measure to compensate for overexposure of noise, because it is only useful when people spend most of their time inside houses with closed windows, which is not the case in Rodrigues.

Another measure may help to limit noise pollution from road traffic:

Develop an efficient public transport system to limit the use of private vehicles.
The measures described above may reduce the impact of aircraft noise, but they cannot be quantified at this stage and their feasibility is to confirm. Thus, the mitigated impact is unchanged.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of medium magnitude.

In addition, it is recommended to set up land use management in the area affected by airport noise, in order to control the development of urbanization and not to increase the populations exposed to noise. Following the example of the French urban planning rules, the procedure can be as follows:

assess which areas are affected by airport noise, based on long-term projections,

define construction rules according to the expected intensity of the nuisance. For instance, prohibit the construction of schools or houses in the most affected areas and encourage the establishement of industrial and commercial buildings,
control the evolution of noise levels by setting up a noise monitoring system, and adapt noise mitigation measures if needed.

It is also strongly recommended to inform the public about the influence of the airport on the noise environment. Indeed, providing information and enabling people to establish communication with airport authorities can help improve their feelings about aircraft noise. It is also important to show people that efforts are being made to limit the impact of airport activities on their living environment.

7.4.5.2.2 Summary

Table 131: Impact during Operation - Noise

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Noi-Op-1	Noise impact due to increased airport capacity	Adverse	Medium	Noi-Mit-3	Limit air traffic at night and the use of noisy equipement	Medium
				Noi-Mit-4	Raise the ILS glide slope to reduce noise emissions during landing	
				Noi-Mit-5	Adapt departure procedures to minimize noise exposure on the ground during take-off	
				Noi-Mit-6	Limit the use of reverse thrust	
				Noi-Mit-7	Develop an efficient public transport system to limit the use of private vehicles	

7.4.6 Heritage resources and visual environment

7.4.6.1 Paleonthology

None.

7.4.6.2 Landscape and visual environment

7.4.6.2.1 Impact Vis-Op-1: alteration of the living environment

7.4.6.2.1.1 Impact before mitigation

The airport extension will result in traffic flow and economic growth.
Local landscapes will be undergoing a rapid change.

Sources of impact associated with the exploitation phase may include:
Permanent earthworks;
Construction of airport buildings and airport infrastructures;
Road traffic and air traffic increase;
Airport inner traffic;
Road development;
Touristic infrastructures development (hotel, golf course, compound, marina, etc.);
Urban development.
The coastline is a very attractive landscape with highly valued and untouched features. In history, natural environments have been severely degraded and modified. But touristic development impacts on the coast are unprecedented in Rodrigues.

Takeoff, landing and aircraft approach might be seen as a positive addition in local residents' daily life. It is unsure if direct view on runway and airport infrastructures bring an equal excitement. From a tourist perspective, in search of an authentic and relaxing experience, it does clearly represent a nuisance.

General sensitivity to alteration of the living environment of main landscape features can therefore be considered high.

There is a high probability for those impacts to occur.

Change in coastline and built surfaces is a permanent loss to key elements of the landscape character, which results in fundamental change.

The impact severity is major. Considering the receptor sensitivity assessed as high, **the impact magnitude is major**.

7.4.6.2.1.2 Mitigation measure and impact after mitigation

A series of mitigation measures will help to minimize the landscape and visual impacts of construction activities. These measures will be:

For airport buildings and infrastructures to reach architectural quality and soundness;
Permanent fences and earthworks will be arranged to reduce visual intrusion on neighboring homes;
Plantings (trees and bushes) will be designed and arranged to form visual screens to mitigate visual impacts from nearby roads and homes; location of hedgerows along ravines and tree lines along main roads to reinforce landscape character. Early planting needed for efficient screening when construction works starts; Screen planting does contribute to construction

acceptance and generally speaking planting contributes to a positive perception of the construction phase;
Touristic infrastructure to respect scale of Rodrigues' landscape and sense of place;
Urban development to foster the development of public places and public amenities.

The mitigation planting has been mapped. Most of it takes place inside the 500m perimeter. That is where receptors are most sensitive to change and where visual mitigation is the most efficiant.

5m high vegetation (shrubs) and 10m high vegetation (tall shrub and small trees) have proved to be widely insufficient to screen views to the new runway.

20m (forest trees) is the appropriate size to screen views to the East of the airport – which is the most significant part of impacted settlements. Plantings will take the shape of little woodlands on both sides of Anse Quitor.

30m high (tall trees) is hardly sufficient to screen the entire runway from residents located west and south of the airport. Costal vegetation is to form little woodlands, hedgerows and thickets there. It would prove more efficient if combined with a landscape earthwork (to raise vegetation).

All planting will be combined with the terrestrial habitat reduction measures: BioT-Mit-3, BioT-Mit-5, and BioT-Mit-7. Also it should be combined with fast growing species (eg; coco tree in coastal planting).

Those mitigation measures will limit the landscape impact to a high change.

There is a risk on living environment of considering visual and aesthetic measures as secondary or unnecessary.

The proposed measures result in a major severity mitigated impact. Thus, The residual impact is of **high magnitude**.

7.4.6.2.2 Impact Vis-Op-2: alteration to landform outside the airport

7.4.6.2.2.1 Impact before mitigation

Outside the airport itself, indirect impact might occur as a medium to long term effect. Induced development might have a strong visual impact due to the very marked topography of the island, the very cut-out reliefs, and rare flat areas. The relative importance of earthworks and engineering structures is therefore a determining factor here. Economic and touristic growth might result in large urban development projects or new infrastructures.

Related landscape issues are as follows:

A controlled change of scale in the urban fabric;
A new type of building size and architecture to fit the local sense of place;
The preservation of ridges, as they are the horizon of most landscapes in Rodrigues (issues: freezing of urbanization on ridges, installation of afforestation...)
The preservation of plains and ravines (challenges: maintaining natural areas, strengthening a green and blue framework, creation of visual screens, etc.)

Soil erosion: In Rodrigues, the corollary of all human activities is soil erosion, as the environment is so fragile. This impact will also be felt after the works are completed (challenges: control of land clearing linked to urbanization, adaptation of the works according to the seasons and rainfall, control of site residues, control of the layout and execution of site tracks, treatment of slopes or other supports, plant engineering strategies...)
Control of quarry zones: On the island, quarry activities are likely to be poorly controlled. Depending on the material balance and earthworks requirements, the supply of backfill materials will have immediate impacts on landscapes near large urban development projects or new infrastructures.
Landscape integration of surplus material disposal areas (issues: choice of disposal sites, work on models, and restitution to agriculture or forestry of certain peripheral backfill areas, etc.)
Natural environments and landscapes might get more degraded and modified.

General sensitivity to pressure increase on island landscape can be considered medium.

Indirect impacts have low to moderate chances to occur, as local awareness seems to rise.

Loss of elements of the landscape character, or alteration to key elements of the landscape character, might result in partial change of landscape character.

The impact severity is medium. Considering the receptor sensitivity assessed as medium to major, **the impact magnitude is medium**.

7.4.6.2.2.2 Mitigation measure and impact after mitigation

The program of action of SIDS (Small Island Developing States) sets actions to be promoted at the national, regional and international levels in order to ensure the viability of the tourism sector and its harmonious development within the cultural and natural endownments in place.

Yet, SIDS Development Policy Framework has to develop into local action plans.

Four types of mitigation measures will help to minimize the landscape and visual impacts of exploitation activities:

Establishment of local Urban Development Master Plan to monitor urban development related to tourism growth, to value and enhance the local landscape; those master plans concern the communities in the vicinity of the 12 public beaches and other locations identified in the PASIDS tourism master plan;
Set up of green and blue grids to help strengthen the national policy for natural resource conservation;
Set up of sustainable and resilient city guidelines and architectural guidelines;
Community support in construction process.
Rodrigues' environment and landscape are altered and fragile. These mitigation measures will permit the limitation of the magnitude of the impact to a low level. The three regulatory framework measures might create or improve conditions of attracting and promoting tourism in Rodrigues.

The proposed measures result in a medium severity mitigated impact. Thus, The residual impact is of **low magnitude**.

7.4.6.2.3 Impact Vis-Op-3: alteration to the island forest cover

7.4.6.2.3.1 Impact before mitigation

Outside the airport itself, indirect impact might occur as a medium to long term effect. Induced development might as well have a strong visual impact due to woodland cutting.

The island of Rodrigues has the particularity of being almost entirely green. Although the natural woodlands of the hillsides are already much degraded, a forest environment persists. This atmosphere is at the same time an asset in terms of sustainable development and quality of life, and an issue for the landscape quality and identity of the island.

The building industry must be able to be provided timber from sustainable planting, with long term management.

Native flora of significance that has been observed on site will require various levels of protection and mitigation from construction impacts and from the introduction of exotic plants.

The impact severity is medium. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium**.

7.4.6.2.3.2 Mitigation measure and impact after mitigation

Four mitigation measures will help to minimize the landscape and visual impacts on the island's forest cover:

Investment in woodland planting to feed the timber industry;
Set up a sustainable timber management plan;
Set up of green and blue grids to help strengthen the national policy for natural resource conservation;
Ravine preservation and sanctuarisation of associated woodlands. By strategically expanding these existing forest communities, landscape measure Land-Mit-9 proposing to add a sizable new area of planting to an already well-established area, they will collectively become an enhanced sanctuary for indigenous species to thrive in.
Rodrigues' environment and landscape are altered and fragile. These mitigation measures will permit the limitation of the magnitude of the impact to a negligeable level. It might result in a positive effect if the the island's forest cover expands.

The proposed measures result in a not significant severity mitigated impact. Thus, The residual impact is of **negligible magnitude**.

7.4.6.2.4 Summary

Table 132: Impact during Operation - Visual Environment & Landscape

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
Impact Vis-Op-1	**Alteration of the living environment**	Adverse	Major	Land-Mit-15	Airport buildings and infrastructures to reach architectural quality and soundness;	High
				Land-Mit-7	Permanent fences and earthworks will be arranged to reduce visual intrusion on neighboring homes	
				Land-Mit-9	Plantings will be designed and arranged to form visual screens to mitigate visual impacts from nearby roads and homes; location of hedgerows along ravines and tree lines along main roads to reinforce landscape character. Early planting needed for efficient screening when construction works starts	
				Land-Mit-16	Touristic infrastructure to respect scale of Rodrigues' landscape and sense of place	
				Land-Mit-17	Urban development to foster the development of public places and public amenities	
Impact Vis-Op-2	**Alteration to the landform outside the Airport**	Adverse	Medium to major	Land-Mit-18	Establishment of local Urban Development Master Plan to monitor urban development related to tourism growth, to value and enhance local landscape	Low
				Land-Mit-19	Set up of green and blue grids	
				Land-Mit-20	Set up of sustainable and resilient city guidelines and architectural guidelines	
				Land-Mit-13	Community support in construction process.	
Impact Vis-Op-3	**Alteration to the island's forest cover**	Adverse	Medium	Land-Mit-21	Investment in woodland planting to feed the timber industry	Negligible
				Land-Mit-22	Set up a sustainable timber management plan	
				Land-Mit-19	Set up of green and blue grids	
				Land-Mit-23	Ravine preservation and sanctuarisation of associated woodlands.	


New Runway of Plaine Corail Airport
VISUAL MESURES - 20 METERS
Legend
Existing infrastructure
Project footprint
Large study area
Restricted study area
Mountain Saint-Mary
Building
Roads
Footway
Residential
Secondary
Proposed visual mesure
New runway view share on inhabited area
less than 25%
between 25 and 50%
between 50 and 75%
more than 75%


New Runway of Plaine Corail Airport
VISUAL MESURES - 20 METERS
Page 2/5
Legend
Existing infrastructure
Project footprint
Large study area
Restricted study area
Mountain Saint-Mary
Building
Roads
Footway
Residential
Secondary
Proposed visual mesure
New runway view share on inhabited area
less than 25%
between 25 and 50%
between 50 and 75%


New Runway of Plaine Corail Airport
VISUAL MESURES - 20 METERS
Page 3/5
Legend
Existing infrastructure Route
Project footprint
Large study area
Restricted study area
Mountain Saint-Mary
Building
Footway
Residential
Secondary
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New runway view share on inhabited area
less than 25%
between 25 and 50%


New Runway of Plaine Corail Airport
VISUAL MESURES - 20 METERS
Page 4/5
Legend
Existing infrastructure
Project footprint
Large study area
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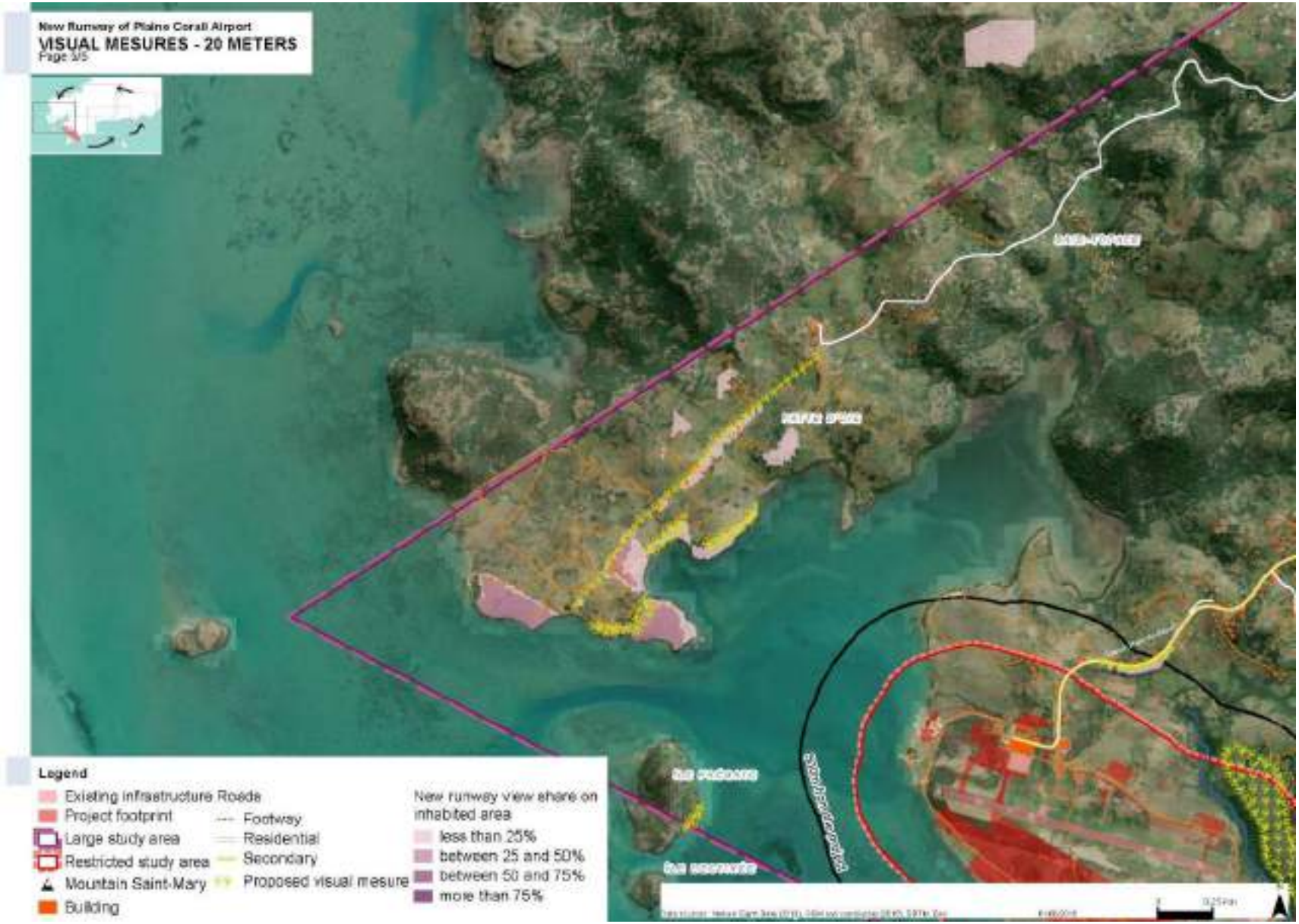
Mountain Saint-Mary
Building
Roads
Footway
Residential
Secondary
Proposed visual mesure
New runway view share on inhabited area
less than 25%
between 25 and 50%
between 50 and 75%


New Runway of Plaine Corail Airport
VISUAL MESURES - 20 METERS
Page 3/5
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Existing infrastructure Roads
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between 25 and 50%
between 50 and 75%
more than 75%

8 Project alternatives

8.1 Brief description of the approach to designing the best development solution

Since the administration of Rodrigues decided to improve air access to the island by developing the existing airport, two phases of study were carried out:

a feasibility study aiming to determine if the new runway project was technically and economically sound, and which development alternative to pursue;
a preliminary design aiming to finalize the selection of the development alternative and to establish the first drawings and dimensions.
The feasibility studies carried out by ECORYS in 2011-2012 aimed to propose various development solutions to improve the current operation of the airport.

Four development alternatives were ultimately proposed. These alternatives ranged from a simple improvement of the current operation of the airport to the extension of the existing runway. Runway extensions, both seaward and landward, were proposed.

The local administration selected the seaward extension of the runway, based on the assumption that the project would not adversely impact the landscape and the karst system. GIBB began to study such options in order to establish a preliminary design for a seaward extension.

A precise bathymetry showed that the seabed was much deeper than expected which resulted in the rejection of the seaward alternative. Therefore, a landward development solution was selected.

8.2 « Doing nothing »: maintain the current arrangements for the foreseeable future

The existing facilities are providing a service that meets most of the current needs of the island during non-peak periods.

However, during the peak period, the maximum of twelve flights per day is not sufficient to meet demand. The current capacity is over-streched.

Furthermore, the Assembly of Rodrigues wishes not only to meet the current demand but also:

To allow aerial cargo in order to increase agricultural income from the export of fresh products and to move away from total dependence on boat supply;
To foster an increase in tourism with the goal of welcoming up to 100 000 tourists per year by 2025 (from 78 000 tourists per year in 2018).
The lack of tourism development and associated cash inflows may lead the population to increase agricultural activity, which is the main source of income on the island. Any significant increase in the agricultural footprint on the island would almost certainly entail soil and biodiversity degradation. As actions undertaken by the local administration and some associations aiming to enhance the island's natural assets are limited in scope by the lack of funding, conservation could be significantly improved with better funding and linkages to the

tourism industry. Limiting the island's tourism development and pursuing agricultural income could, therefore, contribute to limiting the administration's capacity to reclaim the island's natural resources and to preserve its biodiversity.

8.3 Improving the current situation by facilitating the unrestricted operation of the ATR72 aircraft

Currently, the biggest aircraft that can be accommodated at Plaine Corail Airport is the ATR72. The ATR72 suffers a weight restriction due to the presence of the Frégate Island, which constrains the approach to the runway. For this reason, the ATR72 may only transport 64 passengers out of the 72 available seats, and luggage delivery sometimes encounters difficulties.

This option provides sufficient development to enable the ATR72 aircraft to operate with no restriction on passenger numbers or take-off weight; other than those restrictions specified by the manufacturer or applied by the airline for other reasons.

To lift the current restrictions, a slight increase in the runway length is needed, such that the weight of the aircraft becomes the constraining factor rather than the airport facility itself.

A 50m long extension into the lagoon was considered. This extension would be created on mass fill. The extension would cover the current perimeter roads, which would be put into a tunnel, and would require the relocation of the approach lighting installations.

No new structures, such as aircraft hangars, nor changes to the fuel farm were required for this option.

This option, called a "no regret option" as it could have been a first step of development before greater work, was rejected because the civil aviation authority juged the option to be unsafe.

Nonetheless, the increase in capacity associated with this option would not have been sufficient neither to meet current nor projected demand, nor to meet the development goals. This option would also have failed to allow cargo development.

8.4 Extension on the sea to the west

At the end of the feasibility studies it was decided to explore further the solution of seaward extension of the runway.

April 2016 - GIBB (Mauritius) Ltd (GIBB) was commissioned by the Rodrigues Regional Assembly (RRA) to develop the design for extending the runway into the sea based on 2 structural options, following the feasibility study of 2011 (Ecorys Report): a rubble mound structure with land infill as one option and an elevated reinforced concrete structure as the second option.

Geotechnical investigations at sea showed that bedrock was found at 60m compared to the expected foundation depth of 25 to 30m (the assumed depth used for cost estimation). The fill material or aggregate required for either options of extension into the sea (stilts or embankment) would not be available in the vicinity of the airport and possibly not in Rodrigues. For instance, it was estimated that fill material from Mt Croupier and Mt Topaze amounts to 3.0 million m^3 while the required fill for the embankment option was 4.0 million m^3.

This option would have caused a dam effect on the inlet separating the Frégate island from the Plaine Corail shoreline, with a significant impact on the marine physical and natural environment.

Consequently, given the expected impacts in regard to fill material, environmental impact due to earthwork and disturbance of marine currents, expected technical challenges and high costs associated with the runway extension into the sea, the RRA decided not to proceed with any of the runway extension options into the sea and subsequently amended the Consultant's Terms of Reference to prepare the Preliminary Design for a new Land Based Runway which consists of the design of a new 2,100m long runway with connecting taxiways and apron expansion suitable for Airbus A321 series as the design aircraft.

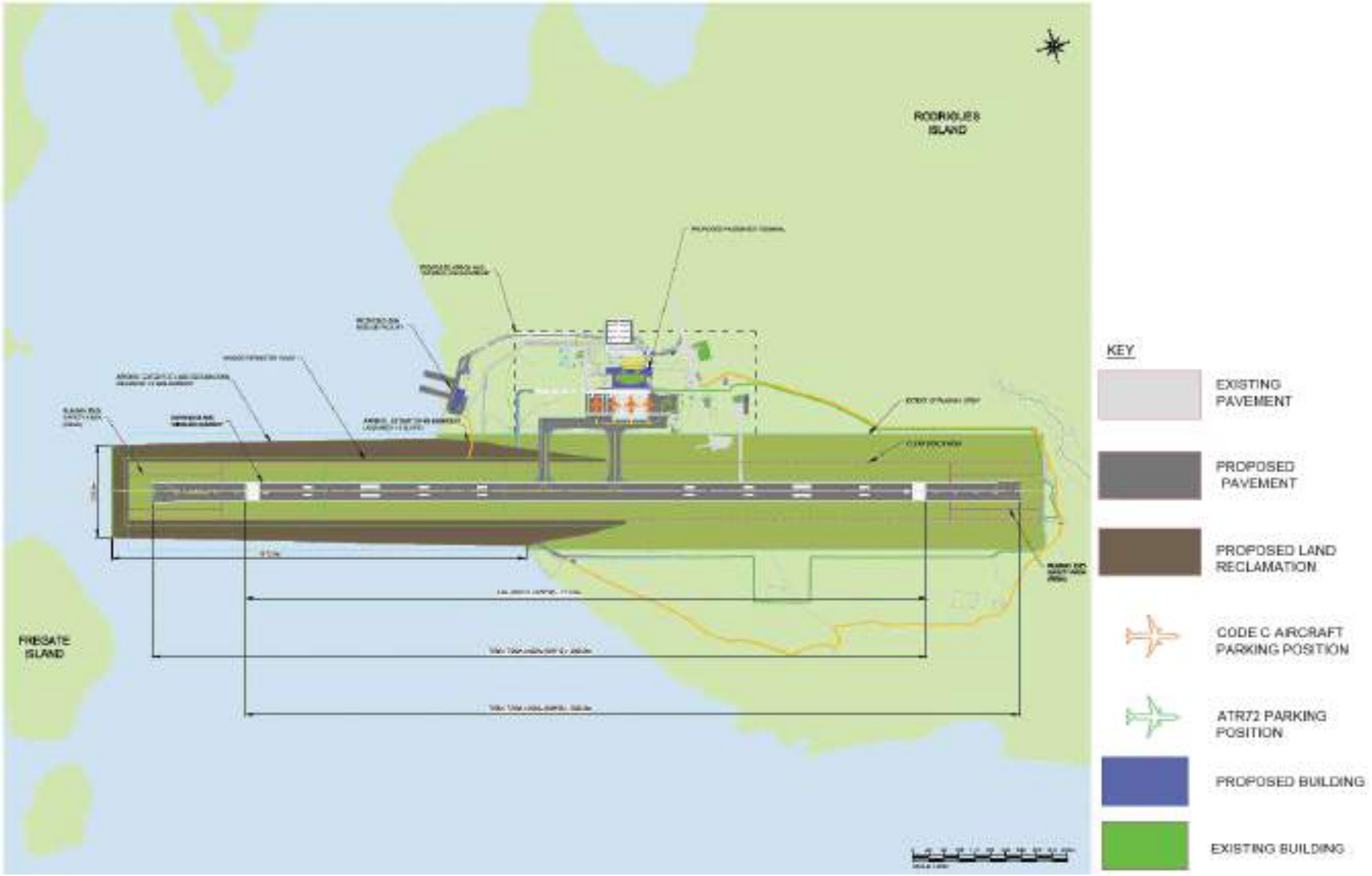


Figure 183: Map of "on sea" option with embankment or stilts (GIBB, 2016)

8.5 Resumption of studies to design a new runway to the southeast and Preliminary design

8.5.1 New runway options

Given the infeasibility of seaward extension of the existing runway, the preliminary studies focused on developing a new runway on earth.

December 2017 – GIBB submitted the "New Runway Options Report" to present to the RRA the different new runway alignment options and the required associated facilities, including budget estimates.

Six options (A, B, C, D, F, and G) were developed and judged according to several criteria. Among the six options, two distinct groups are distinguishable:

Options for avoiding construction at sea;
Options for avoiding earthwork on Sainte Marie Hill.
The options were compared based upon the following criteria:

Volume of earthworks and balance between cut and fill:
importing fill material, in the event of insufficient reusable excavated material, implies impacts on the site where the embankment materials are collected;
impacts on roads and traffic all over the island due to transportation of cut or fill;
transportation of the materials from or to the work site implies an increase in road or sea traffic, with associated local impacts on air quality, noise, and movement of people;
impacts on extraction quarry or on the landfill receiving the excess material;

Option A needs to import more than 8.3 million m^3 of fill material, B needs to import 1 million m^3 of fill material, C achieves the equilibrium or generates 10 % m^3, D needs 1.25 million m^3 of fill material and F and G need to import 5.8 million m^3 of fill material.

Only one option, Option C achieves equilibrium between cut and fill and avoids earthwork impacts or generate a little cut material. All other options need to import very significant volumes of fill material, with a significant impact on environment on the quarries sites and linked to the material transportation to the airport project site.

Impact on Sainte Marie Hill:
since the beginning of the project, the Rodrigues Assembly has paid particular attention to impacts on the landscape and the natural and agricultural land surrounding the airport, and has preferred development at sea rather than on land;

Only the options that block the channel (D, F, and G) or significantly build on the sea (A) make it possible to maintain Sainte Marie Hill.

Impact on the sea:
the embankment and sea defense wall needed to build on the sea have an impact on the seabed and marine life living, feeding, breeding, resting or passing through this zone;
the embankment and sea defense wall also have an impact on the marine currents and the hydro-sedimentary functioning of this part of the lagoon;

the embankment on the sea reduces or blocks, depending on its configuration, the Bangelique channel, impacting the fishing and shipping activities in this zone.

- ⇨ **Only one option, Option C, which impacts Sainte Marie Hill, avoids any work on the sea. Option B also has very little impact on the sea.**

Conservation of the airport building, existing runway, and other facilities:
Options that do not require the construction of an entirely new building, apron and taxiway have less impact on the land and environment and reduce the cost of the project;

Options C, D and F retain the existing buildings and apron. Options D and F need a very long taxiway close to the shoreline. Only Option C allows the existing runway to be reused as a taxiway.

Maintaining the current airport operational during the work:
Air access is now vital for Rodrigues Island and interruption of operations during construction would have a significant impact on the island's people, life and economy.

Only one option, Option A, significantly impacts the existing airport during construction.

Figure 184: Options for avoiding construction on the sea

Figure 185: Options for avoiding Sainte Marie Hill

Option \ Criteria	Cut and fill + if equilibrium - if import of fill x if excedent of cut	Impact on Sainte Marie Hill + if saved - if razed	Impact on the sea + if not impacted - if channel blocked or significantly impacted x if low impacted	Impact on the existing infrastructures + if reused - if impacted x if not impacted	Impact on airport operation during works + if operation not impacted - if operation disturbed	Scoring and Ranking
A	**-**	**+**	**-**	**-**	**-**	1+ / 4- / 0x => -3 **5th**
B	**-**	**-**	**x**	**-**	**+**	1+ / 3- / 1x => -2 **4th**
C	**+**	**-**	**+**	**+**	**+**	4+ / 1- / 0x => +3 **1st**
D	**-**	**+**	**-**	**x**	**+**	2+ / 2- / 1x => 0 **2nd ex aequo**
F	**-**	**+**	**-**	**x**	**+**	2+ / 2- / 1x => 0 **2nd ex aequo**
G	**-**	**+**	**-**	**-**	**+**	2+ / 3- / 0x => -1 **3rd**

Only one option, Option C:

achieves an equilibrium between cut and fill,
avoids impacts on the marine environment,
retains the most existing facilities,
and allows the airport to remain operational during the works phase.

Hence the Option C was chosen to be developed during the Preliminary Design.

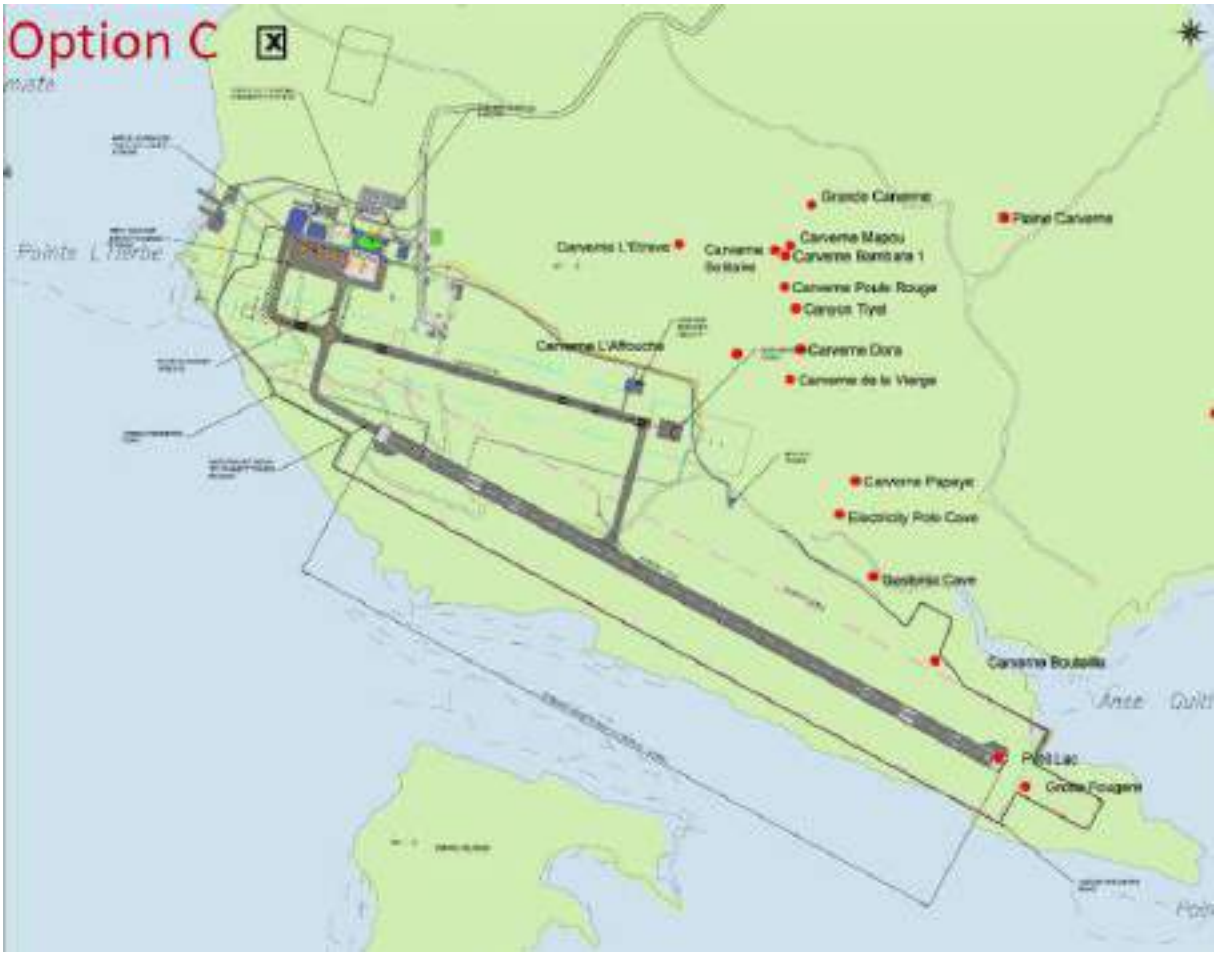


Figure 186: Option C chosen as base to establish the Preliminary Design

8.5.2 Preliminary Design optimization and new options

8.5.2.1 Changing footprint of the runway to avoid impact on open-air caves

During the elaboration of the Preliminary Design, based on Option C, the selected solution was optimized to spare the karst system as much as possible and, in particular, the two open-air caves called Petit Lac and Grotte Fougère. The rationale to change the footprint of the runway – as compared to the Option C (Dec 2017), was to avoid Cave Fougère and Petit Lac. With this change, additional marine works are required.

8.5.2.2 Taxiway or access road for fire fighting

Also, three options were considered for the connection between the new and the existing runway, including a flat taxiway D, a sloped taxiway D, or no taxiway D but an access road from the fire station.

The Preliminary Design Report was submitted by GIBB in November 2018, with preliminary cost estimates, excluding VAT, for two options compiled, as follows:

"**Option 2**"* **at MUR. 4,405,014,619.00**, provides for a new Taxiway D connecting the new runway to the existing threshold 30 with the maximum allowable ICAO compliant slope of 1.5% for the taxiway.
"Option 3" **at MUR 3,923,013,815.00**, does **not** provide for Taxiway D linking the new and existing runways, but replaced by an access road for the fire tenders to travel from the ARFFS station to the new runway.
* *(Option 1 was rejected).*
As per GIBB, the difference in cost is due to the fact that for Option 2, adequate volume of fill material could not be generated from within the site under the project area, as there was a shortfall of fill of about 1,000,000 m^3, in order to allow for the slope for the Taxiway D.

Major difference is due to the fact that the fill material after the geotech investigation has a compaction ratio of 0.7 due to the presence of calcarenite (porous material).

Consequently, the Option 3 (without Taxiway D) was chosen and scope of works and estimates used for further studies, some of which were specifically requested by the funding agencies.

Although it no longer achieves the perfect balance of excavated soil and backfill (it generates excess materials) and has a slight impact on the sea, this option remains the most interesting - see table on next page, where the new option C is in red.

Ultimately, an optimized version of Option C, with slight marine work and with a bare access road (and no Taxiway D), was selected for the Preliminary Design on which this study of environmental impacts and measures is based. As explained in the impacts assessment methodology, despite optimizing the Preliminary Design to avoid impacts to the karst system and caves, an impact on the open-air caves is considered in case the detailed design shows that such an impact is not avoidable.

Option \ Criteria	Cut and fill + if equilibrium - if import of fill x if excedent of cut	Impact on Sainte Marie Hill + if saved - if razed	Impact on the sea + if not impacted - if channel blocked or significantly impacted x if low impacted	Impact on the existing infrastructures + if reused - if impacted x if not impacted	Impact on airport operation during works + if operation not impacted - if operation disturbed	Scoring and Ranking
A	-	+	-	-	-	1+ / 4- / 0x => -3 **5th**
B	-	-	x	-	+	1+ / 3- / 1x => -2 **4th**
Optimized C / option 3	x	-	x	+	+	2+ / 1- / 2x => +1 **1st**
D	-	+	-	x	+	2+ / 2- / 1x => 0 **2nd ex aequo**
F	-	+	-	x	+	2+ / 2- / 1x => 0 **2nd ex aequo**
G	-	+	-	-	+	2+ / 3- / 0x => -1 **3rd**

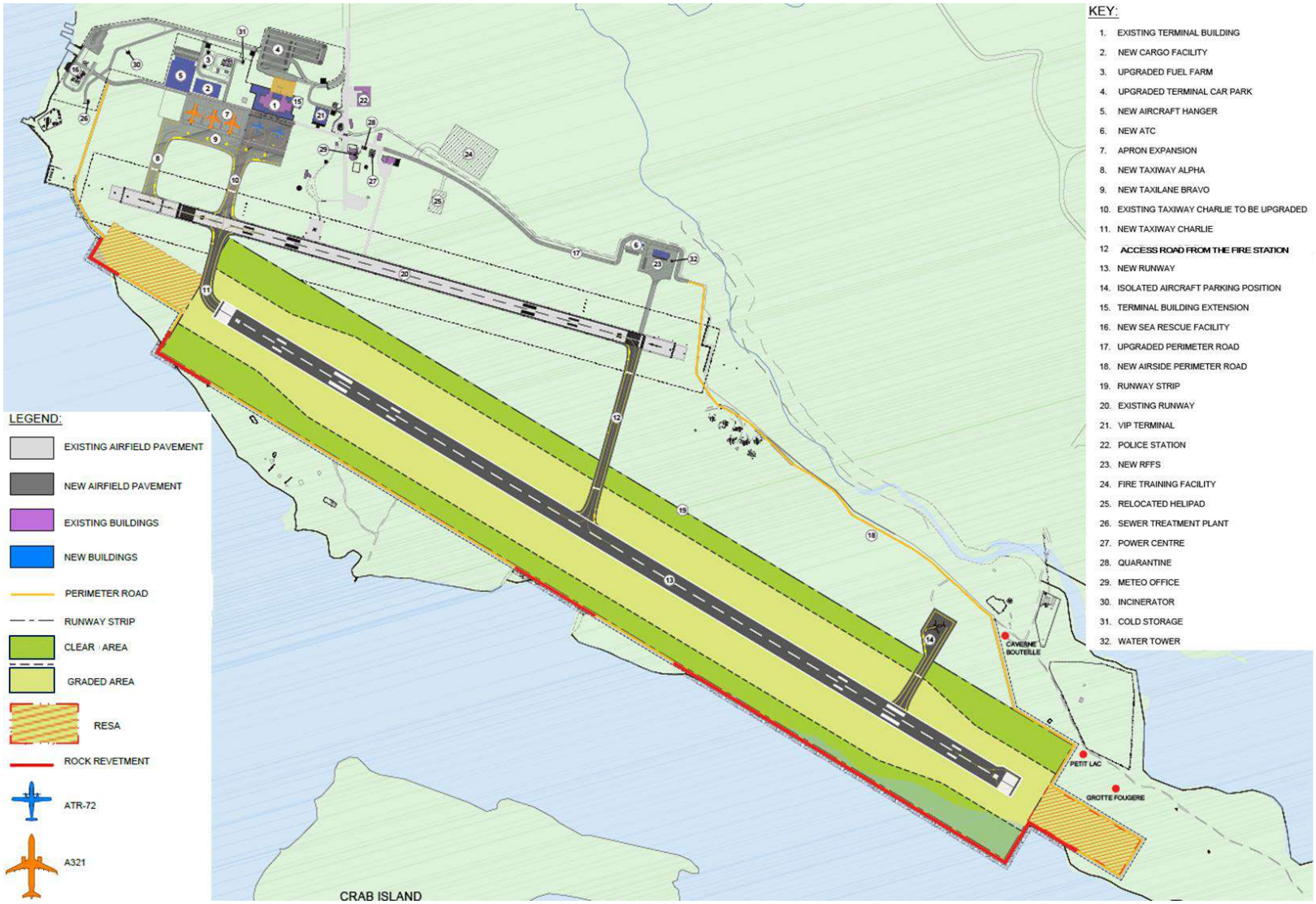


Figure 187: Preliminary Design Project

9 Preliminary Environmental and Social Management Plan (ESMP) for the construction phase

9.1 Preliminary Environment Management Plan for the construction phase

The following chapters (9.1.1, 9.1.2, 9.1.4) aim to summarize and guide to implement all the environmental measures associated to the construction phase. Some measures don't directly address the works nor the operation phase but must be implemented as soon as possible, upstream of the works: these are the compensation measures and the more global measures accompanying the project, and they are also covered in this part.

The measures' descriptions should be read in section 7 as this chapter doesn't provide an exhaustive description of all measures.

The first paragraph is a table listing all the commitment and measures and indicating for each one:

when and by whom it should be initiated and carried out,
how it should be monitored,
and which are the indicators of success, as well as the corrective measures to be taken if the performance objectives are not met.
The second paragraph is intended to guide stakeholders in the implementation of these measures monitoring, indicating which operational plans and procedures should be established to implement and monitor the measures, and the guidelines for the preparation of these plans.

The first paragraph refers to the plan that ensures each measure implementation. The second paragraph recalls for each plan which measures it addresses.

As part of the final EISA, an Environmental and Social Management Plan will be developed in accordance with the World Bank ESS1. An ESMP is an instrument that details (a) the measures to be taken during the implementation and operation of a project (in this case closure) to eliminate or offset adverse environmental and social impacts, or to reduce them to acceptable levels; and (b) the actions needed to implement these measures. The ESMP will include requirements for mitigation, monitoring, capacity development and training, implementation schedule and cost estimates, as well as integration with the Project.

The mitigation measures provided in the draft ESIA Report are by no means exhaustive, as detailed design and additional specialist studies including technical investigations still need to be completed to provide a sufficiently comprehensive list of mitigation measures.

Nonetheless, the mitigation measures included in this report aim to address some of the salient impacts that may be caused by the Project, albeit on a high level at this stage.

9.1.1 Environmental Management Plan for the construction phase

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
Works facilities, buidings and plants	Wor-Fac	Works installations management plan	Plan describing each of the main works facilities and installations, and giving their emission limits, recommendation for installation on site and environmental measures	Works phase and prior to the works **Site and works facilities management and monitoring plan**	Control of the works environment chart and plans Site visits	Compliance of the installation to the recommendations	Replacement of installations which wouldn't comply	To be implemented by the Contractor Under ARL's control
Marine environment	Phy-Mar-Mit-1	Control of backfilling processes	The construction processes must ensure a minimal volume of water in the low-lying embankment delimited area to insure the stability and sustainability of the runway.	Works phase and prior to the works **Marine environment monitoring plan**	Monitoring of turbidity level in the vicinity of the runway. Monitoring the water concentration in the embankment. Ensuring construction equipment are appropriate.	Compliance to water quality prevailing threshold.	Failure to meet the performance criteria shall be recorded as a non-conformance incident. In the case of structural failure or non-compliance turbidity level, works are to immediately cease. Incident has to be reported. Implementing protocol for depollution in case of spill.	External consultancy engineering Under ARL's control
	Phy-Mar-Mit-2	Optimisation of the location of discharges	The discharge should be located in order to promote a local settling of the inorganic matter. A hydrodynamic survey can be conducted to identify these optimal locations.	Works phase and prior to the works **Marine environment monitoring plan**	The discharge should be located in order to promote a local settling of the inorganic matter. A hydrodynamic survey can be conducted to identify these optimal locations.	Compliance for water quality prevailing threshold	Monitoring of turbidity levels.	External consultancy engineering Under ARL's control
	Phy-Mar-Av-3	Optimisation of the discharges timetable to avoid times when currents reverse and/or already turbid condition	In order to minimize the intensity and extent of the flume, discharge should occur with weak current and low level of turbidity.	Works phase and prior to the works **Marine environment monitoring plan**	Monitoring of turbidity levels in the vicinity of the runway. Monitoring of magnitude and direction of the current in the vicinity of the runway.	Compliance to water quality prevailing threshold. Compliance with current prevailing threshold.	Discharge to be stopped if non-compliance. Reducing the hydraulic flows of the deposited materials.	External consultancy engineering Under ARL's control
	Phy-Mar-Mit-4	Silt curtain around discharges	Silt curtains can be used to contain suspended sediments and to prevent sediment dispersal.	Works phase and prior to the works **Marine environment monitoring plan**	Monitoring of turbidity levels. Conducting daily visual inspection of the curtain.	Compliance to water quality prevailing threshold.	Failure to meet the performance criteria shall be recorded as a non-conformance incident. Discharge to be stopped if non-compliance. Verifying the operation of the equipment according to the manufacturer's specifications	Contractor Under ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	Phy-Mar-Mit-5	Silt curtain around dredging area	Silt curtain controls the suspended solids generated by the dredging and is placed around the excavation site.	Works phase and prior to the works **Marine environment monitoring plan**	Monitoring of turbidity levels. Monitoring of contaminants in the water column.	Compliance to water quality prevailing threshold.	Dredging to be stopped if non-compliance. Verifying the operation of the equipment according to the manufacturer's specifications.	Contractor Under ARL's control
Hydrology - Stormwater management Waste water management / Water resource and water supply	Phy-Hyd-Mit-1	Temporary sedimentation ponds	Stormwater management from the modified natural watersheds: During the construction works, excavation of the terrain will facilitate transfer of sediments to the lagoon. => Implementation of specific temporary drains and buffer storage/sedimentation ponds	Works phase **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	Monitoring of water quality at discharge; visual control.	Compliance with prevailing / target standards. Submission to local authorities once a month.	Discharge to be stopped if non-compliance. Informing of local authorities/client for remedial measures.	To be implemented by the Contractor Under RRA and ARL's control
	Phy-Wat-Mit-1	Install a desalination plant to supply drinking water to the workers' camp	Water supply for workers' site facilities and construction facilities: The construction works cannot create a burden on the existing water supply already suffering a severe deficiency Specific desalination skid for the water supply of the workers' site facilities and construction facilities	Works phase **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	Monitoring of water quality at inlet and outlet of Treatment Plant; monitoring of water quality on distribution line; regular manual sampling/analysis (once a week) and visual control; automatic real time monitoring of main parameters (at least pH, turbidity and residual free chlorine) on distribution line.	Compliance with prevailing / target standards. Submission to local authorities once a month.	Water production to be stopped if non-compliance. Informing of local authorities/client for remedial measures.	To be implemented by the Contractor Under RRA and ARL's control
	Phy-Wat-Comp-2	Temporary or permanent relocation of the captation of actual Caverne Bouteille	Propose a new location for Caverne Bouteille, including a seawater pumping, settle a new pumping system and upgrade the existing treatment plant to provide water to the people currently supplied by Caverne Bouteille plant	Works phase and prior to the works **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	Monitoring of water quality at inlet and outlet of Treatment Plant; monitoring of water quality on distribution line; regular manual sampling/analysis (once a week) and visual control; automatic real time monitoring of main parameters (at least pH, turbidity, salinity, temperature, TDS, electrical conductivity and residual free chlorine) on distribution line.	Compliance with prevailing / target standards. Submission to local authorities once a month. Significant change in the value of the measured parameters (e. g. +/- 20%) depending on the tolerance of the treatment system.	Water production to be stopped if non-compliance. Informing of local authorities/client for remedial measures. Temporary stop of pumping Identification of the source/cause of the water quality change Relocation of the catchment	To be implemented by the Contractor Under RRA and ARL's control
	Phy-Wat-Av-3	Works wastewater treatment plant	Wastewater management for the existing airport facilities and workers' site facilities: During the construction works, the existing wastewater treatment facilities will be dismantled. The sewage from the airport facilities will need to be treated to avoid direct	Works phase **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	Monitoring of water quality at inlet and outlet of Treatment Plant; monitoring of water quality at discharge; regular manual sampling/analysis (once a week) and visual control; automatic real time	Compliance with prevailing / target standards. Submission to local authorities once a month.	Discharge to be stopped if non-compliance. Informing of local authorities/client for remedial measures.	To be implemented by the Contractor Under RRA and ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
			discharge into the environment => Wastewater treatment skid of adequate capacity for both the airport facilities and for the workers' site facilities		monitoring on main parameters usually monitored.			
	Phy-Wat-Av/Mit-4	Preventive measures to reduce risks during the construction phase - Risk management plan	Oil and other spills related to chemical products used during construction =>Implementation of specific retention / confining zones for storage and use Identification of threat activity that will cease to be or not become a significant threat to drinking water	Works phase **Site and works facilities management and monitoring plan**	Monitoring of any leakage from the specific retention zones Ensure that all site managers are aware of the RMP and are able to apply it Verify that the resources to apply the RMP are present on the site	Zero leakage observed Regular meetings between the project manager, the contracting authority and all site managers	Implementation of remedial confining procedure Training workshops for all site managers	To be implemented by the Contractor Under ARL's control
Karst	Phy-Kar-Mit-1	Reduce speed of trucks' movement to an acceptable level	-	Works phase **Site and works facilities management and monitoring plan**	Speed limit ≤ 30 km/h	Speed controls	Warning violators	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-2	Reduce rotations between embankment site and material storage site Carry out and document baseline observations at potentially exposed buildings to check on the presence of cracks ahead of works	-	Works phase **Site and works facilities management and monitoring plan**	Mass haul diagram	Check of plant's yield	Earth-moving plan adaptation	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-3	Reuse of materials from cutting to embankment areas	-	Works phase **Site and works facilities management and monitoring plan**	Mass haul diagram	Check of reuse-ratio	Soil aeration/soil stabilization	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-4	Reuse of topsoil materials after works phase	-	Works phase **Site and works facilities management and monitoring plan**	Mass haul diagram	Check of topsoil balance	Reuse exceeding quantities for landscaping	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-5	Infilling of local erosion features and use of drainage system to manage rainwater responsible for local erosion	-	Works phase **Karst monitoring plan**	Daily site visits	No gullies development	Drainage system improvement	To be implemented by the Contractor Under RRA and ARL's control
	Phy-Kar-Mit-6	Open blasting and site excavation works to be done during dry season	-	Works phase **Site and works facilities management and monitoring plan**	Work schedule	Shift of planned tasks	Additional equipment implementation	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-7	Reduce unit explosive charge decreasing noise impact	-	Works phase **Karst monitoring plan**	Vibration monitor device by geophones	Meet the targeted particle velocity	Corrective action plan implementation	To be implemented by the Contractor Under RRA and ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	Phy-Kar-Mit-8	Concentrate open blasting operations in a short amount of time	-	Works phase **Site and works facilities management and monitoring plan**	Work schedule	Schift of planned tasks	Additional equipments implementation	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-9	Work only during the day and inform local authorities and communities bout the health and safety plan applicable on work site	-	Works phase **Air quality and noise environment management and monitoring plan**	Work schedule	Construction supervisor check	Stop works at the scheduled time	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-10	Avoid running excavator's engines in case of no use	-	Works phase **Site and works facilities management and monitoring plan**	Planning of equipment use	Construction supervisor check	Stop of not planned machines	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-11	Chose the closest extraction site for fill material / Forbid the export of cuttings	-	Prior to the works **Site and works facilities management and monitoring plan**	Trucks and boat traffic / Noise and air pollution monitoring	Distance of the extraction site / No export traffic	Change site extraction / Explore on site storage solutions for cuttings	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit/Av-12	Define a restricted area around the caverns with no allowed access to heavy vehicles	-	Works phase **Site and works facilities management and monitoring plan**	Enclosure tape around the restricted area	Construction supervisor check	Warning violators	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-13	Reduce trucks' movement's speed to an acceptable level to minimize the induced vibrations	-	Works phase **Site and works facilities management and monitoring plan**	Speed limit ≤ 30 km/h Checking visit inside the caves / Caves monitoring Plan	Speed controls	Warning violators	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Av-14	Adapt and reduce trucks' movements and rotations between embankment filling site and material storage site	-	Works phase **Site and works facilities management and monitoring plan**	Mass haul diagram	Check of plant's yield	Excavation rate adaptation	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Av-15	Restrict traffic in close vicinity of the caves	Retention measure for unauthorized access	Works phase **Site and works facilities management and monitoring plan**	Daily inspection of the condition of the barriers	Damage to facilities	Additional mobile fences where needed Replacement of damaged parts	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Av-16	Installation of a protective formwork to ensure protection and controlled access by airport authorities	-	Works phase **Site and works facilities management and monitoring plan**	Security checkpoint	Airport security rules	Airport security corrective actions	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Comp-17	Remove the remaining fossiliferous sediments from all threatened caves	Safe storage of sedimentary materials containing palaeontological and paleoenvironmental information	Prior to the works **Karst monitoring plan**	Preventive paleontological searches Supervision of excavation by experts and scientists	Preventive research regulation Complete and detailed list of materials removed and compliance of storage sites	Implementation of the planned correctives actions Final inspection and relocation of undisplaced materials	To be implemented by an external specialist Under ARL's control
	Phy-Kar-Av/Mit-18	Daily maintenance and inspection of excavators	Liquid leakage prevention measure (oil and fuel)	Works phase **Karst monitoring plan**	Inspection of logbooks of the maintenance of equipment	Missing information in the logbook Number and intensity of accidental spills of hydrocarbons and other chemicals	In case of a surface spill, the environmental response plan must be implemented immediately.	To be implemented by the Contractor Under RRA and ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	Phy-Kar-Av/Mit-19	No maintenance and refuelling on the construction site (or with specific waterproof delimited zone)	Vehicles must be refuelled on a dedicated site	Works phase **Site and works facilities management and monitoring plan**				To be implemented by the Contractor Under ARL's control
	Phy-Kar-Mit-20	Establishment of a storage site for earthworks wastes (wood from formwork, material and equipment wrappings, unusable cement / grouting mixes, damaged or contaminated construction material), close to the project site, in order to reduce pollution induced by traffic from storage activity	-	Works phase **Site and works facilities management and monitoring plan**	Installation of a network of observation wells upstream and downstream of the facilities to allow, on the one hand, sampling and analysis of groundwater to define reference values and, on the other hand, to establish a groundwater quality monitoring program (and levels) during the project development phases (construction and operation phases)	Number and intensity of accidental spills of hydrocarbons and other chemicals	In the event of a surface spill, the environmental response plan must be implemented immediately. In the event that there is a significant change in groundwater quality and/or a contaminant is detected, the environmental management plan will also have to be put in place to contain the contamination.	To be implemented by the Contractor Under ARL's control
	Phy-Kar-Av-21	Proceed to an impact assessment of the extraction site and have the material origin validate priori the works phase	-	Prior to the works phase **Site and works facilities management and monitoring plan**	-	-	-	To be implemented by the Contractor Under ARL's control
Biodiversity	BioT-Av-1	Avoid remarkable trees located at the edge of the project Targeted species*: Antirhea bifurcata , Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	This measure consists in avoiding the destruction of remarkable trees located at the boundaries of the project footprint by locally adapting the project boundaries. A total of 19 trees could be easily avoided.	Works phase Before the work begins. **Biodiversity management and monitoring plan**	These 19 trees must be marked prior to the works phase with permanent devices (fences, ribbons, paintings..) and tagged with an identification number (ID) in order to be properly followed during the works phase	Number of trees left after the works phase (out of the 19)	Reinforcing measure BioT-Mit-3	External biodiversity specialists / RRA services Under RRA and ARL's control Potential partners : Wildlife Fondation, Forestry Services
	BioT-Av-2	Moving the control tower out of the nature reserve	This measure consists in avoiding the destruction of approximately 1 hectare of the buffer area of the Anse Quitor nature reserve. This measure allows to save 6 specimens of the following species: Elaeodendron orientale, Sarcanthemum coronopus, Terminalia bentzoe subsp. rodriguesensis	This measure must be anticipated in the project design **Biodiversity management and monitoring plan**	The official boundaries of the nature reserve will be provided by the forestry services	- Surface area left inside the Anse Quitor nature reserve (objective: 0) - Project design with a repositioning of the control tower	Reinforcing measure BioT-Comp-7	External biodiversity specialists / RRA services Under RRA and ARL's control Potential partners : Wildlife Fondation, Forestry Services for the official limits of the nature reserve
	BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	This measure consists in planting 80 specimens of rare and endangered endemic species within the airport limits after the extension airstrip project. This aims to protect, preserve and create an arboretum of endemic seeds	Works phase This measure must be implemented way before the works phase, in particular as regards with the collection of plant material from	A partnership with the Forestry Services or the Mauritius Wildlife Foundation will be conducted in order to produce seedlings of native species from seeds, cuttings or	- number of plants produced (objective : 100) - number of species planted	Reinforcing measure BioT-Comp-7	External biodiversity specialists / Contractor Under ARL's control Potential partners :

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
			that will be used afterwards to produce endemic plants for nature reserves in Rodrigues.	specimens outside the project area. **Biodiversity management and monitoring plan**	juveniles collected from the nature reserves of Rodrigues and/or Mauritius. Collection of plant material will be authorized in advance by the reserve managers in any case. A specific protocol will be designed for tree transplantation.			Wildlife Fondation, Forestry Services
	BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	This measure consists in transplanting all or part of the remarkable trees and ferns intended to be destroyed by the project: in priority, Diospyros, Terminalia, Foetidia, Antirhea, Nephrolepis	Works phase Before and or during works phase (machines will be available during the works phase which optimizes costs) **Biodiversity management and monitoring plan**	A competent and trained external coordinator on the transplantation protocol will be mobilized	- number of trees transplanted - number of trees transplanted which survive the 1st, 2nd, 3rd, 4th and 5th year after transplantation	Reinforcing measures BioT-Mit-3, BioT-Mit-5, BioT-Comp-6	External biodiversity specialists / RRA services Under RRA and ARL's control Potential partners : Wildlife Fondation, Forestry Services
	BioT-Mit-5	Genetic conservation of populations of impacted rare species : production and reintroduction of clones and genetic ancestors of these species	In response to the destruction of several rare species specimens, this measure consists in ensuring the production and reintroduction of clones and genetic ancestors of these species in order to preserve their genetic lineage in the long term. A total of 14 to 35 specimens will be produced, depending on the results obtained by vegetative and sexual propagation.	This measure must be implemented way before the works phase, in particular as regards with the collection of plant material from specimens intended for destruction inside the project footprint. Several campaigns have to be scheduled in order to target the right periods of fruiting **Biodiversity management and monitoring plan**	A partnership with the Forestry Services or the Mauritius Wildlife Foundation will be conducted in order to produce seedlings of native species from seeds, cuttings or juveniles collected from the specimens located within the project footprint.	- number of plants produced (objective : 35) - number of species planted	Reinforcing measures BioT-Mit-3, BioT-Mit-4	External biodiversity specialists / RRA services Under RRA and ARL's control Potential partners : Wildlife Fondation, Forestry Services
	BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity	This measure consists in initiating a new approach for the management of extensive agriculture on the island of Rodrigues by proposing a turnkey operational action plan.	Planning over 24 months will allow satisfactory consultation times for the implementation of the action plan in the short term **Biodiversity management and monitoring plan**	This action plan can be approached by: 1- the inventory and consultation of all agricultural and ecologist partners throughout the project; 2- the establishment of the development challenges of livestock breeding in Rodrigues; 3- drawing up an inventory of actions that can improve the quality and productivity of livestock farming by promoting local biodiversity;	- Obtaining an action plan validated by the regional assembly in 2022	Reinforcing measure BioT-Comp-7	External biodiversity specialists / RRA services Under RRA and ARL's control Potential partners: Wildlife Fondation, Agricultural and Forestry Services, Regional Assemblee…

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
					4- proposing a fine cartographic work accompanied by spatialized actions throughout the territory of Rodrigues.			
	BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	This measure consists in: • Rebuilding the fence around the Anse Quitor nature reserve, with one that would be similar to the fence around the airport in order to discourage grazing livestock inside the reserve. This measure is a short-term response to the grazing vs. biodiversity issue that has to be solved with the offset measure (BioT-Comp-6: Action plan towards more sustainable agricultural practices for native biodiversity). • Reinforcing native species populations by planting 500 native plant specimens within the Anse Quitor nature reserve buffer area, located besides the future airport boundaries (see map below).	Harvesting (seeds, cuttings) and production must take place well before the works phase as well as the fencing work **Biodiversity management and monitoring plan**	- Check the watering quality of the plants; - Identify, locate and count exotic species and define appropriate control methods against invasive and potentially invasive exotic species; - Quantify the mortality rate and health status of native species. - Establish corrective measures if necessary, in order to always orientate this rehabilitation project in an ecologically correct direction.	- Number of plants planted - Mortality rate (total/species) - Number of placettes - Number of linear metres of fence	Reinforcing measures BioT-Mit-3, BioT-Mit-4	External biodiversity specialists / RRA services Under RRA and ARL's control Potential partners: Wildlife Fondation, Forestry Services
	BioT-Mit-8	Collect arthropods from the Tropiphodora genus before and during earthwork	This measure consists in collecting living individuals of Tropiphodora within the project footprint boundaries. Several campaigns will be conducted before the works phase and during earthwork. Sampling planning will allow the entire project area to be visited in an equivalent manner. If species are more abundant in some areas, these areas will be collected more thoroughly.	Works phase This measure must be implemented before and during the earthwork phase. Several campaigns have to be scheduled. **Biodiversity management and monitoring plan**	Learn how to distinguish the two different species recorded on site	- number of living specimens collected - number of species collected - number of survey campaigns	None	External biodiversity specialists / Contractor Under ARL's control Potential partners: Vincent Florens (Department of Biosciences, University of Mauritius, Réduit, Mauritius)
	BioM-Mit-1	Installation of a floating boom to confine sediments and prevent their resuspension in the marine environment	To contain sediments and prevent their resuspension in the marine environment	Works phase During the construction works **Marine environment monitoring plan**	- Visual surveillance of the floating boom's good hold - Measurement campaign of turbidity and current	- Ensure that the floating boom is properly - Visual monitoring of corals at Pointe Palmiste in relation to the turbid plume - Monitoring turbidity with: Duration over an alert and a stop threshold Number of exceedance over a threshold Maximum concentration tolerated	- Decrease of the released flow - Temporary stop of the sediment discharge - Temporary stop of the dredging	Contractor Under ARL's control Potential partner : Shoals Rodrigues / SEMPA

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	BioM-Mit-2	Monitoring for the possible presence of turtles in the project area and egg laying site on Crab Island	To preserve protected species and maintain local biodiversity	Works phase During the construction works Laying period **Marine environment monitoring plan**	Visual surveillance by boat, on foot Laying traces on beaches	GPS location, descriptive and photographic information Continuous consolidation of all published information	Stopping works if marine turtles are present and come to lay eggs on the beaches near the project	Shoals Rodrigues / SEMPA Under ARL's control
	BioM-Av-3	Avoid coral heads located at the edge of the project	To preserve protected species and maintain local biodiversity	Before the construction works **Marine environment monitoring plan**	Identify corals in the work area Marking with buoys Check their movements to SEMPA	Waypoint's position of each type of coral Conservation status (Before/after the movements)	None	Contractor Under ARL's control Potential partner : Shoals Rodrigues / SEMPA
Infrastructures and solid waste management	Inf-Mit-1	Transfer materials out of high traffic periods	To avoid creating traffic jams by adapting the works supply traffic schedules	Works phase **Site and works facilities management and monitoring plan**	Complaint collection	Zero additional traffic jam Zero unaddressed complaint	Re-adapting traffic schedules	To be implemented by the Contractor Under ARL's control Partner: RRA
	Inf-Mit-2	Anticipate and supervise exceptional convoys	To avoid creating traffic jams by adapting the exceptional convoys schedules and the communication before and during their passage	Works phase In case of exceptional convoys / before and during passage **Site and works facilities management and monitoring plan**	Complaint collection	Zero additional traffic jam Zero unaddressed complaint	Re-inforcing communication and exceptional convoys schedule adaptation	To be implemented by the Contractor Under ARL's control Partner: RRA
	Inf-Mit-3	Rehabilitate roads that were used during construction and at the end of works	Rehabilitate the roads that would be spoiled by the trucks traffic	Works phase **Site and works facilities management and monitoring plan**	Roads inspection	Zero road degradation during the works and at the end of the works	Re-inforcing roads inspection and rehabilitation	To be implemented by the Contractor Under ARL's control
	Inf-Mit-4	Adapt the period of work	To avoid traffic jam by adapting the works season, if possible (vacations, low touristic season)	Works phase / to be anticipated during the works' construction planning **Site and works facilities management and monitoring plan**	Complaint collection	Zero additional traffic jam Zero unaddressed complaint	Reinforce Inf-Mit-1	To be implemented by the Contractor Under ARL's control Partner: RRA
	Inf-Mit-5	Use generators	To avoid to create extra burden on the electricity network for works supply	Works phase **Site and works facilities management and monitoring plan**	Complaint collection	Zero deficiency in households' electricity supply	Replace more electricity for works supply with generators	To be implemented by the Contractor Under ARL's control Partner: RRA
	Inf-Mit-6	Recycling and reuse of materials	Sorting and recycling of works' solid waste	Works phase **Site and works facilities management and monitoring plan**	Solid Waste management Plan Environmental site visits and works environment supervision	Recycling objective to be proposed by the detailed design	Improve the sorting system and worker sensibilization	To be implemented by the Contractor Under ARL's control
Air quality	Air-Mit-1	Institute a speed limit on all unpaved roads around the site (max 30 km/h)	-	Works phase	Air quality management and monitoring plan	air emission standards	-	To be implemented by the Contractor

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	Air-Mit-2	Regularly water the main roads and areas producing dust	-	**Air quality and noise environment management and monitoring plan**		air emission standards	-	Under ARL's control
	Air-Mit-3	Limit the storage and handling of materials that may create dust	-			air emission standards	-	
	Air-Mit-4	Reduce road traffic to a minimum by optimizing the truck loading for the site supply	-			air emission standards	-	
	Air-Mit-5	Minimize on-site travel distances and avoid as far as possible traffic close to inhabited areas	-			air emission standards	-	
Noise environment	Noi-Mit-1	Avoid night work and limit work during evening period	-	Works phase **Air quality and noise environment management and monitoring plan**	Noise environment management and monitoring plan	noise emission standards	-	To be implemented by the Contractor Under ARL's control
	Noi-Mit-2	Choose the least noisy techniques and equipements	-			noise emission standards	-	
Landscape	Land-Mit-1	Limit the vegetation clearing area during construction	-	Preliminary works (clearance and site installation): before site clearance starts and during working period. Preparation period of every subsidiary construction contract. **Landscape management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Visual check-up Pictures in the monthly environmental report	Compensation planting and seeding, site cleaning	Contractor Under ARL's control
	Land-Mit-2	Prevent encroachment of areas outside designated boundaries	-	Any phase of work **Landscape management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Visual check-up Pictures in the monthly environmental report	Compensation planting and seeding, site cleaning	Contractor Under ARL's control
	Land-Mit-3	Minimize the lighting of construction sites	-	Any phase of work **Landscape management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Visual check-up Pictures in the monthly environmental report	Contractor to change the lighting furnitures and orientation on request	Contractor Under ARL's control
	Land-Mit-4	Minimize visual intrusion	-	Prior to construction works, not later than preparation period of main contractor **Landscape management and monitoring plan**	A landscape architect	Preliminary Visual Assessment control and final report	To be defined in the visual assesment report	Detail Design Engineer and Architects ARL Contractor Under ARL's control
	Land-Mit-5	Ensure that platforms and construction work areas are maintained in a clean and orderly manner	-	Any phase of work **Landscape management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Visual check-up Pictures in the monthly environmental report	Contractor to proceed to cleaning and site management on request	Contractor Under ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	Land-Mit-6	Perform temporary seeding	-	Any phase of work **Landscape management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Regular billing for seeding	Contractor to proceed to seeding on request	Detail Design Engineer and Architects ARL Contractor Under ARL's control
	Land-Mit-7	Temporary fences and earthworks will be arranged to reduce visual intrusion	-	Any phase of work **Site and works facilities management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Visual check-up Pictures in the monthly environmental report	Contractor to adapt fence type and stock piles layout on request	To be implemented by the Contractor Under ARL's control
	Land-Mit-8	Ensure that earth and material storage areas are not located directly on the coast	-	Any phase of work **Site and works facilities management and monitoring plan** **+** **Landscape management and monitoring plan**	An expert such as an environmentalist or a landscape architect	Visual check-up Pictures in the monthly environmental report	Contractor to adapt storage and stock piles layout on request	To be implemented by the Contractor / Detail Design Engineer and Architects Contractor Under ARL's control
	Land-Mit-9	Plantings are designed and arranged to form visual screens to mitigate visual impacts	-	As early as possible Prior to construction works **Landscape management and monitoring plan**	A landscape architect	Detailed Impact Assessment on site and report	To be defined in the Detailed Design report	Detail Design Engineer and Architects ARL Contractor Under ARL's control
	Land-Mit-10	Rehabilitate areas that were temporarily used during construction.	-	During preparation period of every subsidiary construction contract **Landscape management and monitoring plan**	A landscape architect	Visual check-up Photo report Compare Site Pictures before / after	To be defined	Detail Design Engineer and Architects ARL Contractor Under ARL's control
	Land-Mit-11	Favor dispersed relocation building in existing communities	-	Prior to agreement with families **Landscape management and monitoring plan**	Relevant government administration	Construction control	None	RRA Under RRA and ARL's control
	Land-Mit-12	Relocate families outside of the Zone of Visual Influence	-	Prior to agreement with families **Landscape management and monitoring plan**	Relevant government administration	Construction control	None	RRA Under RRA and ARL's control
	Land-Mit-13	Community support in construction process	-	**Landscape management and monitoring plan**				RRA Under RRA and ARL's control
	Land-Mit-14	Establishment of an Airport Urban Development Master Plan to monitor and frame urban development	-	As early as possible Prior to construction works	Designer such as a landscape architect, urbanist or architect	Deliver an Urban Development Master Plan based on site study and three scenarios	None	RRA Under RRA and ARL's control

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
		related to airport activity and ensure sustainable good living conditions		**Landscape management and monitoring plan**				
	Land-Mit-15	Airport buildings and infrastructures to reach architectural quality and soundness	-	All Design Phases Architect selection Construction contract selection Contractor selection Any phase of work **Landscape management and monitoring plan**	Architect in chief to be nominated	Rodrigues tourism officials and representatives demands met on visual representation, exhaustiveness of Detailed Design	None	Detail Design Engineer and Architects ARL Under ARL's control
	Land-Mit-16	Touristic infrastructure to respect the scale of Rodrigues' landscape and sense of place	-	All Design Phases Architect selection Construction contract selection Contractor selection Any phase of work **Landscape management and monitoring plan**	Relevant government administration	Rodrigues tourism officials and representatives demands met on visual representation, exhaustiveness of Detailed Design	None	RRA Under RRA and ARL's control
	Land-Mit-17	Urban development to foster the development of public places and public amenities	-	All Design Phases Architect selection Construction contract selection Contractor selection Any phase of work **Landscape management and monitoring plan**	Relevant government administration	Rodrigues tourism officials and representatives demands met on this particular concern	None	RRA Under RRA and ARL's control
	Land-Mit-18	Establishment of local Urban Development Master Plan to monitor urban development related to tourism growth, to value and enhance the local landscape	-	As early as possible Prior to construction works **Landscape management and monitoring plan**	Designer such as a landscape architect, urbanist or architect	Deliver an Urban Development Master Plan based on site study and three scenarios	None	RRA Under RRA and ARL's control

Table 133: Overall Environmental Management Plan for the construction phase

9.1.2 Environment Management Plans to be implemented for the construction phase

9.1.2.1 Site and works facilities management and monitoring plan

9.1.2.1.1 Environmental provisions and procedures to be implemented for the site and works facilities

This plan should include all the provisions of the site to ensure that the following measures are implemented:

“Wor-Fac”,
all the measures for infrastructures and solid waste management: “Inf-Mit-1 to 6”,
the measures targeting the earthworks methods and the works schedule and phasing (“Phy-Kar-Mit-3 / 4 / 6 / 8 / 10 / 11 / 14 / 20 / 21”, “Land-Mit-7 / 8”),
the measures targeting the engine and people circulation rules inside the works site (“Phy-Kar-Mit-1 / 2 / 10 / 12 / 13 / 15 / 16”),
the measures “Phy-Wat-Av/Mit-4” and “Phy-Kar-Mit-19”.
This plan should be implemented by the contractor and follow the following guidelines. It should include the following procedures:

A waste management and monitoring plan,
An excavated soil management and monitoring plan,
A hazardous material management plan,
A spill risk management plan (Phy-Wat-Av/Mit-4),
A works traffic inside and outside the works site management plan,
A fencing plan and procedure,
A plants monitoring plan.

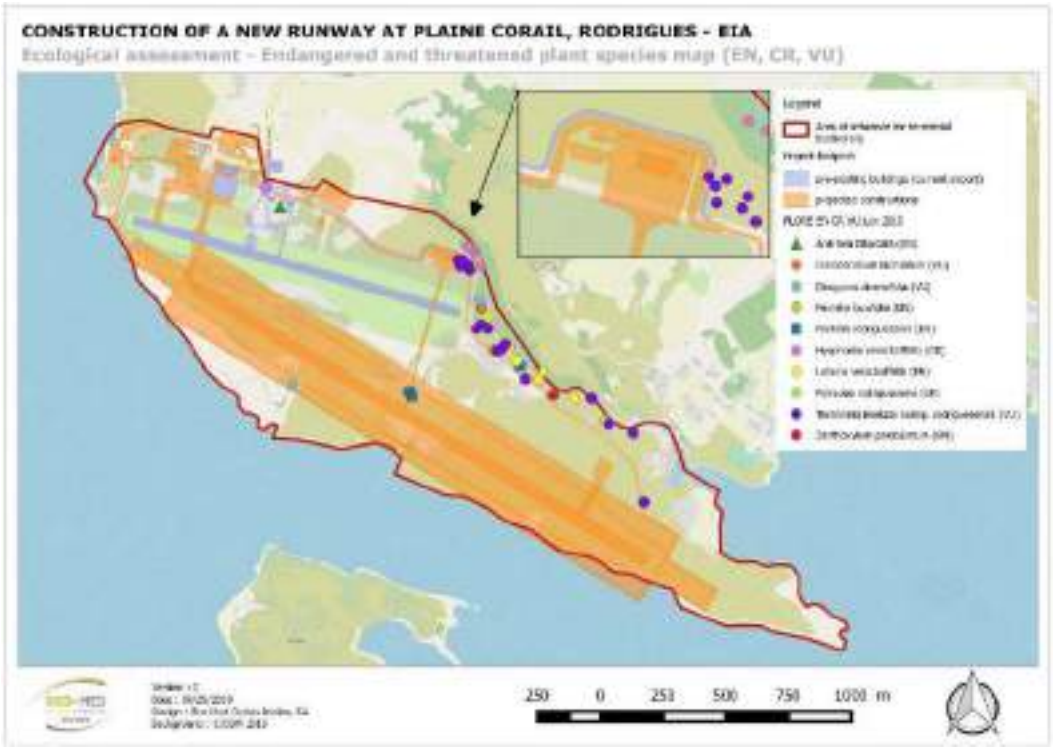
9.1.2.1.2 Plants and facilities

The main site facilities to be provided for the construction of the new runway and other airport project components are as follows:

Base camp,
Wastewater treatment plant,
Desalination plant,
Asphalt plant,
Concrete plant,
Storage and maintenance sheds and hangars,
Crane,
Incinerator.

9.1.2.1.2.1 Location

These facilities should not be located at the level of protected species designated as to be avoided by the project.



9.1.2.1.2.2 Limit emissions

The following standards, promulgated under the Environment Protection Act, apply to all of the site facilities.

First Schedule ***(regulation 3)***

Emission Standards

The following standards are maximum limits for the corresponding pollutant.

Pollutant	*Applicable to*	*Standard*	Applies to project (construction / operational phase)
(i) Smoke	All stationary fuel burning source	Ringelmann No. 2 or equivalent opacity (not to exceed more that 5 minutes in any period of one hour)	X
(ii) Solid particles	(a) Any trade, industry, process, industrial plant or fuel-burning equipment	200 mg/m^3	X
	(b) Any existing trade, industry process or industrial plant using bagasse as fuel	400 mg/m^3	
(iii) Sulphuric acid mist or sulphur trioxide	(a) Any trade, industry or process (other than combustion processes and plants for the manufacture of sulphuric acid)	120 mg/m^3 as sulphur trioxide	X
	(b) Any trade, industry or process in which sulphuric acid is manufactured	30 000 mg/m^3 as sulphur trioxide	
(iv) Fluorine compounds	Any trade, industry or process in the operation of which fluorine, hydrofluoric acid or any inorganic fluorine compounds are emitted	100 mg/m^3 as hydrofluoric acid	X
(v) Hydrogen Chloride	Any trade, industry or process	200 mg/m^3 as hydrogen chloride	X
(vi) Chlorine	Any trade, industry or process	100 mg/m^3 as chlorine	X
(vii) Hydrogen sulphide	Any trade, industry or process	5 ppm as hydrogen sulphide gas	X
(viii) Nitric acid or oxides of nitrogen	Any trade, industry or process in which the manufacture of nitric acid is carried out	2 000 mg/m^3 as nitrogen dioxide	
(ix) Nitric acid or oxides of nitrogen	Any trade, industry or process other than nitric acid plant	1 000 mg/m^3 as nitrogen dioxide	X
(x) Carbon monoxide	Any trade, industry or process	1 000 mg/m^3 as carbon monoxide	X

9.1.2.1.2.3 Focus and the base camp and access roads

The base camp will be designed to accommodate expatriated engineers and workers. It is planned to welcome about 400 people on site.

The following provisions have to be implemented in the Site and works facilities management and monitoring plan:

Provision of all the basic services necessary for the base camp proper functioning and maintenance: sanitary facilities, refectory, accommodation, electricity supply, etc;
Verification of compliance with standards and regulations regarding health, safety and accommodation conditions in the operation of the base camp;
Organisation of a waste management system for the base camp including waste sorting;
Clear and signposted demarcation of the life base;
Regulation of traffic in the life base and on the access roads: planning of access schedules and exceptional convoys;
Planning of a dismantling plan for the base and a rehabilitation of the access roads.

9.1.2.1.2.4 Hangars and sheds

All material storage and maintenance activities must be carried out under the shelter of hangars sized to withstand the particular local climatic conditions.

Hangars and sheds must all have their own pollution containment systems. Maintenance and refuelling hangars must be equipped with their own hydrocarbon separator.

9.1.2.1.2.5 Asphalt and concrete plants

Concrete and asphalt plants must be equipped with filter systems.
Their wastewater must be treated separately from the site wastewater.

9.1.2.1.3 Facilities monitoring

The condition of all site facilities must be weekly checked by a general inspection. The same applies to compliance with all environmental management rules and procedures put in place to respond to measures concerning site installations.

9.1.2.1.4 Person in charge

This plan should be prepared, managed and implemented by the contractor, under ARL's and RRA's relevant commissioners' control.

9.1.2.2 Surface stormwater run-off, drinking and wastewater management and monitoring plan

9.1.2.2.1 Environmental provisions to be implemented

This plan should include all the provisions of the site to ensure that the measures regarding stormwater, wastewater and drinking water resources are implemented : « Phy-Wat-Mit-1 », « Phy-Wat-Comp-2 », « Phy-Wat-Av-3 » et « Phy-Hyd-Mit-1 ».

Refer to section 7 where the detailed measures are described.

A water management plan should be provided by the contractor describing the works facilities envisaged to implement these measures.

The following sections guide the monitoring system to be set up.

9.1.2.2.2 Facilities monitoring and survey

The measures implemented during the works phase will require a monitoring plan of:

- the water quality at the inlet and the outlet of the Water Treatment Plants (both for Drinking Water via the Reverse Osmosis installations and the Sewage Treatment Plant);
- of the stormwater quality at the discharge points at sea.

Therefore, a regular manual sampling/analysis (tentatively once a week) and visual controls of the different works implemented (buffer storage and associated equipment: valves and automatic real time monitoring instrumentation on main parameters usually monitored) will be necessary.

Regarding the water quality, the analysis results shall be compliant with the standards promulgated under the Environment Protection Act, and will be submitted to local authorities once a month. In case of non-compliance, for each installation, the outlet should be stopped and information conveyed to relevant local authorities/client for remedial measures. The remedial measures include direct pumping of non-compliant water/effluents for proper evacuation and elimination.

However, regarding the treatment works, adequate Operation & Maintenance tasks, under the supervision of the Client, should enable to avoid the risks mentioned above. These include the following specific tasks for operation and maintenance of the treatment plant:

Water analyses = 4h per week
Electromechanical tasks = 4h per week per Treatment Plant + 2h per month per pumping station
Current O&M tasks = 10h per week per treatment Plant + 2h per week per pumping station
Oversight 24h/24h = intervention whenever required (alarm, breakdown), with remote information available, considering the implementation of a minimum remote operation monitoring equipment.

Regarding the buffer storage works and oil separators for stormwater run-off, following regular visual controls, maintenance tasks shall be required and carried out, including mainly pumping of sedimentation materials and floats (oil spills), or replacement of monitoring instrumentation if deemed necessary.

9.1.2.2.3 Person in charge

This plan should be prepared, managed and implemented by the contractor, under ARL's and RRA's relevant commissioners' control.

The basic monitoring tasks should be carried out by a qualified technical worker.

The specific operation and maintenance tasks for the treatment plants should be carried out by 2 skilled technicians + 1 on stand-by whenever required. The skills required include:

A technician with good qualifications in water analysis.
A technician with good qualifications in electromechanics.
All O&M personnel shall have good Computer skills.

9.1.2.3 Karst monitoring plan

9.1.2.3.1 Environmental provisions to be implemented

This plan refers to measures “Phy-Kar-Mit-5 / 7 / 18” and aims to guide the development of a robust and comprehensive karst monitoring system from both a hydrogeological and geotechnical perspective.

“Phy-Kar-Mit-17” which concerns the sediments displacement must be implemented under ARL’s control by a specialist prior to the works. ARL should draw up and implement a plan to follow the sediments moving and storage.

9.1.2.3.2 Groundwater quality monitoring plan

This plan consists to identify changes in groundwater quality and flow regime during working and operation phases.

This plan must be implemented:

- Before the working phase to define reference values of water quality and groundwater levels;
- During the working and operation phases to identify any changes of indicators.

This plan consists in:

- Installation of a network of observation wells:
    - Upstream (minimum of 3 observation wells; depth up to 5 meters below groundwater level).
    - Downstream – between facilities and shoreline - (minimum 5 observation wells; depth up to 2 meters below groundwater level). Multi-piezometers must be considered to be installed in each downstream borehole: The deeper must be installed below zero mean sea level and the other between the groundwater level and the zero level.
- Implementation of monitoring program:
    - Groundwater level measurement;
    - Groundwater sampling and in-situ parameters analysis;
    - Sampling frequencies: A first sampling campaign must be carried out in all observation wells before work begins. Downstream well sampling should be conducted on a monthly basis during the construction phase and semi-annually during operations;
    - Parameters analysis of groundwater: The first samples will be fully analysed according to current national water quality standards (number of parameters and threshold values). At a minimum, the Dissolved Priority Pollutant Metals (see note) should be analysed as well as petroleum hydrocarbons.

Note: According to US EPA the 13 Dissolved Priority Pollutant Metals are : Arsenic, barium, cadmium, chromium, Lead, mercury, selenium, Silver, copper, Iron, manganese, Zinc and Sodium.

The groundwater quality monitoring program will be adjusted based on the results of the first analyses.

The performance indicators are the following:

- Groundwater level: Drastic change of initial groundwater levels.
- Groundwater quality:
  - Detection of hydrocarbons in a sample
  - Dissolved Priority Pollutant Metals: Change of more than 20% of threshold values
- Abnormal odor of kerosene, diesel, gasoline or other products used on the site.

In case of insufficient performance, the corrective measures are the following:

- Identification of the source of contamination;
- Stop the source of contamination if it is properly identified;
- In the case of an oil spill: activate the oil spill contingency plan.
- Implementation of depollution protocol and set up a contaminant recovery system depending on the nature of the contaminant.

9.1.2.3.3 Caves Monitoring Plan

This plan aims to carry out a complete survey prior to the works and then monitore the earthworks, construction and airport operation impact on the caves.

ARL should be responsible of this plan as it should be carried out in a coherent way before, during and after the works. A cave expert should be mandated to carry out theses surveys, and could teach and coordinate the contractor and airport environment specialists in charge of the local monitoring.

The initial survey should include the description of the followings:

- Internal factors:
  - Geological characteristics
  - Fracturation
- External factors:
  - Presence of water flow through the cave
  - Surface vegetation upon the caves (and roots impact on the cave opening)
  - Temperature, airborne moisture and airflow inside the cave
  - Pollution traces

During the works, the following monitoring should be carried out:

- Internal factors:
  - Geological characteristics: monitoring of sedimentation compaction inside caves by visual inspection and analysis (description, thickness, sampling and analysis);

  - Fracturation: before and after the blasts, monitoring of strata behaviour (number of fracture traces) as well as count inventory of collapsed blocks located at the ground surface of the cave will be carried out. This will be observed by visual inspection (mapping of fractures network, measurement of fractures orientation);
- External factors :
  - Vibrations: monitoring of vibrations with seismographs located inside the caves (at ground surface and on walls of caves). (3 seismometers per main cave).
    - ***Note***: In parallel and above works phase, vibration consultant to provide a blasting plan comprising hole size, depth, spacing, burden, type of explosives, type of delay sequence, maximum amount of explosive on any one delay period, depth of rock, and depth of overburden if any. The vibration consultant will not be allowed to increase the maximum explosive charge weights per delay included in the plan without the approval of the contractor and airport environment specialists. Record of each blast (date, time and location, amount of explosives used, maximum explosive charge weight per delay period) will be kept by ARL over the whole work period to be consulted by specialists.
  - Water flow: permanent groundwater monitoring (see groundwater monitoring plan);
  - Temperature, airborne moisture and airflow: general characterization of lint removal activities, analysis of dust/lint accumulation plates, analysis of airborne dust/lint. This survey needs sampling and analysis;
  - Pollution traces: visual monitoring of man-induced pollution (oils, wastes, mapping/inventory of visitor impacts, monitoring of cave chemistry) observed by visual inspection and analysis (description, sampling and analysis).

This monitoring should be carried out:

- Once after the first explosive tie and then twice a week during the open blasting works,
- Every two weeks the, during the whole works phase.

This frequency should be increased for the main caves monitoring (Petit Lac and Grotte Fougere, and Caverne Bouteille), up to every day. In the less important caves, a simple visit on visual criterias should be done every month.

At this stage, signs which should lead to stop the works and find other construction methods or additional protections will be assessed by determining acceptable levels of impact on caves in consultation with specialists of cave on different topics, such as:

  - Fracturation: permissible increasing percentage of fractures (length and spacing), in cm, to be determined from ground observations;

- Vibrations: permissible Peak Particle Velocity (PPV) in mm/s, to be determined based of ground vibration natural frequency ranges of caves. The exceeding the threshold will lead stopping the works;
- Water flow: retained maximum groundwater level (in case of wet caves), to be determined based on groundwater monitoring over a minimum 6 months records period (12 months recommended);
- Temperature, airborne moisture and airflow: retained maximum degrees and percentages of moisture of the air inside the caves.

Note that all retained impact levels should be applied thanks to cave preservation strategy, depending on the key aspect to be preserved (karstic heritage, drinking water source or no interest).

9.1.2.3.4 Person in charge

This plan should be managed by the following persons:

- Spill Response Team Leader;
- ARL;
- Construction contractor during work phase;
- Mauritius authorities:
  - Environmental Assessment Division;
  - Pollution Prevention and Control Division;
- (WRU) Water Ressources Unit.

9.1.2.4 Marine environment monitoring plan

9.1.2.4.1 Provisions to be implemented

This plan should include all the provisions of the site to ensure that the measures regarding with the marine environment: turbidity and currents, but also marine biodiversity are implemented:

- “Phy-Mar-Mit-1 / 2 / 4 / 5” and “Phy-Mar-Av-3”,
- “BioM-Mit-1 / 2” and “BioM-Av-3”.

The measures’ descriptions should be read in section 7 as this chapter doesn’t provide an exhaustive description of all measures. The following sections guide the monitoring system to be set up.

9.1.2.4.2 Current and turbidity monitoring

The current affects the extent and the direction of the turbid plume while a high turbidity level endangers corals and natural fauna.

This plan must be implemented:

Before the working phase to evaluate initial state conditions during dry and wet season (2 months minimum each) to determine alert and stop thresholds;
During the works phase, and measurements should begin at least one day before commencement;

A few months after the works phase is achieved until the turbidity has returned to its original value.

This plan consists in the:

Installation of a current profiler ADCP (Acoustic Doppler Current profile) and a turbidimeter;
Measure of turbidity and current every 3 hours in 3 locations:
In the channel between Crab Island and the mainland;
South of Plaine Corail to monitor the entrance of Anse Quitor;
Near the corals at the entrance of Topaze Bay (Pointe Palmiste).

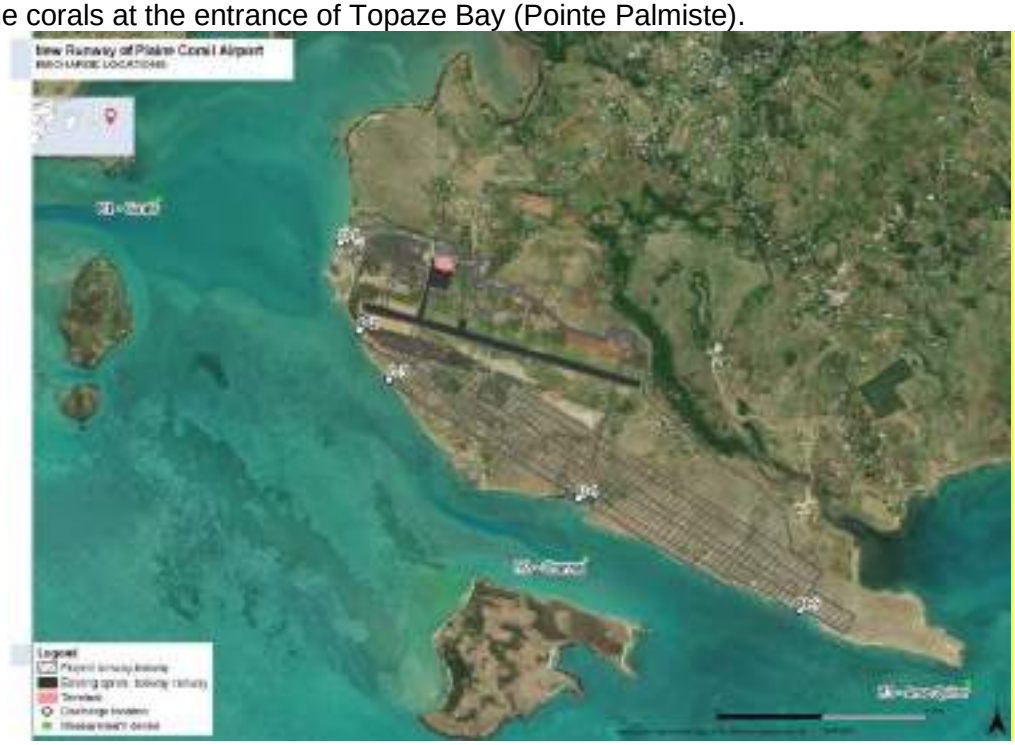


Figure 188 Localization of the potential sediment discharges to the lagoon during works phase and current-meter

The performance indicators are the following:

Turbidity:
Duration over an alert and a stop threshold;
Number of exceedances over a threshold;
Maximum concentration tolerated;
Current magnitude (m/s) and direction (°):
Duration of reverse current > 6 hours;
Number of exceedances over a magnitude threshold;
Maximum magnitude tolerated.

In case of insufficient performance, the corrective measures are the following:

Decrease of the released flow;
Temporary stop of the sediment discharge;
Temporary stop of the dredging;
Implementation of depollution protocol.
Turbidity threshold will be fixed in consultation with stakeholders after the first result of the measurement campaign.

This plan should be implemented and managed by the following people:

External Engineering consultancy will install and determine the initial state;
Airport of Rodrigues insures the adequate state of the buoy;
Construction and dredging company project managers for the works verify the performance indicator results in real time.

9.1.2.4.3 Coral Reef Protection and monitoring

This plan consists in implementing an ecological diagnosis and assessment of the health status of corals at Pointe Palmiste.

This plan must be implemented:

Before the works phase (during 2 years)
During the works

This plan consists in the:

Installation of beaconing and prohibition of access + monitoring / restoration
Communication on coral habitats and their fragility (effects of water heating, trampling, etc.) among the population and local stakeholders in order to raise awareness

The performance indicators are the following:

Coral recovery rate;
Algae recovery rate;
Roughness;
Study of coral reefs (specific richness, recovery rate, morphotypes);
Study of fish populations (density, ecological structure, fisheries interest).

In case of insufficient performance, the corrective measures are the following:

Decrease of the released flow;
Temporary stop of the sediment discharge;
Temporary stop of the dredging.

This plan should be implemented and managed by the following people:

Shoals Rodrigues in partnership with SEMPA.

9.1.2.4.4 Marine works monitoring plan

This plan aims to ensure that the major marine biological issues in the project area are preserved (coral reef at Pointe Palmiste and marine turtles).

This plan must be implemented during the construction works.

This plan consists in:

Visual surveillance by boat, on foot;
Permanent exchange with the various stakeholders of the site;

The performance indicators are the following:

Ensure that the floating boom is properly installed;
Visual monitoring of corals at Pointe Palmiste in relation to the turbid plume;
Monitoring of alert thresholds and work stoppage thresholds (turbidity monitoring);
Visual surveillance of the maritime area, check for the absence of marine turtles.

In case of insufficient performance, the corrective measures are the following:

Decrease of the released flow;
Temporary stop of the sediment discharge;
Temporary stop of the dredging;
Implementation of depollution protocol;
Ask for the optimal position of the floating boom;
Stopping work if marine turtles are present and come to lay eggs on the beaches near the project.

This plan should be implemented and managed by the following people:

Construction and dredging company project managers for the works verify the performance indicator results in real time.

9.1.2.5 Air quality and noise environment management and monitoring plan

9.1.2.5.1 Provisions to be implemented

This plan should include all the provisions of the site to ensure that the measures air quality and the noise environment anre implemented:

“Phy-Kar-Mit-9”,
“Air-Mit-1 to 5”,
and “Noi-Mit-1 & 2”.
The measures’ descriptions should be read in section 7 as this chapter doesn’t provide an exhaustive description of all measures. The following sections guide the monitoring system to be set up inorder to monitor changes in air quality and noise levels to which local residents are exposed, to ensure that the recommended thresholds are not exceeded, and if so, implement the necessary measures.

The following plans should be provided and implemented by the contractor:

Air quality moanagement and monitoring plan,
Noise environment management and monitoring plan.

9.1.2.5.2 Impact study recommendations

9.1.2.5.2.1 Air quality monitoring plan to be implemented during construction phase

Monitoring of dust deposition and PM10 throughout the entire construction phase;
Residential areas located near the site and the school are the preferred locations, as well as the locations chosen for the air quality baseline measurement campaign,
Monitoring data must be analysed regularly and reports must be submitted periodically, in order to quickly identify an overrun of the defined thresholds. A monthly report and an annual summary are recommended. If permanent monitoring is not carried out, it is recommended to

make measurements at least during the phases of work that have the greatest impact on air quality.

9.1.2.5.2.2 Noise environment plan to be implemented during construction phase

Monitoring of noise levels throughout the entire construction phase;
Residential areas located near the site and the school are the preferred locations, as well as the locations chosen for the noise baseline measurement campaign;
Monitoring data must be analysed regularly and reports must be submitted periodically, in order to quickly identify an overrun of the defined thresholds. A monthly report and an annual summary are recommended. If permanent monitoring is not carried out, it is recommended to make measurements at least during the phases of work that have the greatest impact on noise environment.

9.1.2.5.3 Objectives

The monitoring plan during the construction phase and during the operational phase must identify whether the air quality and noise level thresholds remain within acceptable limits. They also make it possible to assess the effect of reduction measures, if any.

First Schedule ***(regulation 3)***
Emission Standards
The following standards are maximum limits for the corresponding pollutant.

Pollutant	*Applicable to*	*Standard*	Applies to project (construction / operational phase)
(i) Smoke	All stationary fuel burning source	Ringelmann No. 2 or equivalent opacity (not to exceed more that 5 minutes in any period of one hour)	X
(ii) Solid particles	(a) Any trade, industry, process, industrial plant or fuel-burning equipment	200 mg/m^3	X
	(b) Any existing trade, industry process or industrial plant using bagasse as fuel	400 mg/m^3	
(iii) Sulphuric acid mist or sulphur trioxide	(a) Any trade, industry or process (other than combustion processes and plants for the manufacture of sulphuric acid)	120 mg/m^3 as sulphur trioxide	X
	(b) Any trade, industry or process in which sulphuric acid is manufactured	30 000 mg/m^3 as sulphur trioxide	
(iv) Fluorine compounds	Any trade, industry or process in the operation of which fluorine, hydrofluoric acid or any inorganic fluorine compounds are emitted	100 mg/m^3 as hydrofluoric acid	X
(v) Hydrogen Chloride	Any trade, industry or process	200 mg/m^3 as hydrogen chloride	X
(vi) Chlorine	Any trade, industry or process	100 mg/m^3 as chlorine	X
(vii) Hydrogen sulphide	Any trade, industry or process	5 ppm as hydrogen sulphide gas	X
(viii) Nitric acid or oxides of nitrogen	Any trade, industry or process in which the manufacture of nitric acid is carried out	2 000 mg/m^3 as nitrogen dioxide	
(ix) Nitric acid or oxides of nitrogen	Any trade, industry or process other than nitric acid plant	1 000 mg/m^3 as nitrogen dioxide	X
(x) Carbon monoxide	Any trade, industry or process	1 000 mg/m^3 as carbon monoxide	X

9.1.2.5.4 Performance indicators

The performance indicators to be taken into consideration are:

the difference between the thresholds to be reached and the measured pollution and noise levels,
the number of actions implemented if the thresholds are exceeded,
the reduction of noise or pollutant concentration following the implementation of mitigation measures.

9.1.2.5.5 Management strategy

The monitoring plan includes the following elements:

choice of pollutant thresholds and noise levels not to be exceeded, based on local standards or international recommendations,
determination of the locations for the measurements, and choice of the values to be measured (pollutants, noise indicators),
choice of a service provider,
analysis and possible publication of the results of the measurements,
implementation of reduction measures in the event of exceeding the thresholds.

9.1.2.5.6 Reports

It is recommended to produce monthly and/or annual reports of the results of the measurements.

These reports will detail the methodology used, the location of the measurement points, the results, the comparison with and justification for the thresholds, any mitigation measures and the monitoring of their effectiveness.

9.1.2.5.7 Person in charge

This plans should be implemented by the contractor, under ARL's control.

9.1.2.6 Biodiversity management and monitoring plans

9.1.2.6.1 Avoidance and Offset measures

"BioT-Av-1" and "BioT-Av-2" are avoidance measures and must be implemented from the detailed design under ARL's control.

"BioT-Mit-4 and 5" are referred to as a mitigation measure because of its low chance of success. However they should be managed as offset measures: from prior to the works under biodiversity specialists management, within the context of specific contracts and under ARL and RRA's control.

"BioT-Comp-6" is an offset measure to be carried out by the Rodrigues authorities throughout the island.

"BioT-Comp-7" is an offset measure to be carried out by biodiversity specialists under ARL and RRA's control.

Details of these measures are provided in section 7. Implementation managers, performance indicators and monitoring systems are described in the previous paragraph (9.1.1) and should be implemented under the control of ARL and RRA.

ARL should provide and implement:

a management plan to follow the implementation of measures to be implemented before the works phase (BioT-Av-1 and 2 / BioT-Mit-4 and 5),
a management plan to follow the measures to be carried out by RRA on an island scale (BioT-Comp-6 / BioT-Comp-7).

9.1.2.6.2 Mitigation measures

“BioT-Mit-3 and 8” are mitigation measures to be carried out from the beginning of works, under biodiversity specialists management, within the context of specific contracts and under ARL and RRA’s control.

The measures’ descriptions should be read in section 7 as this chapter doesn’t provide an exhaustive description of all measures.

ARL should provide and implement a management plan to manage and follow the implementation of these measures BioT-Mit-3 and 8.

9.1.2.7 Landscape management and monitoring plan

9.1.2.7.1 Measures to be carried out within the airport area and under ARL’s control

Measures “Land-Mit-1 / 2 / 3 / 4 / 5 / 6 / 8 / 9 / 10 / 15” will be implemented within the airport and works site area and should be prepared from the detailed design, them implemented by the contractor and monitored by ARL’s landscape and environment specialist.

The measures’ descriptions should be read in section 7 as this chapter doesn’t provide an exhaustive description of all measures.

The **detailed design** should include a landscape management plan for the works phase referring to the Land-Mit-4 / 6 / 8 / 9 / 10 / 15 as they address design, phasing, site organization and costs.

ARL should provide and implement a management plan to follow the implementation of measures to be implemented before the works phase

A procedure for landscape measures management and monitoring including maps should be provided **by the contractor** prior to the works. This procedure should refer to Land-Mit-1 / 2 / 3 / 4 / 5 / 6 / 8 / 9 / 10 and follow the design guidance as far as Land-Mit-/ 4 / 6 / 8 / 9 / 10 are concerned.

During the construction phase, these measures should be monitored by a landscape specialist through regular (monthly) site visits. Between each visit of specialist, a weekly visit should be done in order to implement a visual check up of:

Fences,
General cleanliness and condition,
Location of the storage sites,
Plantings works.

The person in charge for the management of these procedures are the consultant and then the contractor, under ARL’s control.

9.1.2.7.2 Measures to be implemented on an island scale under RRA's responsibility

Measures "Land-Mit-11 / 12 / 13 / 14 / 16 / 17 / 18" consist in implementing actions depending on RRA's authority.

The measures' descriptions should be read in section 7 as this chapter doesn't provide an exhaustive description of all measures. They should be implemented from the beginning of works, under a landscape specialists management, within the context of specific contracts and under RRA's control.

ARL should provide and implement a management plan to follow the measures to be carried out by RRA on an island scale.

9.1.3 Emergencies management plans

Provision for Emergency Preparedness and Response is a prerequisite under section 19 of the ESS4: Community Health and Safety.

9.1.3.1 Oil spill or accidental pollution management

In the event of an oil spill on the ground, two scenarios are possible:

- The oil is contained in the topsoil;
- Oil seeps into the groundwater until it reaches the groundwater and ca flow to the sea.

The karstic aquifer in Plaine Corail is very vulnerable to surface discharge (direct access to groundwater through surface cavities). Any hydrocarbon spill should be reported directly to ARL for a decision on whether to initiate the emergency plan depending on the volume of oil spilled and the nature of the surrounding soil.

The practical thresholds for significant (reportable) spills of petroleum products are usually as follows:

- Land-based spills: 70 L;
- Spills directly on water: Any amount.

In the event of an accidental spill of contaminant on the soil, if it has been able to infiltrate deeper layers, changes in groundwater quality should be monitored through monitor well network.

An Oil Spill Emergency Plan must be implemented in detail before the initial earthwork phase.

The objectives of an Oil Spill Emergency Plan are:

- To minimize the risk of spills or unplanned situations that might cause environmental harm;
- To ensure that contingency measures are in place and implemented in the event of such spills or unplanned situations.

9.1.3.1.1 Land-Contamination

During the work phase, the Oil Spill Emergency Plan should consist to:

- Stop all earthworks within a (i.e.) 10m radius of the area where the suspect material/
- emission/discharge has been recorded.

- Immediately notify the site supervisor.
- Cordon off the area as practicable with a suitable barrier.
- Work shall not resume or commence within a 10m radius of the area unless authorised by the Environmental Manager and CLS.

While the risk of spills cannot be completely prevented, the risks can be minimised and are well within acceptable bounds.

There are two main potential sources of fuel spills at an airport:

- From where the fuel storage takes place
- From where the aircraft are filled

Initial Actions to be taken after Fuel Spill reported as to be prepared and presented in the Outline Fuel Spill Contingency Response Plan. The key features which should be included in the spill response are:

- identification of the source of spill;
- reporting to relevant Authorities;
- ensure the health and safety of personnel and then order an emergency shutdown measures needed to stop or minimize further spillage;
- A rapid initial assessment is conducted:
    - Risk of harm to human health ;
    - Probable quantity of contaminant spilled ;
    - Type of contaminants;
    - Location of the spill ;
    - Probable source and cause;
- containment of leaking fuel;
- recovery and processing of free fuel;
- sampling the piezometers
- clean up methodology; and
- handling and disposal protocols.

If the spill is directed directly to the sea by runoff and not via infiltration and aquifers, a Maritime Oil Spill Response Plan to be implemented (see further).

As a perfect example for an oil spill emergency response in an airport environment, the Spill Prevention and Response policy of the Melbourne airport is proposed in detail in annex.

The response to a spill should involve four stages – Control, Containment, Contact and Clean.

9.1.3.1.1.1 Control

Immediate action should be taken to secure the site and prevent further material from spilling, but only when it is safe to do so. These actions can include:

- Turning off any ignition sources

- In the case of a punctured drum, the drum can be rolled over so the puncture is on top. This should prevent further spilling of material
- Larger containers which are leaking should be moved quickly to a bunded area
- Valves or pumps should be turned off to stop leaks from pipes and fittings

9.1.3.1.1.2 Containment

Action should be taken as soon as possible to contain the spill in order to stop the material entering stormwater drains, contaminating soil or groundwater.

- Spills should be contained using absorbent material
- Any stormwater drain should be protected first by forming a “dam” of absorbent material around the drain
- Spilled material should then be contained by forming a “dam” of absorbent material around the spill

9.1.3.1.1.3 Clean

Absorbent materials such as diatomaceous earth or polypropylene are the preferred products for the cleaning of any spills. These products absorb the spilt material leaving no residue and have no detrimental impact on the environment. A list of approved cleaning materials must be identified in the Emergency Response Plan.

All contaminated soil must be stored and disposed of in accordance with local environmental standards.

9.1.3.1.1.4 Contact

As soon as practicable, the spill must be reported to Airport Autorities (ARL) and Spill response team leader.

9.1.3.1.2 Groundwater contamination

In the most unfavourable case where the contamination reaches the karst aquifer of the Coral Plain, the following particularities of contaminant transport must be considered:

- The transport of the contaminant to the sea could be very fast
- The exact underground flow path is generally not known

9.1.3.1.2.1 Groundwater sampling

As soon as a major spill likely to reach groundwater occurs, groundwater sampling in the downstream observation wells should be implemented. The analyses will focus specifically on the nature of the contaminant.

9.1.3.1.2.2 Groundwater decontamination

A company specializing in soil and groundwater remediation should be contacted immediately to assess the situation and propose appropriate measures to address it:

- Assess the nature and extent of the contamination
- Contain contamination
- Recover the contaminant and decontaminate the aquifer
- Treat contaminated water

- Dispose of contaminated materials (soil and water)

The free phase of the hydrocarbons must be pumped as quickly and efficiently as possible by the contractor. Depending on the direction of groundwater flow, underwater resurgences must be monitored, and a Maritime Oil Spill Response Plan must be implemented.

9.1.3.1.3 Marine contamination

9.1.3.1.3.1 Containment

Action should be taken as soon as possible to contain the spill in order to stop the material entering stormwater drains, contaminating soil or groundwater.

- Spills should be contained using absorbent material
- Any stormwater drain should be protected first by forming a “dam” of absorbent material around the drain
- Spilled material should then be contained by forming a “dam” of absorbent material around the spill
- Temporary floating barriers (booms) should be used to contain marine spills

9.1.3.1.3.2 Clean

Absorbent materials such as diatomaceous earth or polypropylene are the preferred products for the cleaning of any spills. These products absorb the spilt material leaving no residue and have no detrimental impact on the environment. A list of approved cleaning materials must be identified in the Emergency Response Plan.

All contaminated soil must be stored and disposed of in accordance with current environmental standards.

If groundwater is contaminated, decontamination measures must be taken immediately. The free phase of the hydrocarbons must be pumped as quickly and efficiently as possible. Depending on the direction of groundwater flow, underwater resurgences must be monitored and an emergency plan for the containment of contamination at sea must be implemented.

If sea water is contaminated, when the benefit of the clean-up is less than the potential harm caused to remove of the spill, spilled oil products are allowed to degrade naturally. A monitoring program is implemented to ensure there are no unforeseen threats to ecosystems.

In case of a large volume threatening spills into the sea, the use of dispersants could be considered. This chemical agent aids biodegrading by forming tiny oil droplets, making them more available for microbial degradation.

Tarred sand must be removed with appropriate equipment supplied by the state or contactors and transported to a secure disposal site.

Once clean-up operations are achieved, consideration will be given to restore areas identified as having high environmental sensitivity and value.

9.1.3.2 Fire Emergency Plan

In case of a Fire Fighting event on the new runway, it is envisaged to confine the corresponding volume in a storage tank of 240 m^3 to be implemented at each extremity of the new runway. The storage volume is based on the usual prevailing rules for confining water from fire fighting.

It is proposed to consider here 2 hydrants operating at a flow rate of 60 m^3/h each during 2 hours.

The water from firefighting will be collected by the slot drains and conveyed to the dedicated storage tanks where it will be confined by a specific valve arrangement and evacuated later by dedicated pumping.

9.1.3.3 Archaeological or patrimonial chance find procedure

Despite the fields and fact-findings visits, the construction stages of the project are moments of possible discoveries of cultural or ethnological heritage, which are then fortuitous discoveries.

Specialists in the field, ethnologists or archaeologists, must carry out a preliminary assessment, using an open methodology, to determine whether the incidental discovery is part of the cultural or archaeological heritage. Once this has been done, and in the event of a positive response, an investigation process must be put in place. The survey is carried out according to a usual pattern. As works phase is in progress, the process must then be completed quickly.

9.1.3.3.1 Ethnological heritage (very low probability of discovery)

The first step is to manage the local populations reaction. Subcontractors must first be trained or informed on this subject so that they adopt the right attitude : to display ignorance of the presence of a heritage site, apologize, and stop all works immediately.

In the event of discovery by a worker, the approach is the same. A sitting is initiated and the work suspended. The local population must come and see by itself.

A chance discovery during the course of the work implies the urgent implementation of the entire usual investigation procedure. This will logically be followed by a further investigation and a decision on the way to manage.

It is important that the contractor uses competent people to identify the nature of the heritage. A final report should be written once the required processing has been completed.

Activities can only be resumed after information, consultation and approval of local authorities.

The contractor must provide a document specifying its internal procedure as far as chance discoveries are concerned. This may include, for example, establishing a good internal flow of information, allowing, for example, broad communication on the progress of work and the timetable for investigations.

9.1.3.3.2 Cultural / archaeological heritage

The registration of all discovery sites, carried out in a methodical manner, should include:

- The name and GPS coordinates;
- The descriptive summary of the archaeological land and material encountered, photographed and referenced,
- Suggestions for a on-site intervention if the concentration of archaeological objects is very high. However, in the case of significant layers of sediment, a thorough archaeological survey will be required. A preventive archaeological mission will then

be proposed including an initial 1 m² borehole, the depth of which depending on the sediment's thickness and stability. This first borehole will establish whether there is archaeological material in surface and stratigraphic context. If yes, a 1 m² excavation will be carried out. If the thickness of the sediment is greater than 50 cm, a dating will be proposed using the OSL (Optically Stimulated Luminescence) method.
Anyway, according to the exceptional conservation of the archaeological material, it will be necessary to collect all the objects on the total surface of the site, as well as to allow a thorough study before an official delivery to the appropriate institution (museum, laboratory, etc.).

9.1.4 Summary of plans to be drawn up for environmental management during the construction phase

Table 134: Summary of Required ESMP– Environmental Plans - Construction Phase

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control	Activity / Procedures to include
Site and works facilities management and monitoring plan	Wor-Fac Inf-Mit-1 to 6 Phy-Kar-Mit-1 / 2 / 3 / 4 / 6 / 8 / 10 / 11 / 12 / 13 / 14 / 15 / 16 / 19 / 20 / 21 Phy-Wat-Av/Mit-4 Phy-Kar-Mit-19 Land-Mit-7 / 8	To be implemented by the Contractor Under ARL's control	- A waste management and monitoring plan, - An excavated soil management and monitoring plan, - A hazardous material management plan, - A spill risk management plan (Phy-Wat-Av/Mit-4), - A works traffic inside and outside the works site management plan, - A fencing plan and procedure, - A plants monitoring plan
Surface stormwater run-off, drinking and wastewater management and monitoring plan	Phy-Wat-Mit-1 Phy-Wat-Comp-2 Phy-Wat-Av-3 Phy-Hyd-Mit-1	To be implemented by the Contractor Under RRA and ARL's control	- A water management plan - A desalination skid, wastewater treatment plant and ponds monitoring - A water quality monitoring
Karst monitoring plan	Phy-Kar-Mit-5 / 7 / 18	To be implemented by the Contractor Under RRA and ARL's control	- Groundwater monitoring plan - Caves monitoring plan
	Phy-Kar-Comp-17	External specialist Under ARL's control	- A plan to follow the sediments moving and storage
Marine environment monitoring plan	Phy-Mar-Mit-1 / 2 Phy-Mar-Av-3	External consultancy engineering Under ARL's control	- Current and turbidity monitoring plan
	Phy-Mar-Mit-4 / 5	Contractor Under ARL's control	- Marine Works monitoring plan
	BioM-Mit-1 / 2 BioM-Av-3	Shoals Rodrigues / SEMPA	- Coral reef protection and monitoring

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control	Activity / Procedures to include
		Under ARL's control	
Air quality and noise environment management and monitoring plan	Phy-Kar-Mit-9 Air-Mit-1 to 5 Noi-Mit-1 / 2	To be implemented by the Contractor Under ARL's control	- Air quality management and monitoring plan - Noise environment management and monitoring plan
Biodiversity management and monitoring plan	BioT-Av-1 and 2 BioT-Mit-4 and 5 BioT-Comp-6 BioT-Comp-7	External biodiversity specialists / RRA services Under RRA and ARL's control	- A management plan to follow the implementation of measures to be implemented before the works phase (BioT-Av-1 and 2 / BioT-Mit-4 and 5) - A management plan to follow the measures to be carried out by RRA on an island scale (BioT-Comp-6 / BioT-Comp-7)
	BioT-Mit-3 and 8	External biodiversity specialists / Contractor Under ARL's control	- A management plan to manage and follow the implementation of measures BioT-Mit-3 and 8.
Landscape management and monitoring plan	Land-Mit-1 / 2 / 3 / 4 / 5 / 6 / 8 / 9 / 10 / 15	Detail Design Engineer and Architects ARL Under ARL's control	- A management plan to follow the implementation of measures to be implemented before the works phase (Land-Mit-4 / 6 / 8 / 9 / 10 / 15)
		Contractor Under ARL's control	- A landscape management and monitoring plan during the construction works (Land-Mit-1 / 2 / 3 / 4 / 5 / 6 / 8 / 9 / 10)
	Land-Mit-11 / 12 / 13 / 14 / 16 / 17 / 18	RRA Under RRA and ARL's control	- A management plan to follow the measures to be carried out by RRA on an island scale
Emergencies management plans		Contractor Under ARL's control	- Oil spill management plan - Fire Emergency plan - Archeological or patrimonial chance find procedure

9.2 Preliminary Social Management Plan for construction phase

The social impact assessment evaluated a number of potential impacts. The Social Management Plan (SMP) proposes actions that permit mitigation of adverse impacts or enhancement of positive impacts. These different actions are organised through plans which need to be coordinated and the implementation methods of which must be harmonised.

The SMP is primarily the articulation of the responses to the identified impacts and the expression of the willingness to work towards the social integration of the project. The primary objective is therefore twofold, on the one hand to limit degradations, on the other hand to promote sustainable development in the area of intervention of the project which allows the development of the populations and of society.

The SMP offers a number of transversal tools that facilitate the development and use of these different plans. An institutional montage is proposed which clarifies the role and responsibilities of the various actors for their implementation.

9.2.1 Preliminary Social Management Plan for construction phase

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
Communication Ensure a harmonious implementation of the work at all stages of its performance with all the communities directly or indirectly impacted by the project **Communication plan**	**SE-Comp-1**- Implementation of a Resettlement Action Plan (RAP).	The RAP necessarily includes the establishment of communication with the affected communities to provide detailed information on the project, the issues it represents in general for the Rodrigues population and the issues of physical and economic displacement.	The relocation plan must be finalized before the works begin.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly Relocation Plan Report to be submitted by the Relocation Committee at the end of relocation plan and before resettlement.	- Number of communication activities carried out; - Number of communication media produced and distributed; - Number of organized sessions, meetings or information workshops; - Number of information activities organized.	Organise additional communication activities or meeting sessions in case of insufficient communication with involved stakeholders.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Airport of Rodrigues - Spokesperson of the village Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location
	SE-Mit-3- Complaint management and internal support for relocation.	An outcome of the RAP, complaint management is the attentive listening to the affected populations regarding relocation. It must be effective and transparent in order to take into consideration and share all the grievances expressed by the communities in order to define appropriate communication and support strategies.	The complaint management plan covers the entire project: from the implementation of the resettlement plan and throughout the period of adaptation of the displaced communities.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly Quarterly reports to be submitted by the Relocation Committee until full adaptation of resettled population	- Number of registered complaints and reports on actions taken for complaint management.	Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	
	SE-Mit-5- Communication plan concerning the integration of external workers.	The project will bring in foreign and specifically qualified labour. It is important to communicate about a considerable and temporary advent of an external population and to ensure transparency concerning the hiring procedures in relation to foreign workers.	This communication plan must begin prior to the arrival of the first workers and continue throughout all of the works phase.	To be monitored by: RRA / ARL Annual reports submitted by the Airport of Rodrigues in collaboration with Rodrigues Regional Assembly that include communication measures taken on the period as well as local surveys on inhabitants as well as external workers.	- Number of communication activities carried out; - Number of communication media produced and distributed; - Number of organized sessions, meetings or information workshops; - Results of carried out surveys; - Number and qualitative details on hired people; - Number of registered complaints and reports on actions taken for complaints management.	- Organise additional communication activities in case of insufficient communication and if required through surveys results. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Executive Committee of the RRA - Airport of Rodrigues - Project managers for the works - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Local media (radio)
	SE-Mit-7- Communication and hiring management plan **SE-Mit-8-** Communication and complaint management plan connected with employment	Specific communication concerning hiring procedures should be put in place so that impacted communities are informed about job opportunities and other related information.	This communication plan must begin and continue throughout the works phase.				
	SE-Mit-10- RAP follow-up plan	This follow-up plan is a continuation of the RAP communication procedures. It implies a continuous communication strategy aimed at maintaining the link with affected	This follow-up takes place from the construction phase and continues during the period of adaptation of the displaced communities.	To be monitored by: RRA and the Resettlement Monitoring Committee of Rodrigues Regional Assembly	- Number of registered complaints and reports on actions taken for complaint management, - Qualitative evaluation according to survey results.	- Improve communication with local people according to reports' feedback. - Ensure that all registered complaints	- Relocation committee appointed by the Executive Committee of the RRA - Airport of Rodrigues - Spokesperson of the village of Sainte Marie

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
		communities throughout the adaptation period.		(with the help of an external specialized entity) Bi-annual Relocation Plan Report to be submitted by the Relocation Committee including complaints management and satisfaction surveys.		have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location) - Optionally an independent external office
	SE-Mit-11- Community consultation plan for monitoring the evolution of the agro-pastoral system. **SE-Mit-12**- Support measures concerning livestock breeding techniques.	These measures relate to the communication procedures to be employed concerning the specific and important subject of adaptation of agricultural and livestock breeding techniques by all communities.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by the Executive Committee of the RRA - Rodrigues Agriculture Commission - Village Committee (Plaine Corail – Cascade Jean Louis) and non-resident livestock breeders - Possibly a specialised external entity such as an NGO
	SE-Mit-13 - Support and fishermen's complaint management plan.	These measures relate to the communication procedures to be undertaken with the fishermen's community following relocation.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by the Executive Committee of the RRA - Rodrigues fishing Commission - Fishing station managers - Airport of Rodrigues
	SE-Mit-14- Plan for consultation and support of the communities of the area concerning the development of income-generating activities. **SE-Mit-15-** Economic support plan for households.	These measures relate to the communication procedures to be employed with the village communities in the area in order to promote the development of income-generating activities for households by becoming aware of the initiatives that the villages and villagers would like to implement.	These measures are developed from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
Complaint management Ensure that all complaints from communities or individuals affected by the implementation of the	**SE-Comp-**1- Implementation of a Resettlement Action Plan (RAP).	The RAP necessarily includes the establishment of a complaint management procedure issued by affected communities as part of the resettlement process. It requires an effective and transparent complaint management mechanism so that	*(before work)*	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly Relocation Plan Report including complaint	- Number of complaints issued; - Number of complaints satisfactorily resolved.	- Ensure that all registered complaints have been satisfactorily treated. If not, complaints not well treated will have to appear positively	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Airport of Rodrigues - Spokesperson of the village of Sainte Marie

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
project are received, reviewed and that appropriate action is taken within a reasonable time to arrive at a mutually acceptable solution. **Complaints management plan**		the first steps are taken to provide a solid foundation for the relocation process.		management to be submitted by the Relocation Committee at the end of the relocation plan and before resettlement.		handled before works begin.	- Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location)
	SE-Mit-3- Complaint management and internal support for relocation.	The relocation complaint management process requires careful listening to affected populations. It must be effective and transparent in order to take into consideration and share all the grievances expressed by the communities in order to define appropriate communication and support strategies.	*(entire project)*				
	SE-Mit-8 - Communication and complaint management plan connected with employment	This measure is the implementation of an effective and transparent complaint management mechanism concerning hiring procedures during the construction phase of the project, a period during which there will likely be many employment opportunities. This process helps mitigate some potential job-related frustrations.	This communication plan must begin and continue throughout the works phase.	To be monitored by: RRA / ARL Bi-annual reports submitted by the Airport of Rodrigues in collaboration with Rodrigues Regional Assembly that include communication measures taken on the period as well as local surveys on inhabitants as well as external workers.	- Number of registered complaints and reports on actions taken for complaints management, - Qualitative evaluation according to survey results.	- Improve communication with local people according to reports' feedback. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Executive Committee of the RRA - Airport of Rodrigues - Project managers for the works - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis)
	SE-Mit-10- RAP follow-up plan	This follow-up plan is a continuation of the RAP procedures. It implies a complaint management strategy concerning the following phases of the project to maintain the link with affected communities throughout the adaptation period.	This follow-up takes place from the construction phase and continues throughout the period of adaptation of the displaced communities.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity) Bi-annual Relocation Plan Report to be submitted by the Relocation Committee including complaint management and satisfaction surveys.			- Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - Airport of Rodrigues - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location) - Optionally an independent external office
	SE-Mit-11- Community consultation plan for monitoring the evolution of the	This measure is the implementation of an effective and transparent complaint management mechanism concerning agriculture and livestock breeding. This	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - Rodrigues Agriculture Commission

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	agro-pastoral system.	mechanism makes it possible to become aware of the potential discontent of individuals or communities concerning the evolutionary process of the agro-pastoral system.					- Villagers and livestock breeders of the resettlement area
	SE-Mit-13 – Support and fishermen's complaint management plan.	This plan must implement a complaint management mechanism issued by the fishermen's community following relocation.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - Rodrigues fishing Commission - Relocated fishing post managers
Resettlement and compensation The set of measures to be taken for the resettlement and compensation of impacted communities must help to limit the socio-economic impacts resulting from the displacement of populations by restoring livelihoods and the standard of living of displaced people. **Action plan for relocation and compensation (including the livelihood restoration plan)**	**SE-Comp**-1- Implementation of a Resettlement Action Plan (RAP).	The RAP implements a procedure to delineate a land area prior to the organisation of the relocation of impacted villagers and compensation for farmland, pastures or even social infrastructure.	The relocation plan must be finalized before the works begin.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly Relocation Plan Report to be submitted by the Relocation Committee at the end of relocation plan and before resettlement.	- Verification that the levels of compensation meet at least the international requirements (IFC standards) on the basis of a price matrix to be established under the RAP. - Results of a questionnaire on the satisfaction rate of displaced and/or compensated people.	- Ensure updating to IFC standards according to the Relocation Plan Report before resettlement, - Provide particular emphasis on unsatisfying elements that have been pointed out with the questionnaire's results.	- Relocation committee appointed by and in liaison with the Executive Committee of the Rodrigues Regional Assembly - Airport of Rodrigues - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location)
	SE-Comp-2- Availability of farmland.	This measure incorporates the resettlement procedure for the replacement of farmland lost by impacted communities. This ties in with the livelihood restoration plan.	This measure must be effective before the construction phase begins.				- Relocation committee appointed by and in liaison with the Executive Committee of the Rodrigues Regional Assembly - Spokesperson of the village of Sainte Marie - Livestock breeder users of the impacted area - Villagers of Plaine Corail and village committee of Cascade Jean Louis (proposed resettlement towns)
	SE-Comp-4- Provision of pasture areas and new fishing infrastructures.	This measure incorporates the resettlement procedure for the replacement of grazing areas and fishing infrastructures lost by impacted communities. This ties in with the livelihood restoration plan.	This measure must be effective before the construction phase begins.				- Relocation committee appointed by and in liaison with the Executive Committee of the Rodrigues Regional Assembly - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail and village Committee of Cascade

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
							Jean Louis (proposed resettlement towns)
	SE-Mit-10- RAP follow-up plan.	This plan is a continuation of the procedures of the RAP to maintain the follow-up procedure by keeping the connection with affected communities throughout the adaptation period.	This follow-up takes place from the construction phase and continues during the period of adaptation of the displaced communities.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly Bi-annual Relocation Plan Report to be submitted by the Relocation Committee including complaint management and satisfaction surveys.		- Improve communication with local people according to reports' feedback. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Relocation committee appointed by the Executive Committee of the RRA - Airport of Rodrigues - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location) - Optionally an independent external office
	SE-Mit-14- Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	The goal of this measure is to keep communities on a viable and sustainable socio-economic dynamic by proposing to families that they diversify their economic activities.	This follow-up takes place from the construction phase and continues during the period of adaptation of the displaced communities.	To be monitored by RRA Annual report submitted by the Small Entrepreneurship Commission of Rodrigues Regional Assembly to Airport of Rodrigues and Rodrigues Regional Assembly Executive Committee.	- Quantitative and qualitative evaluation of local development according to survey results. - Number of local set up small activities and businesses.	- Enhance local economic environment through group consultations with specific and relevant themes according to evaluation results.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
Community development Medium-term planning of actions that should be implemented to achieve socio-economic development goals at the local level to trigger a virtuous process of improving living conditions **Community development plan**	**SE-Mit-9-** Agricultural technical support plan.	This measure contributes to the consolidation of integration in the community environment through the support of technical services facilitating the adaptation of agricultural models and thereby promoting the viability of production.	These measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity) Annual report submitted by the Commission of Agriculture dealing with results obtained from field surveys and farmer consultations.	- Number of projects implemented; - Number of direct and indirect beneficiaries; - Geographical coverage of the projects implemented; - Diversity of topics discussed.	Projects reinforcement or implementation according to results obtained from field surveys and farmer consultations.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues Agriculture Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
	SE-Mit-11- Community consultation plan for monitoring the evolution of the agro-pastoral system.	These measures contribute to consolidating the integration of communities through the support of technical services facilitating the adaptation of farming methods to the new environment and thereby promoting the viability of production.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues Agriculture Commission - Livestock breeders of the relocation area

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	SE-Mit-12- Support plan concerning livestock breeding techniques.						- Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
	SE-Mit-14- Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	The goal of this measure is to keep communities on a viable and sustainable socio-economic dynamic by proposing to families that they diversify their economic activities.	This follow-up takes place from the construction phase and continues during the period of adaptation of the displaced communities.	To be monitored by RRA Annual report submitted by the Small Entrepreneurship Commission of Rodrigues Regional Assembly to Airport of Rodrigues and Rodrigues Regional Assembly Executive Committee.		- Enhance local economic environment through group consultations with specific and relevant themes according to evaluation results.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
Public health and community safety Contribution to the mitigation of adverse impacts concerning the health and safety of local communities. **Public health and community safety plan**	**SE-Mit-16** - Communication plan for the communities and livestock breeders of the area concerning road safety.	• The objective of this measure is the implementation of a public awareness campaign for the population on road safety issues in the vicinity of construction sites.	This measure must take place from one month before the start of the site operations and must be carried out throughout the entire construction phase.	To be monitored by: RRA / ARL Annual reports submitted by the Commission of Public Health and the Commission of Transport of Rodrigues Regional Assembly to the Airport of Rodrigues and Rodrigues Regional Assembly Executive Committee.	- Number of accidents directly related to the activities of the project. - Number of pathologies detected directly related to the activities of the project.	Enhance and/or maintain communication campaigns in case of noticed accidents or detected pathologies.	- ARL - Project managers - Rodrigues health Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Media (local radio)
	SE-Mit-17- Facilitation of access to protected pedestrian lanes and safety signage management plan.	This measure is to design and construct structural elements for the protection of the public taking into consideration the risks to which they could be exposed in the vicinity of the site areas.	This measure must take place from one month before the start of the site operations and must be carried out throughout the entire construction phase.				- ARL - Project managers - Rodrigues infrastructure commissions - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
	SE-Mit-18- Coordination with the project managers involved in the work sites for the implementation of specific Health-Safety training.	The primary objective of this measure is to assess the health and safety risks and impacts to which affected communities are exposed and to take appropriate preventive measures.		To be monitored by ARL Annual report submitted by the Airport of Rodrigues.	- Number of training and communication activities implemented - Number of accidents directly related to the activities of the project. - Number of pathologies detected directly related to the activities of the project.	Increased numbers of training and communication activities on Health and safety prevention.	- ARL - Project managers - Rodrigues health Commission
	SE-Mit-19- Communication plan for the communities concerning the importance of	The purpose of this measure is to ensure the safety of the project by prohibiting access to sites of unauthorized people and populations through promoting					- ARL - Project managers - Rodrigues health Commission - Village committees of the airport area (Anse Quitor,

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	complying with safety instructions.	awareness of potential hazards in the work area.					Plaine Corail – Cascade Jean Louis) - Media (local radio)
Health and safety of workers For the realisation of the project it does not present a nuisance to the health and safety of the workers on the site. **Occupational health and safety plan**	**SE-Mit-18**- Coordination with the project managers involved in the work sites for the implementation of specific health-safety training.	The objective of this measure is to establish a system for the protection of workers from occupational diseases and to establish a training program for workers in the project to ensure that these employees have the necessary skills to manage the risks associated with the position they are assigned to.	This measure must take place throughout the construction phase.	To be monitored by ARL Annual report submitted by Airport of Rodrigues.	- Number of incidents involving injury or mortality; - Number of cases of work-related illnesses.	Increased numbers of training and communication activities on health and safety prevention.	- ARL - Project managers - Rodrigues health Commission - Rodrigues labour Commission
	SE-Mit-19- Communication plan for the communities on the importance of complying with safety instructions on construction sites.	The goal of this plan is to initiate measures to prevent accidents, injuries and illnesses resulting from work by minimizing the causes of these hazards as much as possible.	This measure must take place throughout the construction phase.				- ARL - Project managers - Rodrigues health Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Media (local radio)
Workforce and training Encouragement to form a more rigorous workforce to improve the skills of local labour leading to economic growth linked to the creation of local jobs. **Workforce management and training plan**	**SE-Mit-5**- Communication plan concerning the integration of external workers.	These measures for the development of a management policy concerning the accommodation of external workers permit the improvement of incomes in the locations.	This measure must take place throughout the construction phase.	To be monitored by: RRA / ARL Annual reports submitted by the Airport of Rodrigues in collaboration with Rodrigues Regional Assembly that include communication measures taken on the period as well as local surveys on inhabitants as well as external workers.	- Number of communication activities carried out; - Number of communication media produced and distributed; - Number of organized sessions, meetings or information workshops; - Results of carried out surveys; - Number and qualitative details on hired people; - Number of registered complaints and reports on actions taken for complaints management, - Qualitative evaluation according to survey results.	- Organise additional communication activities in case of insufficient communication and if required through survey results. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- ARL - Project managers - Rodrigues labour Commission - Executive Committee of the RRA - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Local media (radio)
	SE-Mit-6 - Influx management plan						- ARL - Project managers - Rodrigues labour Commission - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis)
	SE-Mit-7- Communication and hiring management plan **SE-Mit-8** - Communication and complaint management plan	This measure is to showcase local skills, job opportunities and associated hiring conditions, and to foster local hiring to provide opportunities to obtain skills. This measure is to implement a worker complaint management process including the	This measure must take place throughout the construction phase.				- ARL - Project managers - Executive Committee of the RRA - Rodrigues labour Commission - Village committees of the airport area (Anse Quitor and

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	connected with employment	development of a labour law awareness and training program.					Plaine Corail – Cascade Jean Louis) - Local media (radio)
	SE-Mit-18- Coordination with the contractors involved in the work sites for the implementation of specific Health-Safety training.	This measure allows the provision of a secure work environment and facilitates learning and therefore the gaining of skills.	This measure must take place throughout the construction phase.	To be monitored by ARL Annual report submitted by the Airport of Rodrigues.	- Number of incidents involving injury or mortality; - Number of cases of work-related illnesses.	Increased numbers of training and communication activities on health and safety prevention.	- ARL - Project managers - Rodrigues labour Commission - Rodrigues health Commission
	SE-Mit-19- Communication plan for the communities on the importance of complying with safety instructions on construction sites.	This allows employees to be trained more quickly on safety risk issues and on the procedures applicable to project employees.	This measure must take place throughout the construction phase.				- ARL - Project managers - Rodrigues labour Commission - Rodrigues health Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Media (local radio)

Table 135: Overall Social Management Plan for construction phase

9.2.2 Preliminary Social Management Plans to be implemented for the construction phase or prior to the works

This SMP is accompanied by monitoring and evaluation tools that are required to monitor the performance and assess its accuracy.

The different plans proposed in this document are explained and a general "framework" is given for their development. The SMP alone cannot suffice, and each of the tools must be subject to development work.

It is proposed that the Social Management Plan of the Project of expansion of the runway of Plaine Corail Airport be structured and articulated according to the following plans:

Base camp and works site social management plan
Communication plan
Complaint management plan
Action plan for resettlement and compensation (including the livelihood restoration plan);
Community development plan;
Public health and community safety plan;
Occupational health and safety plan;
Management plan for project-induced immigration,
Workforce management and training plan.
Base camp and works site social management plan

A management plan should be implemented after the following guidances:

Communication to the population about the temporary nature of the facility
Elaboration of internal rules and wide internal dissemination of these rules (prevention of harassment, rules of good conduct, etc.)
Hiring of personnel for the maintenance of the base camp (maintenance agent, intendant, etc.) and catering services (as far as possible a local hiring)
Regular information to local populations and companies about construction site activities
Establishment of a system to control and regulate access to construction sites and prohibition of access by opportunists to construction sites
Delimitation of installations and hazard signalling via pictorial panels
Regular safety rule reminder sessions
Informing local authorities and surrounding populations about the nature and extent of all potential risks and impacts resulting from project activities and about the procedures to be followed in the event of an accident or unforeseen emergency situation
Raising awareness on cross-cutting issues (gender, disease protection, use of latrines, etc.)
Specific awareness-raising on relations at work and outside the workplace (harassment, corruption, bribes and other forms of extortion)
Organisation of awareness, prevention and treatment programmes on STI-HIV/AIDS for workers
Display of awareness posters concerning major risks, particularly STI-HIV/AIDS, in areas regularly visited by workers
Seek partnerships with specialized external organizations to help the company provide STI/HIV/AIDS training, awareness campaigns and treatment to employees, their dependents and, possibly, the general population
Establishment of a on-site care centre to provide routine medical services required by eligible employees and other persons and emergency response in the event of an accident, in order to stabilize the injured person for transfer to an appropriate medical centre

The company will be asked to prepare an emergency evacuation plan in the event of a serious accident. The medical team will be placed under the responsibility of an emergency doctor. An Internal Operation Plan and a Health, Safety and Security Plan should be implemented
Strict control of drivers' skills when hiring and driving for excessive speed or drunkenness, for which exemplary and dissuasive punishment should be applied
- Implementation of adequate signage.

9.2.2.1 Communication plan

9.2.2.1.1 Management issues

In order to maintain good relations with all the stakeholders affected by the project and to promote a harmonious integration of the project in the environment, it is essential to establish operational channels and strategies for communication enabling an ongoing dialogue and information flow between the project's developers and the affected communities.

9.2.2.1.2 Impact study recommendations

The social impact study emphasizes a number of avenues of action to stabilize and improve the communication loop between the project and the communities, and to establish a specific mechanism to:

Organize information meetings at the level of the towns affected by the project (to be incorporated into mitigation plans SE-Comp-1, SE-Mit-3, SE-Mit-5, SE-Mit-7, SE-Mit-10, SE-Mit-11, SE-Mit-12, SE-Mit-13, SE-Mit-14, SE-Mit-15, SE-Mit-16 and SE-Mit-19);
Use an effective and transparent complaint management mechanism at project level and communicate this mechanism to the towns impacted by the project activities (integrated into mitigation measures SE-Comp-1, SE-Mit-3, SE-Mit-8, SE-Mit-10, SE-Mit-11 and SE-Mit-13);
Develop and adopt a continuous and transparent communication strategy concerning the issues of displacement and relocation (the various mitigation plans take into consideration communication concerning issues related to the habitat, the various sectors of activity such as agriculture, livestock and fisheries, employment, health and safety. These communication measures are implemented at the beginning of the project, during the construction phase, and maintained for certain measures – measures SE-Mit-3, SE-Mit-10, SE-Mit-11, SE-Mit-13, SE-Mit-14 and SE-Mit-15);
Communicate transparently about the procedures for direct and indirect hiring of the project (opportunities, skills and education levels required – mitigation measures SE-Mit-5, SE-Mit-7 and SE-Mit-8);
Establish a framework for consultation with regular meetings (local authorities, communities, airport, Rodrigues government) to address public development initiatives (notably through measures SE-Mit-7, SE-Mit-14, SE-Mit-15 and SE-Mit-18).

9.2.2.1.3 Objectives

The guidelines of the communication plan to be established are intended to ensure a smooth implementation of the work at all stages of its performance.

9.2.2.1.4 Performance indicators

The performance indicators to be taken into consideration in the communication plan are:

The number of communication activities carried out;
The number of communication media items produced and distributed;
The number of organized sessions, meetings or information workshops;
The number of information activities organized.

9.2.2.1.5 Management strategy

A communication plan will be prepared and put in place. A community relations officer will be appointed.

The information should be communicated on a regular basis in an understandable and accessible way to stakeholders. The communication strategy should be tailored to the linguistic preferences of the affected communities, their decision-making process and the needs of vulnerable or disadvantaged groups.

The communication plan includes the following elements:

Identification of stakeholders: i.e. each group or person affected and/or concerned by the work;
Choice of the appropriate mechanisms for communicating and disseminating information, which may include individual meetings, design, at the organisational level, of the role of a community liaison officer, the use of local media, etc;
Elaboration of a timetable for the implementation of the communication and dissemination of information in relation to the planned activities and according to the target audiences.
Identification of the necessary resources and responsibilities of each stakeholder.

9.2.2.1.6 Follow-up

It is essential to establish a follow-up process to ensure that the actions of the plan are actually put in place.

9.2.2.1.7 Reports

The contents of the reports prepared must show:

A communication and information dissemination plan;
A report of each of the meetings and communication actions organized;
Quarterly and annual reports from the project holder, taking stock of the activities carried out.

9.2.2.2 Complaints management plan

9.2.2.2.1 Management issues

In order to establish and maintain a good relationship with the surrounding communities during the implementation of the project, the Developer must permit these communities to share their views, interests and concerns concerning the work to be done.

9.2.2.2.2 Impact study recommendations

For a social impact study, the recommendations for structuring a complaint management plan are to:

Establish a complaint management mechanism that is widely known to local stakeholders (local authorities and populations affected directly or indirectly by the project) and works in an efficient and transparent manner (to be integrated specifically in the plans for mitigation measures SE-Comp-1, SE-Mit-3, SE-Mit-8, SE-Mit-10; SE-Mit-11 and SE-Mit-13);
Use an effective and transparent complaint management mechanism at project level and communicate this mechanism to the authorities and towns impacted by the project activities.

9.2.2.2.3 Objectives

The main objective of a complaint management plan is to ensure that all complaints from communities or individuals affected by the implementation of the project are received, reviewed and that appropriate action is taken within a reasonable period to arrive at a mutually acceptable solution.

9.2.2.2.4 Performance indicators

The performance indicators to be taken into consideration during the communication plan are the:

Number of complaints issued per month;
Number of complaints per month satisfactorily resolved.

9.2.2.2.5 Management strategies

The complaint management strategy is based on the following principles:

the procedure for making a complaint and to whom it should be made must be transparent and presented to communities according to their language preference. This procedure should be widely disseminated to the communities that could potentially be affected by the implementation of the project. The communication can be made verbally and/or in writing;
the channels of communication between the parties must remain open until the situation is resolved to the satisfaction of both parties;
all claims or complaints from the communities and the reactions or responses proposed must be described and classified in a register.
Community or individual claims will be subject to the following procedure:

Receipt: the claims received verbally or in writing by the project managers are directed within 24 hours of receipt to a single point of contact;
Preliminary assessment: when the claim is urgent and requires immediate response, and the community relations officer cannot respond to it, it shall be communicated promptly to a manager appointed by the project;
Registration: the person in charge of the community relations registers all the claims and the correspondence and actions taken on this subject;

Transmission: If the complaint cannot be resolved on the spot, the community relations officer informs his supervisor within the project management to immediately initiate a resolution process;
Acknowledgement of receipt: the community relations officer shall send a written reply to the requestor within 48 hours to acknowledge receipt of the claim. The letter provides detailed information about the complaint itself (subject, explanation, people concerned, etc.) and the steps that will be taken and the estimated time to resolve the claim. The content of the correspondence is also verbally addressed to ensure that the members of the affected community have a good understanding;
Evaluation meeting: if necessary, a meeting is organized with the person/group who has filed the claim to discuss and try to clarify and resolve the matter;
Conflict resolution meeting: If the issue is not resolved to the satisfaction of all parties at the evaluation meeting, a more expanded meeting is organized, involving other institutions that can act as mediators in the resolution of the dispute (specialised commissions);
Meeting of the administrative authorities: If the matter is still unresolved, another expanded meeting comprising the participation of the administrative authorities (Regional Assembly) is organised;
Legal action: as a last resort, a lawsuit could be brought by the parties concerned, after all other possible avenues of dispute resolution have been exhausted.

9.2.2.2.6 Follow-up

In order to ensure proper monitoring of a complaint management plan, it is necessary to:

Maintain a register and ensure that all complaints have been addressed;
Ensure that investigations are completed within seven days of receipt of a complaint.
Ensure that complaints are processed and resolved within one month of receipt.

9.2.2.2.7 Reports

The contents of the reports prepared must show:

A complaint registration form containing at least the following pieces of information:
unique file number;
time and date of receipt of the complaint;
nature and description of the complaint;
means of communication (telephone, letter, visit, verbal communication);
person in charge of the case;
name, address, contact details and signature of the complainant;
name, address, contact information and signature of the witness(es);
follow-up and investigation carried out after the complaint was lodged;
actions undertaken and signature of the person having examined the complaint;
agreement leading to the closure of the file (including the complainant's signature).
Monthly reports from the community relations officer reporting the number of complaints and the status of the conflict resolution process.

9.2.2.3 Resettlement Action Plan and compensation (including the livelihood restoration plan)

A framework Resettlement Action Plan (RAP) must be completed following the completion of the ESIA. This framework RAP will be based on the recommendations of the ESIA, in order to integrate in a coherent and harmonious way the actions already undertaken in the area of resettlement and compensation by the regional authorities of Rodrigues.

The framework RAP will review each of these data, define, deepen and refine them to form a reference document for the implementation of the RAP.

9.2.2.3.1 Management issues

The project will cause involuntary displacement, both physical and economic. In order to compensate for these impacts, the project is committed to the implementation of procedures for the inventory of assets and spaces allocated, valuation of their value, identification of rights holders, distribution of compensation and support for the livelihoods of displaced populations.
Impact study recommendations

For a social impact study, the recommendations for the implementation of an action plan for relocations and compensations are to:

Ensure that the implementation of the Resettlement Action Plan (RAP) is in line with the project's commitments for the resettlement and restoration of livelihoods and IFC standards (notably through mitigation measures SE-Comp-1 and SE-Mit-10);

Clarify the delimitation of land boundaries and right-holders prior to the compensation process (mitigation measures SE-Comp-1, SE-Comp-2 and SE-Comp-4);
Conduct consultations with potentially impacted villages to prepare for the implementation of the Resettlement Action Plan;
Organize restitution of farmland areas to the communities of the towns (mitigation measure SE-Comp-2 and SE-Comp-4);
Compensate land and infrastructure on the basis of a plan to manage individual and community compensation by land as much as possible, cover losses incurred for both individuals and the community (other solutions can be studied in the development of the RAP and through the recommended mitigation measures SE-Comp-2 and SE-Comp-4);
Develop a Livelihood Restoration Plan for communities that will be affected by "economic displacement" (loss of property and/or livelihoods) and establish a monitoring-assessment program of the socio-economic conditions of displaced people;
Support the diversification of income-generating economic activities in the context of the Livelihood Restoration Plan so that people affected by the project can regain sustainable livelihoods and possibly invest in these activities a part of the financial indemnifications resulting from the RAP (and in particular through mitigation measures SE-Comp-2, SE-Comp-4 and SE-Comp-14);
Compensate for all farmland affected by the project, cover losses incurred on the basis of the economic reality of the study area, both for individual and community right holders (measures SE-Comp-1 and SE-Comp-2);
Integrate compensation mechanisms for impacted livestock breeders (measures SE-Comp-1 and SE-Comp-4);
Integrate compensation mechanisms for fishermen impacted by the activities of the project (measures SE-Comp-1 and SE-Comp-4);
Search for, to the extent possible, replacement farmland to permit displaced populations to have sustainable livelihoods (measure SE-Comp-2);
Search for land to accommodate physically displaced people and organise relocation (through measures SE-Comp-1 and SE-Comp-4);
Replace any social infrastructure that will be destroyed or the method of operation of which will be altered by the project (by measure SE-Comp-1);
Support projects for the development of income-generating activities aimed at internally displaced people, in particular people displaced due to economic reasons (measure SE-Mit-14).

9.2.2.3.2 Objectives

The objectives of the RAP may be as follows:

Avoid or minimize, as much as possible, involuntary relocation and the acquisition of land, by studying all viable alternatives, during the design of the project;
Mitigate the adverse social and economic impacts resulting from the acquisition of land;
Improve, or at least maintain the means of subsistence and the standards of living of the displaced people;
Ensure that the affected people are consulted and are given the opportunity to participate in all the crucial stages of the process of elaboration and implementation of the activities of involuntary relocation and compensation.
Ensure that the compensation is commensurate with the impacts suffered, in order to verify that no person affected by the project is disproportionately penalized.
Ensure that the affected people, including people identified as vulnerable, are assisted in their efforts to improve their means of existence and their standards of living, or at least to re-establish them to their pre-relocation level or at their level prior to the start of the project, whichever is the most advantageous for them.

9.2.2.3.3 Performance indicators

The performance indicators to be taken into consideration during the action plan for relocations and compensations are:

Compensations that meet at least the international requirements (IFC standards) on the basis of a price matrix to be established in the framework RAP;
Results of a questionnaire on the satisfaction rate of displaced and/or compensated people.

9.2.2.3.4 Management strategy

For each phase of the implementation of the RAP, the project will endeavour to promote and implement the following guiding principles:
Recognition of the rights of occupation, use and administration;
Development of a set of resettlement measures adapted to each household;
Collective, non-monetary compensation at the community level;
Compensation at their value for impacts on assets, crops and means of subsistence (agriculture, livestock breeding and fishing, in particular)
Relocation sites of selected displaced towns in a community-driven process;
Possibility of resettlement of households by themselves against financial compensation or reconstruction by the project.
In order to comply with these principles, the RAP must therefore include the procedure for announcing a deadline, the principles governing the identification of people affected by the project (PAP), the land and property affected. An eligibility matrix will bring together the latest information. A calculation method permits one to evaluate the losses caused by the project and on the other hand to assess the amount of compensation. For each of the properties, lands and activities that can be impacted, an assessment of their cost must be carried out. The valuation method will take into consideration the values of residential buildings, all other infrastructures (fences, commercial infrastructures, etc.), crops (annuals as well as perennials, native trees, etc.), land (land construction, agricultural, etc.) and the shortfall that could result in relation to an activity.

The various stages of implementation of the RAP are different depending on whether it is compensation for economic displacement or physical displacement:

Compensation for economic displacement

Identification of the project's boundary area and announcement of the deadline;
Identification of impacted people, lineages and communities;
Calculating the values of the damage caused by the project;
Definition of the type of compensation and negotiation with the PAP;
Definition of the form of payment and execution of the compensation;
Follow-up and closure of the process.
Compensation for physical displacement (relocation)
Identification of the starting areas
Identification of the arrival areas
Acquisition and preparation of resettlement sites
Compensation for host communities
Relocation
Monitoring and closing the relocation
The institutional montage must be detailed and permit everyone to play the role assigned to them (Airport, Regional Assembly, Commissions, communities). A timetable, budget and monitoring and evaluation procedures should be included in the RAP document.

9.2.2.3.5 Follow-up

A monitoring and evaluation procedure should permit:

The monitoring of the execution of compensation and relocation process (verification of the level of execution and its quality);
The monitoring of the impacts of the PARC (verifying the achievement of objectives and redefining them when necessary).

9.2.2.3.6 Reports

The reports to be edited to facilitate the follow-up of the process established are:

RAP guidelines document;
RAP implementation report;
Evaluation monitoring reports.
It should be noted that relocation provisions of the populations affected by the project have already been undertaken by the Rodrigues authorities through the Executive Committee of the Rodrigues Regional Assembly which has specifically established a Relocation Committee with the objective of preparing, organising and implementing the RAP of the communities identified as directly impacted by the project. As all the actions already undertaken follow in part the international standards mentioned above, the challenge is then to verify that the procedures undertaken are consistent with the requirements.

9.2.2.4 Community development plan

9.2.2.4.1 Management issues

Measures to support the reconstitution of an economic and productive situation favourable to the families affected by the project, both in the area directly impacted and in the areas proposed as relocation areas, must be planned and implemented.

9.2.2.4.2 Impact study recommendations

Recommendations for the implementation of community development support measures are to:

Promote local economic development initiatives to accompany the people and communities affected by the project (specifically for measure SE-Mit-14);
Reinforce or create income-generating activities, in particular those carried out by women (measure SE-Mit-14);
Develop programs to support economic diversification and the development of income-generating activities (e.g. crafts, trade, services and processing of agricultural and fishery products) (measure SE-Mit-14);
Develop programs to support agricultural and agro-pastoral development in order to make the best use of the territory's resources and adapt land uses (measures SE-Mit-9, SE-Mit-11 and SE-Mit-12);
Support livestock breeding by allowing for the creation of water points and creating fodder perimeters for livestock (measure SE-Mit-12);
Improve access to water in proposed areas such as the resettlement areas (measures SE-Mit-9 and SE-Mit-12).

9.2.2.4.3 Objectives

The CDP is to be constructed with the communities and aims to plan in the medium term the actions that should be implemented to achieve socio-economic development goals at the local level. It is intended to trigger a virtuous process of improving living conditions in the host communities of internally displaced people, benefiting resettled families and host families equally.

9.2.2.4.4 Performance indicators

Indicators that can highlight the performance of the community development plan are:

The number of projects implemented within the framework of the CDP;
The number of direct and indirect beneficiaries of projects implemented within the framework of the CDP;
The scope of projects implemented within the framework of the CDP;
Geographical coverage of projects implemented within the framework of the CDP;
The diversity of the topics addressed by the projects implemented within the framework of the CDP (health, education, access to water, transport, agriculture, livestock, fisheries, market gardening, economic diversification, income-generating activities...).

9.2.2.4.5 Management strategy

The CDP should be developed and implemented on the basis of the following aspects:

The methods of project selection and allocation of budgets: the choice of projects must be based on a participatory approach, in particular in terms of prioritisation.
Implementation methods: the realisation of tenders, the selection of contractors, of partners for implementation and of control officers must be controlled by the local administrative Entities as much as possible and be monitored by the populations.
The monitoring and control methods: communities must be equipped with tools and means to ensure that the projects are properly implemented, in articulation and with the support of the administrative authorities and the committees that provide control over the assignment and execution of projects. The monitoring of the execution must be based on simple and measurable performance indicators.

The system of communication and transparency: the most complete and broadest communication is the first safeguard against misuse of funds. It also makes it possible to obtain a broad membership of the people in the project.
Monitoring and assessment of impacts: in the same way as monitoring of implementation must be carried out, monitoring to measure achievement of objectives and effectiveness of actions is necessary. The local authorities, through the specific established committee bringing together those responsible for the various themes involved, must be able to carry out the monitoring of the impacts. A budget must be allocated to it and it must allow for a regular period to carry out an external audit.

9.2.2.4.6 Reports

The reports to be drafted to facilitate the follow-up of the community development plan to be implemented are:

CDP strategy and guidance documents;
Implementation reports of projects funded in the context of the CDP;
Annual reports of implementation of the CDP.

9.2.2.5 Public health and community safety plan

9.2.2.5.1 Management issues

A construction project usually leads to an increase in the movement of vehicles and construction equipment which undeniably increases the risk of road accidents. Local communities are often users of the sides of the road and especially young people during school periods. They must consequently be made aware of the fact that there are no road-side adaptations to prevent this risk. This implies then that actions to prevent, inform and raise awareness of health and safety must be put in place for the attention of the communities.

9.2.2.5.2 Impact study recommendations

The recommendations for the establishment of a public health and safety plan for communities are to:

Design and construct the structural elements of the project, taking into consideration the risks to workers and affected communities (measures SE-Mit-16 and SE-Mit-17);
Implement a public awareness campaign for the population on road safety issues in the vicinity of construction sites (measure SE-Mit-16);
Ensure the infrastructure of the project in order to limit untimely penetrations that could generate accidents (which can be taken into consideration with measures SE-Mit-18 and SE-Mit-19);
Prohibit access to sites of unauthorized people (measure SE-Mit-19);
Assess the health and safety risks and impacts to which affected communities are exposed and take appropriate preventive measures, this includes developing a community health and safety plan and a work health and safety plan (measures SE-Mit-18 and SE-Mit-19).

9.2.2.5.3 Objectives

The objective of the community health and safety plan is to contribute to the mitigation of negative impacts on the health and safety of local communities.

9.2.2.5.4 Performance indicators

Indicators to highlight the performance of the community's public health and safety plan are:

The number of pathologies detected directly related to the activities of the project.
The number of accidents directly related to the activities of the project.

9.2.2.5.5 Management strategies

In the areas of community health and safety, two types of actions can be proposed:

Physical safety related to traffic and the movement of machinery and trucks in the construction phase;
Awareness, training and safety information related to road use during the construction phase. The sessions will be addressed in particular to young people and children from families resettled near the paved road.

9.2.2.5.6 Follow-up

The monitoring and evaluation of the public health and safety plan should permit to:

Ensure the monitoring of accident cases;
Ensure the monitoring of the health status of communities in relation to existing healthcare infrastructures.

9.2.2.5.7 Reports

The reports to be drafted to facilitate the follow-up of the process established are:

A safety strategy document;
An intervention strategy document in the area of community health.

9.2.2.6 Occupational health and safety plan

9.2.2.6.1 Management issues

The project to build a large scale infrastructure involves many works that can affect the health and safety of workers, so this is an essential issue to consider for the success of the project.

9.2.2.6.2 Impact study recommendations

The recommendations for the establishment of a public health and safety plan are to:

Establish a system of protection of workers against occupational diseases (screening of nuisance factors, regular medical visits of workers, etc.) (in connection with measure SE-Mit-18);
Establish a project worker training program to ensure that these employees have the skills, information and capabilities to manage the risks associated with the position to which they are assigned (measure SE-Mit-18);
The goal of this plan is to initiate measures to prevent accidents, injuries and illnesses resulting from work by minimizing the causes of these hazards as much as possible. (measures SE-Mit-18 and SE-Mit-19)
Equip workers with all the necessary protective equipment to minimize the risks associated with the tasks carried out in the course of their employment (measures SE-Mit-18);
Develop the health/safety culture of project workers and raise awareness of risks and their mastery (measure SE-Mit-19).

9.2.2.6.3 Objectives

The objectives of the occupational health and safety plan are to:

Ensure that the realisation of the project does not harm the health and safety of employees;
Take the necessary measures to prevent accidents, injuries and illnesses related to/or caused by the activities of the project by minimizing, to the extent possible, the risks.

9.2.2.6.4 Performance indicators

The indicators for measuring the performance of the occupational health and safety plan during the runway construction project are as follows:

The number of incidents involving injury or mortality;
The number of cases of work-related illnesses.

9.2.2.6.5 Management strategies

During the construction phases, management strategies related to the occupational health and safety management plan are to:

Raise awareness, through adequate training, of all staff concerning health and safety, in order to minimize all risks of incidents, accidents and illnesses
Ensure the presence of a medical team with basic equipment and medications to address any health problems or incidents of a minor nature;

Ensure the presence of rapid and reliable evacuation of the wounded to a health centre adapted to the seriousness of the situation;
Ensure the availability of a means of transportation for the urgent evacuation of a serious casualty or patient to a recognized hospital;
Ensure that appropriate and easily understandable signage by the local population will be installed near the project sites to identify potential safety hazards.
Ensure that any new employee is sensitized and trained in the health safety plan before commencing his activities;

9.2.2.6.6 Follow-up

The monitoring and evaluation process of the worker health and safety plan consists of:

Analysis and risk management through the implementation of systemic practices to identify, assess, control, prevent and minimize the hazards and risks associated with the process and service activities and products, and resulting consequences;
Monitoring of incidents and accidents as well as workplace illnesses, impacting the health or safety of workers;
Regular assessment of the effectiveness of the health and safety measures put in place;
The proposal, if any, of new measures to control or reduce recurrent health and safety problems.

9.2.2.6.7 Reports

The reports and documents to be drafted to facilitate the follow-up of the process are:

Occupational Health and Safety Report
Register of incidents, accidents and non-conformities

9.2.2.7 Workforce management and training plan

9.2.2.7.1 Management issues

The project must establish and encourage rigorous workforce management that maximizes local economic benefits without compromising the quality of the work.

The project will generate temporary jobs during the construction phase. A preference for the assignment of jobs should be directed towards the citizens of Rodrigues and especially the citizens of the communities close to the airport area.

9.2.2.7.2 Impact study recommendations

Recommendations for the implementation of a workforce management and training plan are to:

Develop and implement a workforce management plan that includes:
a description of working conditions and hiring conditions (measure SE-Mit-7);
a management and quality policy concerning the accommodation of external workers (measures SE-Mit-5 and SE-Mit-6);
a worker complaint management process (measure SE-Mit-8);
the provision of a safe and healthy working environment (measure SE-Mit-18);
a worker awareness program that includes ways of informing workers about their rights through training or communication campaigns (measure SE-Mit-8);
Ensure the implementation of a recruitment policy favouring local citizens with the goal of prioritizing the resettled people of the project and the affected local communities (measure SE-Mit-7);

Prepare a training program for employees and a training plan for communities in collaboration with regional administrative authorities;
Carry out an inventory of local skills within the framework of the training and skill-building action plan in order to prioritise the employment of those directly affected by the project (measure SE-Mit-7);
Ensure that employees are continuously trained on the following subjects (measure SE-Mit-18 and SE-Mit-19);
training in relation to the performance of work specific to each position;
specific training for each task for any new assignment;
knowledge of the risks associated with the work and the current health and safety procedures;
understanding of the appropriate procedures associated with the use and handling of hazardous materials;
knowledge of hiring conditions and personnel rights;
knowledge of emergency procedures and training related to this topic;
knowledge of the workers' code of conduct;
Train employees as soon as they are admitted to the project and on an ongoing basis over the life of the project concerning safety risk issues and the procedures applicable to project employees (measure SE-Mit-19).

9.2.2.7.3 Objectives

The main objectives in a workforce management and training plan are to:

Establish and maintain a good working relationship between the project, its partners, subcontractors and workers;
Promote equal opportunities and equitable treatment of workers;
Encourage the economic growth of the region of implementation of the project by creating local jobs.

9.2.2.7.4 Performance indicators

In order to measure the performance of the workforce management plan and the training established, consideration should be given to:

The number of complaints issued or non-conformities identified;
The number of satisfactory settlements within one month.

9.2.2.7.5 Management strategies

The strategies to be established for the workforce and training management plan concern:

A hiring policy: with equal skills, all recruitments will respect the order of priority in order to encourage job creation within the populations directly affected by the project;
Hiring procedures: in addition to be posted in the project information office, labour needs will be disseminated in nearby towns;
Working conditions and terms of employment: the project and the selected contractors will provide in writing an employment contract to all employees. This contract will include the terms and conditions of work: remuneration, hours of work, overtime, holidays and sick leave, etc;
Representation of workers and grievance management: according to the national labour code.
Training: all project staff, including those working for contractors, subcontractors and suppliers, must have the necessary skills and must be aware of the risks associated with their work, their responsibilities for managing these risks and the plans, procedures or instructions that must be followed in relation to the management of these risks.
Subcontractors: all requirements of the GSP and all operational controls developed under the management system will also apply to all contractors and subcontractors responsible for the

design, construction, operation or closure of the project. By extension, these requirements will also be applied to suppliers of goods and services to the project.

9.2.2.7.6 Follow-up

To ensure the monitoring the workforce management plan and training, it is necessary to:

Regularly check the number of local jobs created in the project activities in the mining, road and port areas using indicators;
Check the complaints register regularly, to ensure that actions have been taken to resolve the various cases.

9.2.2.7.7 Reports

Reports on the workforce and training management plan will be required to document monthly complaints, grievances, strikes, etc. and the measures put in place to resolve disputes.

9.2.3 Summary of plans to be drawn up for social management during the construction phase

Table 136: Summary of Required ESMP– Social Plans - Construction Phase

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
Base camp and works site social management plan	-	**Contractor + ARL**
Communication plan	SE-Comp-1 SE-Mit-3 SE-Mit-5 SE-Mit-7 SE-Mit-8 SE-Mit-10 SE-Mit-11 SE-Mit-12 SE-Mit-13 SE-Mit-14 SE-Mit-15 (and take into account SE-Mit-16, SE-Mit-18, SE-Mit-19)	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - ARL - Spokesperson of the village Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location) - Executive Committee of the RRA - ARL - Project managers for the works - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Local media (radio) - Rodrigues Agriculture Commission - Village Committee (Plaine Corail – Cascade Jean Louis) and non-resident livestock breeders - Possibly a specialised external entity such as an NGO - Optionally an independent external office - Rodrigues fishing Commission - Rodrigues women and small entrepreneurship Commission To be monitored by: RRA / ARL and the Resettlement Monitoring Committee of Rodrigues Regional Assembly

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
Base camp and works site social management plan	-	**Contractor + ARL**
Complaints management plan	SE-Comp-1 SE-Mit-3 SE-Mit-8 SE-Mit-10 SE-Mit-11 SE-Mit-13	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - ARL - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location) - Executive Committee of the RRA - ARL - Project managers for the works - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Optionally an independent external office - Rodrigues Agriculture Commission - Villagers and livestock breeders of the resettlement area - Rodrigues fishing Commission To be monitored by: RRA / ARL and the Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity)
Action plan for relocation and compensation (including the livelihood restoration plan)	SE-Comp-1 SE-Comp-2 SE-Mit-10 SE-Comp-4 SE-Mit-14	- Relocation committee appointed by and in liaison with the Executive Committee of the Rodrigues Regional Assembly - ARL - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
Base camp and works site social management plan	**-**	**Contractor + ARL**
		- Villagers of Plaine Corail and village committee of Cascade Jean Louis (proposed resettlement towns) - Optionally an independent external office - Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission To be monitored by: RRA / Resettlement Monitoring Committee of Rodrigues Regional Assembly
Community development plan	SE-Mit-9 SE-Mit-11 SE-Mit-12 SE-Mit-14	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues Agriculture Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Livestock breeders of the relocation area - Rodrigues women and small entrepreneurship Commission - Rodrigues fishing Commission - ARL To be monitored by: RRA / Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity)
Public health and community safety plan	SE-Mit-16 SE-Mit-17 SE-Mit-18 SE-Mit-19	- ARL - Project managers - Rodrigues health Commission - Rodrigues infrastructure commissions

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
Base camp and works site social management plan	-	**Contractor + ARL**
		- Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Media (local radio) To be monitored by: RRA / ARL
Occupational health and safety plan	SE-Mit-18 SE-Mit-19	- ARL - Project managers - Rodrigues health Commission - Rodrigues labour Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Media (local radio) To be monitored by: ARL
Workforce management and training plan	SE-Mit-5 SE-Mit-6 SE-Mit-7 SE-Mit-8 SE-Mit-18 SE-Mit-19	- ARL - Project managers - Rodrigues labour Commission - Executive Committee of the RRA - ARL - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Local media (radio) To be monitored by: RRA / ARL

10 Environmental and Social Management Plan (ESMP) for the operational phase

10.1 Environment Management Plan for operational phase

10.1.1 Environmental Management Plan for operational phase

The following chapters aim to summarize and guide to implement all the environmental measures associated to the post-commissioning phase and the operational phase.

Some measures are part of the airport design and must be anticipated during the study phase.

Some other measures correspond to monitoring to be carried out after the end of the works for a few months, or to be permanently integrated into the airport's routine environmental management.

The measures' descriptions should be read in section 7 as this chapter doesn't provide an exhaustive description of all measures.

The first paragraph is a table listing all the commitment and measures and indicating for each one:

when and by whom it should be initiated and carried out,
how it should be monitored,
and which are the indicators of success, as well as the corrective measures to be taken if the performance objectives are not met.
The second paragraph is intended to guide stakeholders in the implementation of these measures monitoring, indicating which operational plans and procedures should be established to implement and monitor the measures, and the guidelines for the preparation of these plans.

The first paragraph refers to the plan that ensures each measure implementation. The second paragraph recalls for each plan which measures it addresses.

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
Marine environment	Phy-Mar-Mit-6	Prevent spills and accidents: train staff to avoidance of spills.	-	Operational phase **Emergencies prevention and management plans**	Regular checking visits and tests	Zero spill	Improve training	ARL
	Phy-Mar-Mit-7	Implementing methodologies for quick confining and treatment of pollutants and protocol for depollution in case of spill	-	Operational phase In case of a spill **Emergencies prevention and management plans**	Monitoring of turbidity levels. Monitoring of contaminants in the water column.	Compliance to water quality prevailing threshold.	Informing of local authorities. The spill source will be immediately isolated, stopped and contained	ARL
Hydrology - Stormwater management Wastewater management / Water resource and water supply	Phy-Hyd-Mit-5	Treat chronic or accidental sources of pollution	Prevention / management of accidental pollution / water from firefighting Confining any accidental pollution / water from firefighting	Operational phase In case of a spill **Emergencies prevention and management plans**	Monitoring of water quality at stormwater outlet and nearby aquifer (control piezometer)	Compliance with prevailing / target standards.	Information of local authorities and implementation of remedial measures / dedicated pumping for evacuation if deemed necessary.	ARL
	Phy-Hyd-Mit-2 Phy-Hyd-Mit-3 Phy-Hyd-Mit-4 Phy-Hyd-Mit-6	Stormwater network Stormwater ditch located to restore the watershed boundary Climate change adaptation: buffering storage and works facilitating infiltration Vegetation of slopes and ditches and collection of infrastructures runoff	Stormwater management for the runway before discharge at sea: Implementation of oil separator/sedimentation works on outlet	Permanent as from the commissioning of the runway **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	The oil separator on the discharge point at sea will be equipped with an alarm to order a maintenance before leakage; monitoring of water quality at discharge at sea; regular manual sampling/analysis of outlet during discharge at sea and visual control.	Compliance with prevailing / target standards. Submission to local authorities once a month.	Discharge to be stopped if non-compliance. Informing of local authorities and implementation of remedial measures: confining / dedicated pumping for evacuation if deemed necessary.	To be implemented by the Detail Design Engineer Under ARL's control Operation Monitoring: ARL (or external specialist engineer under ARL and RRA's control)
			Stormwater management and collection in a buffer storage pond to reduce peak flows before discharge at sea: Implementation of oil separator/sedimentation works before outlet into the pond. Stormwater collection in a buffer storage pond. Implementation of a water treatment plant within an integrated water management plan including reuse of treated stormwater collected.	Permanent as from the commissioning of the new runway facilities **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	The oil separator on the inlet of the buffer storage pond will be equipped with an alarm to order a maintenance before leakage; monitoring of water quality at discharge at sea, regular manual sampling/analysis of outlet during discharge at sea and visual control.	Compliance with prevailing / target standards. Submission to local authorities once a month.	Discharge / reuse to be stopped if non-compliance. Informing of local authorities and implementation of remedial measures: confining / dedicated pumping for evacuation if deemed necessary.	To be implemented by the Detail Design Engineer Under ARL's control Operation Monitoring: ARL (or external specialist engineer under ARL and RRA's control)
	Phy-Wat-Av-6 Phy-Wat-Mit-7 Phy-Wat-Mit-8	Integrated water management plan Water treatment plant Reuse water plan	Wastewater management for the airport facilities before discharge at sea Wastewater integrated management for the airport facilities =>Implementation of a water treatment plant within an integrated water management plan including reuse of treated wastewater.	Permanent as from the commissioning of the treatment facilities **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	Monitoring of water quality at inlet and outlet of Treatment Plant; monitoring of water quality in industrial water storage and stored water quality is maintained including disinfection; regular manual sampling/analysis (once a week) and visual control; automatic real time monitoring on main	Compliance with prevailing / target standards. Submission to local authorities once a month.	Discharge / reuse to be stopped if non-compliance. Informing of local authorities and implementation of remedial measures: confining / dedicated pumping for evacuation if deemed necessary.	To be implemented by the Detail Design Engineer Under ARL's control Operation Monitoring: ARL (or external specialist engineer under ARL and RRA's control)

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
					parameters usually monitored.			
			Rainwater integrated management for the airport facilities: Implementation of a water treatment plant within an integrated water management plan including reuse / treatment of rainwater harvested for drinking water production.	Permanent as from the commissioning of the treatment facilities **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	Monitoring of water quality at inlet and outlet of Treatment Plant; monitoring of water quality in rainwater storage and stored water quality is maintained including disinfection; regular manual sampling/analysis (once a week) and visual control; automatic real time monitoring on main parameters usually monitored for drinking water production (at least pH and turbidity)	Compliance with prevailing / target standards. Submission to local authorities once a month.	Reuse to be stopped if non-compliance. Informing of local authorities and implementation of remedial measures: confining / dedicated pumping for evacuation if deemed necessary.	To be implemented by the Detail Design Engineer Under ARL's control Operation Monitoring: ARL (or external specialist engineer under ARL and RRA's control)
			Drinking Water supply integrated management for the airport facilities: Implementation of a water treatment plant within an integrated water management plan including reuse / treatment of rainwater harvested for drinking water production. Reuse and treatment of wastewater / stormwater collected if necessary.	Permanent as from the commissioning of the treatment facilities **Surface stormwater run-off, drinking and wastewater management and monitoring plan**	Monitoring of water quality at inlet and outlet of Treatment Plant; monitoring of water quality in drinking water storage and stored drinking water quality is maintained including disinfection; regular manual sampling/analysis (once a week) and visual control; automatic real time monitoring of main parameters (at least pH, turbidity and residual free chlorine) on distribution line.	Compliance with prevailing / target standards. Submission to local authorities once a month.	Distribution to be stopped if non-compliance. Informing of local authorities and implementation of remedial measures: confining / dedicated pumping to empty drinking water storage if deemed necessary.	To be implemented by the Detail Design Engineer Under ARL's control Operation Monitoring: ARL (or external specialist engineer under ARL and RRA's control)
Karst	Phy-Kar-Av-25	All operations involving hydrocarbons must comply with current standards to prevent spills and, if necessary, implement emergency measures	-	Operational phase **Emergencies prevention and management plans**	Installation of a network of observation wells upstream and downstream of the facilities to allow, on the one hand, sampling and analysis of groundwater to define reference values and, on the other hand, to establish a groundwater quality monitoring program (and levels) during the project development phases (construction and operation phases)	Number and intensity of accidental spills of hydrocarbons and other chemicals	In the event of a surface spill, the environmental response plan must be implemented immediately. In the event that there is a significant change in groundwater quality and/or a contaminant is detected, the environmental management plan will also have to be put in place to contain the contamination.	ARL
	Phy-Kar-Mit-26	Do not allow groundwater use downstream of airport infrastructure	-	Operational phase **Karst monitoring plan**				To be implemented by the Detail Design Engineer Under ARL's control Operation Monitoring: ARL (or external specialist engineer under ARL control)
	Phy-Kar-Av-22	Supplementary geotechnical and geophysical investigations to characterize karstic network (caves and voids)	-	Operational phase **Karst monitoring plan**	Periodic topographic surveys	Non-compliance with the leveling tolerances	Geophysical and/or ground investigation launching	To be implemented by ARL or an external specialist Contractor

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
	Phy-Kar-Mit/Comp-23	In situ investigation diagnostic of infilled cavities (televisual cavity inspections)	-	Operational phase **Karst monitoring plan**	Geophysical/geotechnical detection of underground cavity(ies)	Borehole log anomaly vertical to a levelling defect	Repair works as cavity filling/grouting	(as part of the 10-year guarantee) Under ARL's control
	Phy-Kar-Mit/Comp-24	Additional laboratory testings (Aggregate testings) to characterize erosive potential of in situ geological formations	-	Operational phase **Karst monitoring plan**	Detection of gully development as part of site visits	Slope instability, defect on drainage device	Slope reconstruction with coarse granular materials/Drainage system improvement works	
Infrastructures and solid waste management	Inf-Mit-7	Restore road connections	To adapt the surrounding airport routes to achieve overall network coherence	Operational phase **Infrastructures and access monitoring plan**	Post-commissioning assessment of persistent traffic problems	Zero additional traffic jam	Resizing of road network	To be implemented by the Detail Design Engineer and Contractor (as part of the 10-year guarantee) Under RRA and ARL's control
Air quality	Air-Mit-6	If possible, limit the taxiing distance	-	During operational phase **Air quality management and monitoring plan**	Air quality and noise environment Management Plan	air emission standards	-	To be implemented by ARL or external specialist engineer Under ARL and RRA's control
	Air-Mit-7	Opt for technologies that limit aircraft pollutant emissions during taxiing	-		Air quality and noise environment Management Plan	air emission standards	-	
	Air-Mit-8	Encourage pilots to shut down unneeded engines when taxiing	-		Air quality and noise environment Management Plan	air emission standards	-	
	Air-Mit-9	Limit congestion (aircraft queues) by making departures as fluid as possible	-		Air quality and noise environment Management Plan	air emission standards	-	
	Air-Mit-10	Minimize the use of the APU and GPU	-		Air quality and noise environment Management Plan	air emission standards	-	
	Air-Mit-11	Develop and implement procedures to limit the use of the thrust reverser	-		Air quality and noise environment Management Plan	air emission standards	-	
	Air-Mit-12	Make ecological performance a criterion of choice for service vehicles and ground equipment	-	Before operational phase **Air quality management and monitoring plan**	Air quality and noise environment Management Plan	air emission standards	-	To be implemented by the Detail Design Engineer Under ARL's control
	Air-Mit-13	Develop an efficient public transport system to limit the use of private vehicles	-		Air quality and noise environment Management Plan	air emission standards	-	
Noise	Noi-Mit-3	Limit air traffic at night and the use of noisy equipement	-	During operational phase **noise management and monitoring plan**	Air quality and noise environment Management Plan	noise emission standards	-	To be implemented by ARL or external specialist engineer Under ARL and RRA's control
	Noi-Mit-4	Raise the ILS glide slope to reduce noise emissions during landing	-		Air quality and noise environment Management Plan	noise emission standards	-	
	Noi-Mit-5	Adapt departure procedures to minimize noise exposure on the ground during take-off	-		Air quality and noise environment Management Plan	noise emission standards	-	
	Noi-Mit-6	Limit the use of reverse thrust	-		Air quality and noise environment Management Plan	noise emission standards	-	
	Noi-Mit-7	Develop an efficient public transport system to limit the use of private vehicles	-	Before operational phase	Air quality and noise environment Management Plan	noise emission standards	-	To be implemented by the Detail Design Engineer

Theme / Issue	Title and ID of the measure		Complementary description	Period of performance / Corresponding plan	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation
				noise management and monitoring plan				Under ARL's control
Landscape	Land-Mit-19	Set up of green and blue grids	-	Any time **Landscape measures follow-up plan**	Environmental study	Environmental Assessment, guidelines and final report	None	RRA
	Land-Mit-20	Set up of sustainable and resilient city guidelines and architectural guidelines	-		Designer team: landscape architect, urbanist or architect with environmentalist and sociologist	Site Assessment, guidelines and final report	None	RRA
	Land-Mit-21	Investment in woodland planting to feed the timber industry	-		Private or relevant government administration	Yearly increase in wooded surfaces	None	RRA
	Land-Mit-22	Set up sustainable timber management plan	-		Forestry expert	Timber management assessment and report	None	RRA
	Land-Mit-23	Ravine preservation and sanctuarisation of associated woodlands	-		Relevant government administration	Extent of fence + yearly cost of maintenance	None	RRA

Table 137: Overall Environmental Management Plan for operational phase

10.1.2 Environment Management Plans to be drawn up in operational phase

10.1.2.1 Surface stormwater run-off, drinking and wastewater management and monitoring plan

10.1.2.1.1 Design

The detailed design implemented during the construction should comply with the Environmental impact objectives set out in sections 5.3.10 and in section 74.1.2 where measures “Phy-Hyd-Mit-2 / 3 / 4 / 6”, “Phy-Wat-Av-6” and “Phy-Wat-Mit-7 / 8” are described.

10.1.2.1.2 Operation monitoring of measures

A monitoring system should be set up in the operational phase and integrated into the current routine inspections of the airport, with reference to the following measures described in section 10.1.1 : “Phy-Hyd-Mit-2 / 3 / 4 / 6”, “Phy-Wat-Av-6”, “Phy-Wat-Mit-7 / 8”.

The following specific tasks for operation and maintenance of the treatment plant should be included:

Water analyses = 4h per week
Electromechanical tasks = 4h per week per Treatment Plant + 2h per month per pumping station
Current operation and maintenance tasks = 10h per week per treatment Plant + 2h per week per pumping station
Oversight 24h/24h = intervention whenever required (alarm, breakdown), with remote information available, considering the implementation of a minimum remote operation monitoring equipment.

10.1.2.1.3 Persons in charge and document to provide and implement

Design measures should be designed and sized in the detailed design and implemented during the operation and followed-up by ARL. A water management plan should be provided.

Operation monitoring measures should be implemented by ARL or by an external specialist sub-consultant. This one should implement:

A desalination plant, wastewater treatment plant and storm water management system monitoring procedure including namely regular manual sampling/analysis and visual controls.
A water quality monitoring plan including namely regular manual sampling/analysis and visual controls.
The basic monitoring tasks should be carried out by a qualified technical worker. The specific operation and maintenance tasks for the treatment plants should be carried out by 2 skilled technicians + 1 on stand-by whenever required. The skills required include:

A technician with good qualifications in water analysis.
A technician with good qualifications in electromechanics.
All O&M personnel shall have good Computer skills.

10.1.2.2 Karst monitoring plan

10.1.2.2.1 Design

The detailed design should comply with the Environmental impact objectives set out in section 7 where measure “Phy-Kar-Mit-26” are described.

The following documents should be provided or implemented:

Sizing note and plans
A follow-up plan to implement by ARL

10.1.2.2.2 Post-commissioning Caves Monitoring Plan

This plan aims to monitor the airport operation impact on the caves with reference to the following measures: “Phy-Kar-Av-22”, “Phy-Kar-Mit/Comp-23”, and “Phy-Kar-Mit/Comp-24”.

ARL should be responsible of this plan as it should be carried out in a coherent way before, during and after the works. A cave expert should be mandated to carry out these surveys, and could teach and coordinate the contractor and airport environment specialists in charge of the local monitoring.

During the operation phase, the same criteria and measurements should be monitored for the first 6 months (visual criteria) to 9 months (environmental criteria : air quality, moisture, water flow) after commissioning, the following monitoring should be carried out:

- Internal factors:
  - Geological characteristics: monitoring of sedimentation compaction inside caves by visual inspection and analysis (description, thickness, sampling and analysis);
  - Fracturation: before and after the blasts, monitoring of strata behaviour (number of fracture traces) as well as count inventory of collapsed blocks located at the ground surface of the cave will be carried out. This will be observed by visual inspection (mapping of fractures network, measurement of fractures orientation);
- External factors:
  - Vibrations: monitoring of vibrations with seismographs located inside the caves (at ground surface and on walls of caves). (3 seismometers per main cave).
    - ***Note***: In parallel and above works phase, vibration consultant to provide a blasting plan comprising hole size, depth, spacing, burden, type of explosives, type of delay sequence, maximum amount of explosive on any one delay period, depth of rock, and depth of overburden if any. The vibration consultant will not be allowed to increase the maximum explosive charge weights per delay included in the plan without the approval of the contractor and airport environment specialists. Record of each blast (date, time and location, amount of explosives used, maximum explosive charge weight per delay period) will be kept by ARL over the whole work period to be consulted by specialists.
  - Water flow: permanent groundwater monitoring (see groundwater monitoring plan);

- Temperature, airborne moisture and airflow: general characterization of lint removal activities, analysis of dust/lint accumulation plates, analysis of airbone dust/lint. This survey needs sampling and analyzise;
- Pollution traces: visual monitoring of man-induced pollution (oils, wastes, mapping/inventory of visitor impacts, monitoring of cave chemistry) observed by visual inspection and analyzis (description, sampling and analyzis).

This monitoring should be carried out once a month in the main caves.

The following plans and procedures should be implemented:

A monitoring procedure to implement by the person in charge for the monitoring,
A follow-up plan to implement by ARL.

10.1.2.2.3 Operational phase groundwater quality monitoring plan

This plan consists in keeping monitoring the network of observation wells upstream and downstream of the facilities to allow sampling and analysis of groundwater to define reference values and then to establish a groundwater quality monitoring program (and levels).

The installation of observation wells and water analyses will have been carried out before the work begins.

The water quality monitoring program will have begun during the construction phase.

During the airport's operational phase, semi-annual monitoring should be carried out under normal circumstances or more frequently in the event of a spill incident. This should be included in the routine inspection program of the airport.

In the event of a surface spill, the environmental response plan must be implemented immediately.

In the event that there is a significant change in groundwater quality and/or that a contaminant is detected, the environmental management plan will also have to be put in place to contain the contamination.

This plan should be implemented and managed by the following people:

- ARL;
- Project managers;
- Mauritius authorities:
  - Environmental Assessment Division;
  - Pollution Prevention and Control Division;
- (WRU) Water Resources Unit.

The following plans and procedures should be implemented:

A monitoring procedure to implement by the person in charge for the monitoring and to be integrated to the current routine inspections of the airport,
A follow-up plan to implement by ARL.

10.1.2.3 Infrastructures and access monitoring plan

This plan aims to allow to respond to measure “Inf-Mit-7”:

firstly by providing for a redesign of the roads, routes and traffic around the airport from the design stage,
and secondly by planning the rehabilitation of the roads used by the construction equipment at the end of the worksite.
At the beginning of the operational phase, monitoring must be put in place for one year to observe any traffic problems generated and the state of the restored infrastructure.

A future roads and circulation map and sizing notes,
A 1 year post-commissioning monitoring plan.

10.1.2.4 Marine biodiversity and habitats monitoring plan

This plan consists in implementing an ecological diagnosis and assessment of the health status of corals at Pointe Palmiste.

This plan must will have begun before and during the works, and then must be implemented at 1, 3 and 5 years into the operational phase.

This plan consists in the:

Installation of beaconing and prohibition of access + monitoring / restoration
Communication on coral habitats and their fragility (effects of water heating, trampling, etc.) among the population and local stakeholders in order to raise awareness

The performance indicators are the following:

Coral recovery rate;
Algae recovery rate;
Roughness;
Study of coral reefs (specific richness, recovery rate, morphotypes);
Study of fish populations (density, ecological structure, fisheries interest).

In case of insufficient performance, the corrective measures are the following:

Decrease of the released flow;
Temporary stop of the sediment discharge;
Temporary stop of the dredging.
This plan should be implemented and managed by the following people:

Shoals Rodrigues in partnership with SEMPA.

The following documents should be provided and implemented:

A monitoring procedure to implement by the person in charge for the monitoring,

A follow-up plan to implement by ARL.

10.1.2.5 Air quality and noise environment management plans

10.1.2.5.1 Design

The detailed design should comply with the Environmental impact objectives set out in section 7 where the following measures are described:

“Air-Mit-6 to 11”,
“Noi-Mit-3 to 5”.
The following documents should be provided:

Air quality management plan,
Noise environment management plan

10.1.2.5.2 Management issues

This plan aims to guide the monitoring of the changes in air quality and noise levels to which local residents are exposed, to ensure that the recommended thresholds are not exceeded, and if so implement the necessary measures, with reference to the the following measures described in section 7

“Air-Mit-12 / 13”,
“Noi-Mit-7”.

- Noise environment monitoring plan

10.1.2.5.3 Impact study recommendations

10.1.2.5.3.1 Air quality

An air quality monitoring plan should be implemented including:

The same monitoring stations as the one used during the works should be used and store main pollutants (PM2.5, PM10, SO2, CO, NO2, O3),
It is recommended to carry out at least 2 campaigns per year, of 1 month each.

10.1.2.5.3.2 Noise environment

A noise monitoring plan should be implemented including:

The same monitoring stations as the ones used during the works should be used. Data to be produced are at least: 24-hour L_{Aeq}, percentile levels L_n, Lden, LAmax. The recorded levels must be correlated with aircraft movements, aircraft types and flight tracks.
It is recommended to set up a permanent monitoring system with 1 or 2 fixed points. If not, a minimum of 2 measurement campaigns per year, of at least 1 week each, is to be expected.

10.1.2.5.4 Objectives

The monitoring plan during the operational phase must identify whether the air quality and noise level thresholds remain within acceptable limits. They also make it possible to assess the effect of reduction measures, if any.

First Schedule ***(regulation 3)***
Emission Standards
The following standards are maximum limits for the corresponding pollutant.

Pollutant	*Applicable to*	*Standard*	Applies to project (construction / operational phase)
(i) Smoke	All stationary fuel burning source	Ringelmann No. 2 or equivalent opacity (not to exceed more that 5 minutes in any period of one hour)	X
(ii) Solid particles	(a) Any trade, industry, process, industrial plant or fuel-burning equipment	200 mg/m^3	X
	(b) Any existing trade, industry process or industrial plant using bagasse as fuel	400 mg/m^3	
(iii) Sulphuric acid mist or sulphur trioxide	(a) Any trade, industry or process (other than combustion processes and plants for the manufacture of sulphuric acid)	120 mg/m^3 as sulphur trioxide	X
	(b) Any trade, industry or process in which sulphuric acid is manufactured	30 000 mg/m^3 as sulphur trioxide	
(iv) Fluorine compounds	Any trade, industry or process in the operation of which fluorine, hydrofluoric acid or any inorganic fluorine compounds are emitted	100 mg/m^3 as hydrofluoric acid	X
(v) Hydrogen Chloride	Any trade, industry or process	200 mg/m^3 as hydrogen chloride	X
(vi) Chlorine	Any trade, industry or process	100 mg/m^3 as chlorine	X
(vii) Hydrogen sulphide	Any trade, industry or process	5 ppm as hydrogen sulphide gas	X
(viii) Nitric acid or oxides of nitrogen	Any trade, industry or process in which the manufacture of nitric acid is carried out	2 000 mg/m^3 as nitrogen dioxide	
(ix) Nitric acid or oxides of nitrogen	Any trade, industry or process other than nitric acid plant	1 000 mg/m^3 as nitrogen dioxide	X
(x) Carbon monoxide	Any trade, industry or process	1 000 mg/m^3 as carbon monoxide	X

10.1.2.5.5 Performance indicators

The performance indicators to be taken into consideration are:

the difference between the thresholds to be reached and the measured pollution and noise levels,
the number of actions implemented if the thresholds are exceeded,
the reduction of noise or pollutant concentration following the implementation of mitigation measures.

10.1.2.5.6 Management strategy

The monitoring plan includes the following elements:

choice of pollutant thresholds and noise levels not to be exceeded, based on local standards or international recommendations,
determination of the locations for the measurements, and choice of the values to be measured (pollutants, noise indicators),
choice of a service provider,
analysis and possible publication of the results of the measurements,
implementation of reduction measures in the event of exceeding the thresholds.

10.1.2.5.7 Reports

It is recommended to produce monthly and/or annual reports of the results of the measurements.

These reports will detail the methodology used, the location of the measurement points, the results, the comparison with and justification for the thresholds, any mitigation measures and the monitoring of their effectiveness.

10.1.2.6 Landscape measures following-up plan

The landscape measures planned in the operational phase “Land-Mit-19 / 20 / 21 / 22 / 23” (section 7) should be implemented by RRA services as they concern the entire island.

10.1.3 Emergencies prevention and management plans

10.1.3.1 Oil spill prevention prevention plan

An oil spill prevention plan should be implemented describing all the precautions, procedures, tools, actions of training, awareness-raising and check-up routine that should be scheduled in order to prevent oil spills and other pollutions, with reference to measures “Phy-Mar-Mit-6 / 7”, “Phy-Hyd-Mit-5” and “Phy-Kar-Av-25”.

10.1.3.2 Oil spill management plan

In the event of an oil spill on the ground, two scenarios are possible:

- The oil is contained in the topsoil
- Oil seeps into the groundwater until it reaches the groundwater

The karstic aquifer in Plaine Corail are very vulnerable to surface discharge (direct access to groundwater through surface cavities). Any hydrocarbon spill should be reported directly to ARL for a decision on whether to initiate the emergency plan depending on the volume of oil spilled and the nature of the surrounding soil.

The practical thresholds for significant (reportable) spills of petroleum products are usually as follows:

- Land-based spills: 70 L
- Spills directly on water: Any amount

In the event of an accidental spill of contaminant on the soil, if it has been able to infiltrate deeper layers, changes in groundwater quality should be monitored through monitor well network (see section 8.5.1.6).

An Oil Spill Emergency Plan must be implemented in detail before the initial earthwork phase.

The objectives of an Oil Spill Emergency Plan are:

- To minimize the risk of spills or unplanned situations that might cause environmental harm.
- To ensure that contingency measures are in place and implemented in the event of such spills or unplanned situations.

10.1.3.2.1 Land contamination

There are two main potential sources of fuel spills at an airport:

- From where the fuel storage takes place
- From where the aircraft are filled

Initial Actions to be taken after Fuel Spill reported as to be prepared and presented in the Outline Fuel Spill Contingency Response Plan. The key features which should be included in the spill response are:

- identification of the source of spill;

- reporting to relevant Authorities;
- ensure the health and safety of personnel and then order an emergency shutdown measures needed to stop or minimize further spillage;
- A rapid initial assessment is conducted:
    - Risk of harm to human health ;
    - Probable quantity of contaminant spilled ;
    - Type of contaminants;
    - Location of the spill ;
    - Probable source and cause;
- containment of leaking fuel;
- recovery and processing of free fuel;
- sampling the piezometers
- clean up methodology; and
- handling and disposal protocols.

If the spill is directed directly to the sea by runoff and not via infiltration and aquifers, a Maritime Oil Spill Response Plan to be implemented.

As a perfect example for an oil spill emergency response in an airport environment, the Spill Prevention and Response policy of the Melbourne airport is proposed in detail in 14.3.

The response to a spill should involve four stages – Control, Containment, Contact and Clean.

10.1.3.2.1.1 Control

Immediate action should be taken to secure the site and prevent further material from spilling, but only when it is safe to do so. These actions can include:

- Turning off any ignition sources
- In the case of a punctured drum, the drum can be rolled over so the puncture is on top. This should prevent further spilling of material
- Larger containers which are leaking should be moved quickly to a bunded area
- Valves or pumps should be turned off to stop leaks from pipes and fittings

10.1.3.2.1.2 Containment

Action should be taken as soon as possible to contain the spill in order to stop the material entering stormwater drains, contaminating soil or groundwater.

- Spills should be contained using absorbent material
- Any stormwater drain should be protected first by forming a “dam” of absorbent material around the drain
- Spilled material should then be contained by forming a “dam” of absorbent material around the spill

10.1.3.2.1.3 Clean

Absorbent materials such as diatomaceous earth or polypropylene are the preferred products for the cleaning of any spills. These products absorb the spilt material leaving no residue and have no detrimental impact on the environment. A list of approved cleaning materials must be identified in the Emergency Response Plan.

All contaminated soil must be stored and disposed of in accordance with local environmental standards.

10.1.3.2.1.4 Contact

As soon as practicable, the spill must be reported to Airport Authorities (ARL) and Spill response team leader.

10.1.3.2.2 Groundwater contamination

In the most unfavourable case where the contamination reaches the karst aquifer of the Coral Plain, the following particularities of contaminant transport must be considered:

- The transport of the contaminant to the sea could be very fast
- The exact underground flow path is generally not known

10.1.3.2.2.1 Groundwater sampling

As soon as a major spill likely to reach groundwater occurs, groundwater sampling in the downstream observation wells should be implemented. The analyses will focus specifically on the nature of the contaminant.

10.1.3.2.2.2 Groundwater decontamination

A company specializing in soil and groundwater remediation should be contacted immediately to assess the situation and propose appropriate measures to address it:

- Assess the nature and extent of the contamination
- Contain contamination
- Recover the contaminant and decontaminate the aquifer
- Treat contaminated water
- Dispose of contaminated materials (soil and water)

The free phase of the hydrocarbons must be pumped as quickly and efficiently as possible by the contractor. Depending on the direction of groundwater flow, underwater resurgences must be monitored, and a Maritime Oil Spill Response Plan must be implemented.

10.1.3.2.3 Marine contamination

10.1.3.2.3.1 Containment

Action should be taken as soon as possible to contain the spill in order to stop the material entering stormwater drains, contaminating soil or groundwater.

- Spills should be contained using absorbent material
- Any stormwater drain should be protected first by forming a “dam” of absorbent material around the drain
- Spilled material should then be contained by forming a “dam” of absorbent material around the spill
- Temporary floating barriers (booms) should be used to contain marine spills

10.1.3.2.3.2 Clean

Absorbent materials such as diatomaceous earth or polypropylene are the preferred products for the cleaning of any spills. These products absorb the spilt material leaving no residue and

have no detrimental impact on the environment. A list of approved cleaning materials must be identified in the Emergency Response Plan.

All contaminated soil must be stored and disposed of in accordance with current environmental standards.

If groundwater is contaminated, decontamination measures must be taken immediately. The free phase of the hydrocarbons must be pumped as quickly and efficiently as possible. Depending on the direction of groundwater flow, underwater resurgences must be monitored and an emergency plan for the containment of contamination at sea must be implemented.

If sea water is contaminated, when the benefit of the clean-up is less than the potential harm caused to remove of the spill, spilled oil products are allowed to degrade naturally. A monitoring program is implemented to ensure there are no unforeseen threats to ecosystems.

In case of a large volume threatening spills into the sea, the use of dispersants could be considered. This chemical agent aids biodegrading by forming tiny oil droplets, making them more available for microbial degradation.

Tarred sand must be removed with appropriate equipment supplied by the state or contactors and transported to a secure disposal site.

Once clean-up operations are achieved, consideration will be given to restore areas identified as having high environmental sensitivity and value.

10.1.3.3 Fire Emergency Plan

In case of a Fire Fighting event on the new runway, it is envisaged to confine the corresponding volume in a storage tank of 240 m^3 to be implemented at each extremity of the new runway. The storage volume is based on the usual prevailing rules for confining water from fire fighting. It is proposed to consider here 2 hydrants operating at a flow rate of 60 m^3/h each during 2 hours.

The water from firefighting will be collected by the slot drains and conveyed to the dedicated storage tanks where it will be confined by a specific valve arrangement and evacuated later by dedicated pumping.

10.1.4 Summary of plans to be drawn up for environmental management during the operational phase

Table 138: Summary of Environmental Management Plan for operational phase

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control	Activity / Procedures to include
Surface stormwater run-off, drinking and wastewater management and monitoring plan	Design Phy-Hyd-Mit-2 / 3 / 4 / 6 Phy-Wat-Av-6 Phy-Wat-Mit-7 / 8	To be implemented by the Detail Design Engineer Under ARL's control	- A water management plan
	Operation monitoring of measures Phy-Hyd-Mit-2 / 3 / 4 / 6 Phy-Wat-Av-6 Phy-Wat-Mit-7 / 8	To be implemented by ARL or external specialist engineer Under ARL and RRA's control	- A desalination plant, wastewater treatment plant and storm water management system monitoring - A water quality monitoring plan
Karst monitoring plan	Design – groundwater Phy-Kar-Mit-26	To be implemented by the Detail Design Engineer Under ARL's control	- Sizing note and plans - A follow-up plan to implement by ARL
	Operation monitoring – groundwater Phy-Kar-Mit-26	To be implemented by ARL or an external specialist Under ARL's control	- A monitoring procedure to implement by the person in charge for the monitoring - A follow-up plan to implement by ARL
	Operation monitoring – caves Phy-Kar-Av-22 Phy-Kar-Mit/Comp-23 Phy-Kar-Mit/Comp-24	To be implemented by ARL or an external specialist Contractor (as part of the 10-year guarantee) Under ARL's control	
Marine biodiversity and habitats monitoring plan	-	To be implemented by ARL or an external specialist Under ARL's control	- A monitoring procedure to implement by the person in charge for the monitoring - A follow-up plan to implement by ARL

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control	Activity / Procedures to include
Infrastructures and access monitoring plan	<u>Design ad post-commissioning monitoring</u> Inf-Mit-7	To be implemented by the Detail Design Engineer and Contractor (as part of the 10-year guarantee) Under RRA and ARL's control	- A future roads map and sizing notes - A 1 year post-commissioning monitoring plan
Air quality and noise environment management and monitoring plan	<u>Design</u> Air-Mit-6 to 11 Noi-Mit-3 to 5	To be implemented by the Detail Design Engineer Under ARL's control	- Air quality management plan - Noise environment management plan
	<u>Operation monitoring</u> Air-Mit-12 / 13 Noi-Mit-7	To be implemented by ARL or external specialist engineer Under ARL and RRA's control	- Air quality monitoring plan - Noise environment monitoring plan
Landscape measures follow-up plan	Land-Mit-19 / 20 / 21 / 22 / 23	RRA Under RRA and ARL's control	- A management plan to follow the measures to be carried out by RRA on an island scale
Emergencies prevention and management plans	Phy-Mar-Mit-6 / 7 Phy-Hyd-Mit-5 Phy-Kar-Av-25	ARL	- Oil spill prevention and management plan - Fire Emergency plan

10.2 Social Management Plan for operational phase

10.2.1 Social Management Plan for operational phase

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system – reports to provide	Performance indicators	Corrective measures	Responsible managers for implementation
Communication Ensure a harmonious implementation of the work at all stages of its performance with all the communities directly or indirectly impacted by the project **Communication plan**	**SE-Mit-3-** Complaint management and internal support for relocation.	An outcome of the RAP, complaint management is the attentive listening to the affected populations regarding relocation. It must be effective and transparent in order to take into consideration and share all the grievances expressed by the communities in order to define appropriate communication and support strategies.	The complaint management plan covers the entire project: from the implementation of the resettlement plan and throughout the period of adaptation of the displaced communities.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly Quarterly reports to be submitted by the Relocation Committee until full adaptation of resettled population	- Number of registered complaints and reports on actions taken for complaint management.	Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - Airport of Rodrigues - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location)
	SE-Mit-5- Communication plan concerning the integration of external workers.	The project will bring in foreign and specifically qualified labour. It is important to communicate about a considerable and temporary advent of an external population and to ensure transparency concerning the hiring procedures in relation to foreign workers.	This communication plan must begin prior to the arrival of the first workers and continue throughout all of the works phase.	To be monitored by: RRA / ARL Annual reports submitted by the Airport of Rodrigues in collaboration with Rodrigues Regional Assembly that include communication measures taken on the period as well as local surveys on inhabitants as well as external workers.	- Number of communication activities carried out; - Number of communication media produced and distributed; - Number of organized sessions, meetings or information workshops; - Results of carried out surveys; - Number and qualitative details on hired people; - Number of registered complaints and reports on actions taken for complaints management.	- Organise additional communication activities in case of insufficient communication and if required through surveys results. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Executive Committee of the RRA - Airport of Rodrigues - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Local media (radio)
	SE-Mit-7- Communication and hiring management plan	Specific communication concerning hiring procedures should be put in place so that impacted communities are informed about job opportunities and other related information.	This communication plan must begin and continue throughout the works phase.				
	SE-Mit-11- Community consultation plan for monitoring the evolution of the agro-pastoral system. **SE-Mit-12**- Support measures concerning livestock breeding techniques.	These measures relate to the communication procedures to be employed concerning the specific and important subject of adaptation of agricultural and livestock breeding techniques by all communities.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.	To be monitored by: RRA and the Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity) Bi-annual Relocation Plan Report to be submitted by the Relocation Committee including complaints management and satisfaction surveys.	- Number of registered complaints and reports on actions taken for complaint management, - Qualitative evaluation according to survey results.	- Improve communication with local people according to reports' feedback. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Relocation committee appointed by the Executive Committee of the RRA - Rodrigues Agriculture Commission - Village Committee (Plaine Corail – Cascade Jean Louis) and non-resident livestock breeders - Possibly a specialised external entity such as an NGO
	SE-Mit-13 - Support and fishermen's complaint management plan.	These measures relate to the communication procedures to be undertaken with the fishermen's community following relocation.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by the Executive Committee of the RRA - Rodrigues fishing Commission - Fishing station managers - Airport of Rodrigues

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system – reports to provide	Performance indicators	Corrective measures	Responsible managers for implementation
	SE-Mit-14- Plan for consultation and support of the communities of the area concerning the development of income-generating activities. **SE-Mit-15-** Economic support plan for households.	These measures relate to the communication procedures to be employed with the village communities in the area in order to promote the development of income-generating activities for households by becoming aware of the initiatives that the villages and villagers would like to implement.	These measures are developed from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
Complaint management Ensure that all complaints from communities or individuals affected by the implementation of the project are received, reviewed and that appropriate action is taken within a reasonable time to arrive at a mutually acceptable solution. **Complaints management plan**	**SE-Mit-3-** Complaint management and internal support for relocation.	The relocation complaint management process requires careful listening to affected populations. It must be effective and transparent in order to take into consideration and share all the grievances expressed by the communities in order to define appropriate communication and support strategies.	*(entire project)*	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly Relocation Plan Report including complaint management to be submitted by the Relocation Committee at the end of the relocation plan and before resettlement.	- Number of complaints issued; - Number of complaints satisfactorily resolved.	- Ensure that all registered complaints have been satisfactorily treated. If not, complaints not well treated will have to appear positively handled before works begin.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Airport of Rodrigues - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Villagers of Plaine Corail (proposed resettlement location)
	SE-Mit-11- Community consultation plan for monitoring the evolution of the agro-pastoral system.	This measure is the implementation of an effective and transparent complaint management mechanism concerning agriculture and livestock breeding. This mechanism makes it possible to become aware of the potential discontent of individuals or communities concerning the evolutionary process of the agro-pastoral system.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity) Bi-annual Relocation Plan Report to be submitted by the Relocation Committee including complaint management and satisfaction surveys.	- Number of registered complaints and reports on actions taken for complaints management, - Qualitative evaluation according to survey results.	- Improve communication with local people according to reports' feedback. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - Rodrigues Agriculture Commission - Villagers and livestock breeders of the resettlement area
	SE-Mit-13 – Support and fishermen's complaint management plan.	This plan must implement a complaint management mechanism issued by the fishermen's community following relocation.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - Rodrigues fishing Commission - Relocated fishing post managers

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system – reports to provide	Performance indicators	Corrective measures	Responsible managers for implementation
Resettlement and compensation The set of measures to be taken for the resettlement and compensation of impacted communities must help to limit the socio-economic impacts resulting from the displacement of populations by restoring livelihoods and the standard of living of displaced people. **Action plan for relocation and compensation (including the livelihood restoration plan)**	**SE-Mit-14-** Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	The goal of this measure is to keep communities on a viable and sustainable socio-economic dynamic by proposing to families that they diversify their economic activities.	This follow-up takes place from the construction phase and continues during the period of adaptation of the displaced communities.	To be monitored by RRA Annual report submitted by the Small Entrepreneurship Commission of Rodrigues Regional Assembly to Airport of Rodrigues and Rodrigues Regional Assembly Executive Committee.	- Quantitative and qualitative evaluation of local development according to survey results. - Number of local set up small activities and businesses.	- Enhance local economic environment through group consultations with specific and relevant themes according to evaluation results.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
Community development Medium-term planning of actions that should be implemented to achieve socio-economic development goals at the local level to trigger a virtuous process of improving living conditions **Community development plan**	**SE-Mit-9-** Agricultural technical support plan.	This measure contributes to the consolidation of integration in the community environment through the support of technical services facilitating the adaptation of agricultural models and thereby promoting the viability of production.	These measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity) Annual report submitted by the Commission of Agriculture dealing with results obtained from field surveys and farmer consultations.	- Number of projects implemented; - Number of direct and indirect beneficiaries; - Geographical coverage of the projects implemented; - Diversity of topics discussed.	Projects reinforcement or implementation according to results obtained from field surveys and farmer consultations.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues Agriculture Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
	SE-Mit-11- Community consultation plan for monitoring the evolution of the agro-pastoral system. **SE-Mit-12**- Support plan concerning livestock breeding techniques.	These measures contribute to consolidating the integration of communities through the support of technical services facilitating the adaptation of farming methods to the new environment and thereby promoting the viability of production.	The measures occur from the resettlement of displaced villagers and continue throughout the period of community adaptation.				- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues Agriculture Commission - Livestock breeders of the relocation area - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system – reports to provide	Performance indicators	Corrective measures	Responsible managers for implementation
	SE-Mit-14- Plan for consultation and support of the communities of the area concerning the development of income-generating activities.	The goal of this measure is to keep communities on a viable and sustainable socio-economic dynamic by proposing to families that they diversify their economic activities.	This follow-up takes place from the construction phase and continues during the period of adaptation of the displaced communities.	To be monitored by RRA Annual report submitted by the Small Entrepreneurship Commission of Rodrigues Regional Assembly to Airport of Rodrigues and Rodrigues Regional Assembly Executive Committee.		- Enhance local economic environment through group consultations with specific and relevant themes according to evaluation results.	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)
Workforce and training Encouragement to form a more rigorous workforce to improve the skills of local labour leading to economic growth linked to the creation of local jobs. **Workforce management and training plan**	**SE-Mit-5**- Communication plan concerning the integration of external workers.	These measures for the development of a management policy concerning the accommodation of external workers permit the improvement of incomes in the locations.	This measure must take place throughout the construction phase.	To be monitored by: RRA / ARL Annual reports submitted by the Airport of Rodrigues in collaboration with Rodrigues Regional Assembly that include communication measures taken on the period as well as local surveys on inhabitants as well as external workers.	- Number of communication activities carried out; - Number of communication media produced and distributed; - Number of organized sessions, meetings or information workshops; - Results of carried out surveys; - Number and qualitative details on hired people; - Number of registered complaints and reports on actions taken for complaints management, - Qualitative evaluation according to survey results.	- Organise additional communication activities in case of insufficient communication and if required through survey results. - Ensure that all registered complaints have been satisfactorily treated. If not, complaints not yet treated will have to appear positively handled in following report.	- ARL - Project managers - Rodrigues labour Commission - Executive Committee of the RRA - Airport of Rodrigues - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Local media (radio)
	SE-Mit-7- Communication and hiring management plan	This measure is to showcase local skills, job opportunities and associated hiring conditions, and to foster local hiring to provide opportunities to obtain skills. This measure is to implement a worker complaint management process including the development of a labour law awareness and training program.	This measure must take place throughout the construction phase.				- ARL - Project managers - Executive Committee of the RRA - Rodrigues labour Commission - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Local media (radio)

Table 139: Overall Social Management Plan for operational phase

10.2.2 Social Management Plans to be implemented for the operational phase

This SMP is accompanied by monitoring and evaluation tools that are required to monitor the performance and assess its accuracy.

The different plans proposed in this document are explained and a general "framework" is given for their development. The SMP alone cannot suffice, and each of the tools must be subject to development work.

It is proposed that the Social Management Plan of the Project of expansion of the runway of Plaine Corail Airport be structured and articulated according to the following plans:

Communication plan
Complaint management plan
Community assistance and communication plan for the development of income generating activities
Community development plan
Public health and community safety plan
Workforce management and training plan.

10.2.2.1 Communication plan

10.2.2.1.1 Management issues

In order to maintain good relations with all the stakeholders affected by the project and to promote a harmonious integration of the project in the environment, it is essential to establish operational channels and strategies for communication enabling an ongoing dialogue and information flow between the project's developers and the affected communities.

10.2.2.1.2 Impact study recommendations

The social impact study emphasizes a number of avenues of action to stabilize and improve the communication loop between the project and the communities, and to establish a specific mechanism to:

Organize information meetings at the level of the towns affected by the project (to be incorporated into mitigation plans SE-Mit-3, SE-Mit-5, SE-Mit-7, SE-Mit-11, SE-Mit-12, SE-Mit-13, SE-Mit-14, SE-Mit-15);
Use an effective and transparent complaint management mechanism at project level and communicate this mechanism to the towns impacted by the project activities (integrated into mitigation measures SE-Mit-3, SE-Mit-11 and SE-Mit-13);
Develop and adopt a continuous and transparent communication strategy concerning the issues of displacement and relocation (the various mitigation plans take into consideration communication concerning issues related to the habitat, the various sectors of activity such as agriculture, livestock and fisheries, employment, health and safety. These communication measures are implemented at the beginning of the project, during the construction phase, and maintained for certain measures – measures SE-Mit-3, SE-Mit-11, SE-Mit-13, SE-Mit-14 and SE-Mit-15 - in the operating phase);
Communicate transparently about the procedures for direct and indirect hiring of the project (opportunities, skills and education levels required – mitigation measures SE-Mit-5, SE-Mit-7);
Establish a framework for consultation with regular meetings (local authorities, communities, airport, Rodrigues government) to address public development initiatives (notably through measures SE-Mit-7, SE-Mit-14, SE-Mit-15).

10.2.2.1.3 Objectives

The guidelines of the communication plan to be established are intended to ensure a smooth implementation of the work at all stages of its performance.

10.2.2.1.4 Performance indicators

The performance indicators to be taken into consideration in the communication plan are:

The number of communication activities carried out;
The number of communication media items produced and distributed;
The number of organized sessions, meetings or information workshops;
The number of information activities organized.

10.2.2.1.5 Management strategy

A communication plan will be prepared and put in place. A community relations officer will be appointed.

The information should be communicated on a regular basis in an understandable and accessible way to stakeholders. The communication strategy should be tailored to the linguistic preferences of the affected communities, their decision-making process and the needs of vulnerable or disadvantaged groups.

The communication plan includes the following elements:

Identification of stakeholders: i.e. each group or person affected and/or concerned by the work;
Choice of the appropriate mechanisms for communicating and disseminating information, which may include individual meetings, design, at the organisational level, of the role of a community liaison officer, the use of local media, etc;
Elaboration of a timetable for the implementation of the communication and dissemination of information in relation to the planned activities and according to the target audiences.
Identification of the necessary resources and responsibilities of each stakeholder.

10.2.2.1.6 Follow-up

It is essential to establish a follow-up process to ensure that the actions of the plan are actually put in place.

10.2.2.1.7 Reports

The contents of the reports prepared must show:

A communication and information dissemination plan;
A report of each of the meetings and communication actions organized;
Quarterly and annual reports from the project holder, taking stock of the activities carried out.

10.2.2.2 Complaints management plan

10.2.2.2.1 Management issues

In order to establish and maintain a good relationship with the surrounding communities during the implementation of the project, the Developer must permit these communities to share their views, interests and concerns concerning the work to be done.

10.2.2.2.2 Impact study recommendations

For a social impact study, the recommendations for structuring a complaint management plan are to:

Establish a complaint management mechanism that is widely known to local stakeholders (local authorities and populations affected directly or indirectly by the project) and works in an efficient and transparent manner (to be integrated specifically in the plans for mitigation measures SE-Mit-3, SE-Mit-11 and SE-Mit-13);
Use an effective and transparent complaint management mechanism at project level and communicate this mechanism to the authorities and towns impacted by the project activities

10.2.2.2.3 Objectives

The main objective of a complaint management plan is to ensure that all complaints from communities or individuals affected by the implementation of the project are received, reviewed and that appropriate action is taken within a reasonable period to arrive at a mutually acceptable solution.

10.2.2.2.4 Performance indicators

The performance indicators to be taken into consideration during the communication plan are the:

Number of complaints issued per month;
Number of complaints per month satisfactorily resolved.

10.2.2.2.5 Management strategies

The complaint management strategy is based on the following principles:

the procedure for making a complaint and to whom it should be made must be transparent and presented to communities according to their language preference. This procedure should be widely disseminated to the communities that could potentially be affected by the implementation of the project. The communication can be made verbally and/or in writing;
the channels of communication between the parties must remain open until the situation is resolved to the satisfaction of both parties;
all claims or complaints from the communities and the reactions or responses proposed must be described and classified in a register.
Community or individual claims will be subject to the following procedure:

Receipt: the claims received verbally or in writing by the project managers are directed within 24 hours of receipt to a single point of contact;
Preliminary assessment: when the claim is urgent and requires immediate response, and the community relations officer cannot respond to it, it shall be communicated promptly to a manager appointed by the project;
Registration: the person in charge of the community relations registers all the claims and the correspondence and actions taken on this subject;
Transmission: If the complaint cannot be resolved on the spot, the community relations officer informs his supervisor within the project management to immediately initiate a resolution process;
Acknowledgement of receipt: the community relations officer shall send a written reply to the requestor within 48 hours to acknowledge receipt of the claim. The letter provides detailed information about the complaint itself (subject, explanation, people concerned, etc.) and the steps that will be taken and the estimated time to resolve the claim. The content of the correspondence is also verbally addressed to ensure that the members of the affected community have a good understanding;
Evaluation meeting: if necessary, a meeting is organized with the person/group who has filed the claim to discuss and try to clarify and resolve the matter;

Conflict resolution meeting: If the issue is not resolved to the satisfaction of all parties at the evaluation meeting, a more expanded meeting is organized, involving other institutions that can act as mediators in the resolution of the dispute (specialised commissions);
Meeting of the administrative authorities: If the matter is still unresolved, another expanded meeting comprising the participation of the administrative authorities (Regional Assembly) is organised;
Legal action: as a last resort, a lawsuit could be brought by the parties concerned, after all other possible avenues of dispute resolution have been exhausted.

10.2.2.2.6 Follow-up

In order to ensure proper monitoring of a complaint management plan, it is necessary to:

Maintain a register and ensure that all complaints have been addressed;
Ensure that investigations are completed within seven days of receipt of a complaint.
Ensure that complaints are processed and resolved within one month of receipt.

10.2.2.2.7 Reports

The contents of the reports prepared must show:

A complaint registration form containing at least the following pieces of information:
unique file number;
time and date of receipt of the complaint;
nature and description of the complaint;
means of communication (telephone, letter, visit, verbal communication);
person in charge of the case;
name, address, contact details and signature of the complainant;
name, address, contact information and signature of the witness(es);
follow-up and investigation carried out after the complaint was lodged;
actions undertaken and signature of the person having examined the complaint;
agreement leading to the closure of the file (including the complainant's signature).
Monthly reports from the community relations officer reporting the number of complaints and the status of the conflict resolution process.

10.2.2.3 Community assistance and communication plan for the development of income generating activities

10.2.2.3.1 Impact study recommendations

For a social impact study, the recommendations for the implementation of an action plan for relocations and compensations are to:

Develop a Livelihood Restoration Plan for communities that will be affected by "economic displacement" (loss of property and/or livelihoods) and establish a monitoring-assessment program of the socio-economic conditions of displaced people;
Support the diversification of income-generating economic activities in the context of the Livelihood Restoration Plan so that people affected by the project can regain sustainable livelihoods and possibly invest in these activities a part of the financial indemnifications resulting from the RAP (SE-Mit-14);
Support projects for the development of income-generating activities aimed at internally displaced people, in particular people displaced due to economic reasons (measure SE-Mit-14).

10.2.2.3.2 Performance indicators

The performance indicators to be taken into consideration during the action plan for relocations and compensations are:

Compensations that meet at least the international requirements (IFC standards) on the basis of a price matrix to be established in the framework RAP;
Results of a questionnaire on the satisfaction rate of displaced and/or compensated people.

10.2.2.3.3 Follow-up

A monitoring and evaluation procedure should permit:

The monitoring of the execution of compensation and relocation process (verification of the level of execution and its quality);
The monitoring of the impacts of the PARC (verifying the achievement of objectives and redefining them when necessary).

10.2.2.3.4 Reports

The reports to be edited to facilitate the follow-up of the process established are:

Evaluation monitoring reports.
It should be noted that relocation provisions of the populations affected by the project have already been undertaken by the Rodrigues authorities through the Executive Committee of the Rodrigues Regional Assembly which has specifically established a Relocation Committee with the objective of preparing, organising and implementing the RAP of the communities identified as directly impacted by the project. As all the actions already undertaken follow in part the international standards mentioned above, the challenge is then to verify that the procedures undertaken are consistent with the requirements.

10.2.2.4 Community development plan

10.2.2.4.1 Management issues

Measures to support the reconstitution of an economic and productive situation favourable to the families affected by the project, both in the area directly impacted and in the areas proposed as relocation areas, must be planned and implemented.

10.2.2.4.2 Impact study recommendations

Recommendations for the implementation of community development support measures are to:

Promote local economic development initiatives to accompany the people and communities affected by the project (specifically for measure SE-Mit-14);
Reinforce or create income-generating activities, in particular those carried out by women (measure SE-Mit-14);
Develop programs to support economic diversification and the development of income-generating activities (e.g. crafts, trade, services and processing of agricultural and fishery products) (measure SE-Mit-14);
Develop programs to support agricultural and agro-pastoral development in order to make the best use of the territory's resources and adapt land uses (measures SE-Mit-9, SE-Mit-11 and SE-Mit-12);
Support livestock breeding by allowing for the creation of water points and creating fodder perimeters for livestock (measure SE-Mit-12);

Improve access to water in proposed areas such as the resettlement areas (measures SE-Mit-9 and SE-Mit-12).

10.2.2.4.3 Objectives

The CDP is to be constructed with the communities and aims to plan in the medium term the actions that should be implemented to achieve socio-economic development goals at the local level. It is intended to trigger a virtuous process of improving living conditions in the host communities of internally displaced people, benefiting resettled families and host families equally.

10.2.2.4.4 Performance indicators

Indicators that can highlight the performance of the community development plan are:

The number of projects implemented within the framework of the CDP;
The number of direct and indirect beneficiaries of projects implemented within the framework of the CDP;
The scope of projects implemented within the framework of the CDP;
Geographical coverage of projects implemented within the framework of the CDP;
The diversity of the topics addressed by the projects implemented within the framework of the CDP (health, education, access to water, transport, agriculture, livestock, fisheries, market gardening, economic diversification, income-generating activities...).

10.2.2.4.5 Management strategy

The CDP should be developed and implemented on the basis of the following aspects:

The methods of project selection and allocation of budgets: the choice of projects must be based on a participatory approach, in particular in terms of prioritisation.
Implementation methods: the realisation of tenders, the selection of contractors, of partners for implementation and of control officers must be controlled by the local administrative Entities as much as possible and be monitored by the populations.
The monitoring and control methods: communities must be equipped with tools and means to ensure that the projects are properly implemented, in articulation and with the support of the administrative authorities and the committees that provide control over the assignment and execution of projects. The monitoring of the execution must be based on simple and measurable performance indicators.
The system of communication and transparency: the most complete and broadest communication is the first safeguard against misuse of funds. It also makes it possible to obtain a broad membership of the people in the project.
Monitoring and assessment of impacts: in the same way as monitoring of implementation must be carried out, monitoring to measure achievement of objectives and effectiveness of actions is necessary. The local authorities, through the specific established committee bringing together those responsible for the various themes involved, must be able to carry out the monitoring of the impacts. A budget must be allocated to it and it must allow for a regular period to carry out an external audit.

10.2.2.4.6 Reports

The reports to be drafted to facilitate the follow-up of the community development plan to be implemented are:

CDP strategy and guidance documents;
Implementation reports of projects funded in the context of the CDP;
Annual reports of implementation of the CDP.

10.2.2.5 Workforce management and training plan

10.2.2.5.1 Management issues

The project must establish and encourage rigorous workforce management that maximizes local economic benefits without compromising the quality of the work.

The project will generate temporary jobs during the construction phase. A preference for the assignment of jobs should be directed towards the citizens of Rodrigues and especially the citizens of the communities close to the airport area.

10.2.2.5.2 Impact study recommendations

Recommendations for the implementation of a workforce management and training plan are to:

Develop and implement a workforce management plan that includes:
a description of working conditions and hiring conditions (measure SE-Mit-7);
a management and quality policy concerning the accommodation of external workers (measure SE-Mit-5);
Ensure the implementation of a recruitment policy favouring local citizens with the goal of prioritizing the resettled people of the project and the affected local communities (measure SE-Mit-7);
Prepare a training program for employees and a training plan for communities in collaboration with regional administrative authorities;
Carry out an inventory of local skills within the framework of the training and skill-building action plan in order to prioritise the employment of those directly affected by the project (measure SE-Mit-7);

10.2.2.5.3 Objectives

The main objectives in a workforce management and training plan are to:

Establish and maintain a good working relationship between the project, its partners, subcontractors and workers;
Promote equal opportunities and equitable treatment of workers;
Encourage the economic growth of the region of implementation of the project by creating local jobs.

10.2.2.5.4 Performance indicators

In order to measure the performance of the workforce management plan and the training established, consideration should be given to:

The number of complaints issued or non-conformities identified;
The number of satisfactory settlements within one month.

10.2.2.5.5 Management strategies

The strategies to be established for the workforce and training management plan concern:

A hiring policy: with equal skills, all recruitments will respect the order of priority in order to encourage job creation within the populations directly affected by the project;
Hiring procedures: in addition to be posted in the project information office, labour needs will be disseminated in nearby towns;

Working conditions and terms of employment: the project and the selected contractors will provide in writing an employment contract to all employees. This contract will include the terms and conditions of work: remuneration, hours of work, overtime, holidays and sick leave, etc;
Representation of workers and grievance management: according to the national labour code.
Training: all project staff, including those working for contractors, subcontractors and suppliers, must have the necessary skills and must be aware of the risks associated with their work, their responsibilities for managing these risks and the plans, procedures or instructions that must be followed in relation to the management of these risks.
Subcontractors: all requirements of the GSP and all operational controls developed under the management system will also apply to all contractors and subcontractors responsible for the design, construction, operation or closure of the project. By extension, these requirements will also be applied to suppliers of goods and services to the project.

10.2.2.5.6 Follow-up

To ensure the monitoring the workforce management plan and training, it is necessary to:

Regularly check the number of local jobs created in the project activities in the mining, road and port areas using indicators;
Check the complaints register regularly, to ensure that actions have been taken to resolve the various cases.

10.2.2.5.7 Reports

Reports on the workforce and training management plan will be required to document monthly complaints, grievances, strikes, etc. and the measures put in place to resolve disputes.

10.2.3 Summary of plans to be drawn up for social management during the the operational phase

Table 140: Summary of Social Management Plans for operational phase

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
Communication plan	SE-Mit-3 SE-Mit-5 SE-Mit-7 SE-Mit-11 SE-Mit-12 SE-Mit-13 SE-Mit-14 SE-Mit-15	- Executive Committee of the RRA - Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - ARL - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area - Rodrigues Agriculture Commission - Rodrigues women and small entrepreneurship Commission - Rodrigues fishing Commission - Villagers of Plaine Corail (proposed resettlement location) - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Local media (radio) - Possibly a specialised external entity such as an NGO To be monitored by: ARL/ RRA and the Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity)
Complaints management plan	SE-Mit-3 SE-Mit-11 SE-Mit-13	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - ARL - Spokesperson of the village of Sainte Marie - Fishing station managers and livestock breeder users of the impacted area

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
		- Villagers of Plaine Corail (proposed resettlement location) - Relocation committee appointed by the Executive Committee of the Rodrigues Regional Assembly - Rodrigues Agriculture Commission - Villagers and livestock breeders of the resettlement area - Rodrigues fishing Commission - Relocated fishing post managers To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity)
Community assistance and communication plan for the development of income generating activities	SE-Mit-14	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues women and small entrepreneurship Commission - Rodrigues Agriculture Commission - Rodrigues fishing Commission - ARL - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) To be monitored by RRA
Community development plan	SE-Mit-9 SE-Mit-11 SE-Mit-12 SE-Mit-14	- Relocation committee appointed by and in liaison with the Executive Committee of the RRA - Rodrigues Agriculture Commission - Livestock breeders of the relocation area - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Rodrigues fishing Commission - Rodrigues women and small entrepreneurship Commission

Plan	Measures that the plan must allow to implement and monitor (see description in section 7 and ESMP above)	Person in charge of implementation and control
		To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly (with the help of an external specialized entity)
Workforce management and training plan	SE-Mit-5 SE-Mit-7	- ARL - Project managers - Rodrigues labour Commission - Executive Committee of the RRA - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Local media (radio) To be monitored by: RRA / ARL

11 Cumulative Impact Assessment

11.1 Introduction

At this stage, the Cumulative Impact Assessment is only outlined and is of generic nature, based on bibliographic review and initial assessment from the ESIA undertaken and will be further assessed as part of the final ESIA based on the updated project information and strategic development plan for Rodrigues, currently being finalized .

It is proposed to use IFC's 'Good Practice Handbook - Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets' for the preparation of a Cumulative Impact Assessment.

Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity (collectively referred to in this document as "developments") when added to other existing, planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities.

Multiple and successive environmental and social impacts from existing developments, combined with the potential incremental impacts resulting from proposed and/or anticipated future developments, may result in significant cumulative impacts that would not be expected in the case of a stand-alone development.

The expected outcomes of a good Cumulative Impact Assessment can be summarized as follows:

- Identification of all Valued Environmental and Social Components (VEC) that may be affected by the development under evaluation.
- In consultation with stakeholders, agreement on the selected VECs the assessment will focus on.
- Identification of all other existing and reasonably anticipated and/or planned and
- potentially induced developments, as well as natural environmental and external social drivers that could affect the selected VECs.
- Assessment and/or estimation of the future condition of selected VECs, as the result of the cumulative impacts that the development is expected to have, when combined with those of other reasonably predictable developments as well as those from natural environmental and external social drivers.
- Evaluation of the future condition of the VECs relative to established or estimated thresholds of VEC condition or to comparable benchmarks.
- Avoidance and minimization, in accordance with the mitigation hierarchy, of the development's impact on the VECs for the life of the development or for as long as the impacts continue to be present.
- Monitoring and management of risks to VEC viability or sustainability over the life span of either the development or its effects, whichever lasts longer.

- Provision of project-related monitoring data to governments and other stakeholders for the life of the development, and material support for the development of collaborative regional monitoring and resource management initiatives.
- Continuous engagement and participation of the affected communities in the decision-making process, VEC selection, impact identification and mitigation, and monitoring and supervision

11.2 Identification of Valued Environmental and Social Components

Valued environmental and Social components (VECs) are defined as fundamental elements of the physical, biological or socio-economic environment, including the air, water, soil, terrain, vegetation, wildlife, fish, birds and land use that may be affected by a proposed project.

The Draft ESIA has identified the preliminary VECs of concern both during construction and operation phases, as listed below. The final VECs will be assessed further during the finalization of the ESIA based on the revised designs and upon comprehensive consultation with stakeholders.

- Physical Environment (section 6.3)
    - Terrestrial geology and geotechnics
    - Marine and shores geology and marine turbidity
    - Hydrology
    - Hydrogeology
    - Water resource and waste water management
- Biological Environment (section 6.4)
    - Terrestrial Biological Environment
    - Marine Biological Environment
- Utility and Services (section 6.5)
    - Transport network
    - Electricity supply
    - Water supply
    - Wastewater management
    - Solid waste management
- Socio-Economic Environment (section 6.6)
    - Land Use Planning
    - Housing
    - Heritage Conservation
    - Education, Health and Community Facilities
    - Employment Uses
    - Agriculture and Fisheries
    - Mineral Resources
    - Tourism
- Air quality and noise (section 6.7)
- Heritage and Landscape (section 6.8)

11.3 Spatial and Temporal Boundaries

11.3.1 Spatial Boundary

Given the site of the island, it is estimated that the whole island should be taken into account for utilities & services and Socio-economic environment

Physical and Biological Environment are more of a regional scale

11.3.2 Temporal Boundary

The temporal boundary is set by the foreseen phased approach of the airport expansion and the increase in flight rotations with time

The project is expected to bring a significant boost to the air connectivity of the island, while creating new opportunities for business and tourism in Rodrigues Boosting the Economic Development of Rodrigues

Boosting the Economic Development of Rodrigues has an overall positive impact

11.4 Assessing Cumulative Impacts on VECs

The cumulative and indirect impact study will have to take into account all the variables that could be impacted by the increase in the volume of passengers transported to the island. In particular, it will be necessary to evaluate:

11.4.1 With regard to the increase in tourist flows

- The current capacity of tourist reception (number and typology of reception structures: accommodation, catering, transport, services to tourism: leisure, sports, cultural tours, etc.)
- The economic contribution of tourism through the circuit of reception structures (accommodation, catering, etc.)
- The number of employments in the sector (by sub-sector of activities)
- Evaluation of the needs arising from the increase in demand

11.4.2 About the possible demographic evolutions

- Migration to Rodrigues of economic operators (which also includes the resettlement or return of Rodrigues inhabitants settled in Mauritius or abroad)

11.4.3 Assessment of the increase in pressure on the island's resources and services

- Assessment of the current state of service provision and evaluation of possible scenarios of increased demand, with respect to:
    - Water supply
    - Food supply, especially for local production (fishing, breeding, market gardening)
    - Transportation
    - Solid and liquid waste management
    - Health

11.4.4 Assessment of the possible increase in pressure on critical habitat

- Assessment of the increase in pressure on critical habitats due to change in land use
- Assessment of the increase in pressure on marine and terrestrial habitats, primarily associated with the tourism industry

11.4.5 Evaluation of the institutional framework and the capacities of the regional administration to respond to the increase in demand for goods and services resulting from the increase in flows to the island.

The study of the policy orientations of the regional administration in the areas of tourism, housing, environment and basic services will be included.

The study should also take stock of other major projects underway or in the planning phase in Rodrigues and identify the cumulative effects of the various projects. An inventory of major infrastructure and service strengthening projects is to be drawn up.

The study will be based on available data and on the collection of primary data from economic operators and service delivery structures. The databases produced in 2019 during the first study will serve as the basis for the work.

A management plan for the cumulative and indirect impacts of the project will be produced and will contain recommendations on the measures to be adopted to enhance the positive impacts and mitigate the negative impacts.

11.5 Assessing the Carrying Capacity of the Island

As part of the CIA study the carrying capacity of the island will be determined based on the available information from the KPMG-Deloitte report and the updated Rodrigues Development Plan. The ESIA will further assess the potential impacts of the VEC over a set time period and will identify any short comings and provide potential mitigation measures to improve sustainability and prevent degradation.

From a Tourism point of view, the carrying capacity of a destination determines the ideal number of international arrivals that can visit at the same time without causing destruction of local resources. It is not a static number, but rather can fluctuate over time based on the destination's ability to handle visitors – for instance, whether or not there is sufficient waste management infrastructure in place. The goal of this type of study is to create balance and a sustainable tourism industry – i.e. determine how to generate economic growth while ensuring environmental protection, a quality visitor experience, and the well-being of local residents.

12 Estimated costs of the environmental management

12.1 Environment measures costs

The following table presents a cost estimate of the various environmental measures and management and monitoring plans previously presented.

Those costs are not to be considered as a project commitment, they are just indicative and will have to be revised afterwards.

Geotechnical measures are not estimated here as they will have to be sized and included within the work cost.

12.1.1 Construction phase

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
Works facilities, buildings and plants	Works-ins	Works facilities management plan and associated monitoring	Management and monitoring pans preparation, implementation and control	To be implemented by the Contractor Under ARL's control	500 000	considering a person dedicating 5 days a week to this task throughout the duration of the work (to be parted between contractor and ARL)
	Site and works facilities management and monitoring plan					
Marine environment including marine works monitoring (Marine environment monitoring plan)	Phy-Mar-Mit-1	Control of backfilling processes	Measurement campaign of turbidity and current	External consultancy engineering Under ARL's control	30000 + 10000/month	Transport: 30000 €. Installation of measure devices (buoy), measurement, and analysis: 10000 € per month.
	Marine environment monitoring plan for current and turbidity					
	Phy-Mar-Mit-2	Optimisation of the location of discharges	Specific hydrodynamic survey	External consultancy engineering Under ARL's control	60000	To limit the plume extent by choosing a sheltered release location.
	Phy-Mar-Av-3	Optimisation of the discharges timetable to avoid times when currents reverse and/or already turbid condition				To limit the plume extent by releasing at the appropriate time (weak current, initial low level of suspended particulate matter).
	Phy-Mar-Mit-4	Silt curtain around discharges	Placed around the discharge locations during the working phase.	Contractor Under ARL's control	15000	To contain suspended sediments and to prevent sediment dispersal.
	Phy-Mar-Mit-5	Silt curtain around dredging area	Placed around the excavation site during the dredging phase.	Contractor Under ARL's control	15000	To contain suspended sediments and to prevent sediment dispersal.

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
Hydrology - Stormwater management Wastewater management / Water resource and water supply	Phy-Hyd-Mit-1	Temporary sedimentation ponds	-	To be implemented by the Contractor Under RRA and ARL's control	-	Included in construction costs
	Phy-Wat-Mit-1	Install a desalination plant to supply drinking water to the workers' camp	Specific desalination skid for the workers' site facilities and construction facilities during the construction phase	To be implemented by the Contractor Under RRA and ARL's control	200 000 €	Estimated cost for a 60 m3/d desalination plant
	Phy-Wat-Comp-2	Temporary or permanent replacement of current Caverne Bouteille plant supply by seawater and plant upgrading in order to enable it to treat sea water In case of no possible upgrading, a new mobile treatment plant would would be necessary	Research for a new catchment site with construction of a structure and installation of pumps Caverne Bouteille existing plant upgrading	To be implemented by the Contractor Under RRA and ARL's control	Upgrading and new pumping system: to be sized and estimated by contractor In case of a new mobile treatment plant: 1,5 M€	Relocation in the sea or in Plaine Caverne area out of the zone of influence *30 000 €/month in a leasing solution is chosen*
	Phy-Wat-Av-3	Works wastewater treatment plant	Wastewater treatment skid of adequate capacity for both the airport facilities and for the workers' site facilities during the construction phase	To be implemented by the Contractor Under RRA and ARL's control	700 000 €	For 400 workers, and 100 l/d
	Surface stormwater run-off, drinking and wastewater management and monitoring plan		Controls and analysis	To be implemented by the Contractor Under RRA and ARL's control	67 000€/year	Basic monitoring tasks & survey = 12,000 €/y Specific O&M tasks on the Treatment Plants: - Sewage Treatment Plant (50 m3/d) = 90 € / day, i.e. around 25,000 € per year.

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
						- Drinking Water Treatment Plant (60 m3/d) = 110 €/day, i.e. around 30,000 € per year.
	Phy-Wat-Av/Mit-4	Preventive measures to reduce risks during the construction phase - Risk management plan	-	To be implemented by the Contractor Under ARL's control	-	Included in construction costs
Karst	Phy-Kar-Mit-1	Reduce speed of trucks' movement to an acceptable level	-	To be implemented by the Contractor Under ARL's control	-	Included in construction costs
	Phy-Kar-Mit-2	Reduce rotations between the embankment site and material storage site Carry out and document baseline observations at potentially exposed buildings to check on the presence of cracks ahead of works	-		-	Included in construction costs
	Phy-Kar-Mit-3	Reuse of materials from cutting to embankment areas	-		-	Included in construction costs
	Phy-Kar-Mit-4	Reuse of topsoil materials after works phase	-		-	Included in construction costs
	Phy-Kar-Mit-5	Infilling of local erosion features and use of drainage system to manage rainwater responsible for local erosion	-	To be implemented by the Contractor Under RRA and ARL's control	-	Included in construction costs

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
	Phy-Kar-Mit-6	Open blasting and site excavation works to be done during dry season	-	To be implemented by the Contractor Under ARL's control	-	Included in construction costs
	Phy-Kar-Mit-7	Reduce unit's explosive charge decreasing noise impact	-	To be implemented by the Contractor Under RRA and ARL's control	-	Included in construction costs
	Phy-Kar-Mit-8	Concentrate open blasting operations in a short amount of time	-	To be implemented by the Contractor Under ARL's control	-	Included in construction costs
	Phy-Kar-Mit-9	Work only during the day and inform local authorities and communities bout the health and safety plan applicable on work site	-		-	Included in construction costs
	Phy-Kar-Mit-10	Avoid running excavator's engines in case of no use	-		-	Included in construction costs
	Phy-Kar-Mit-11	Chose the closest extraction site for fill material / Forbid the export of cuttings	-		-	Included in construction costs
	Phy-Kar-Mit/Av-12	Define a restricted area around the caverns with no heavy vehicles allowed to access it	-		-	Included in construction costs
	Phy-Kar-Mit-13	Reduce trucks' movement's speed to an acceptable level to minimize the induced vibrations	-		-	Included in construction costs

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
	Phy-Kar-Av-14	Adapt and reduce trucks' movements and rotations between embankment filling site and material storage site	-		-	Included in construction costs
	Phy-Kar-Av-15	Restrict traffic in close vicinity of the caves	-		-	Included in construction costs
	Phy-Kar-Av-16	Installation of a protective formwork to ensure protection and controlled access by airport authorities	-		-	Included in exploitation costs
	Phy-Kar-Comp-17	Remove the remaining fossiliferous sediments from all threatened caves		External specialist Under ARL's control	30000	*To be precisely estimated* Estimation includind 15 days of an external specialist, and 15 days of 2 helpers, and transport costs
	Phy-Kar-Av/Mit-18	Daily maintenance and inspection of excavators	-	To be implemented by the Contractor Under RRA and ARL's control	-	Included in construction costs
	Phy-Kar-Av/Mit-19	No maintenance and refuelling on the construction site (or with specific waterproof delimited zone)	-	To be implemented by the Contractor Under ARL's control	-	Included in construction costs
	Phy-Kar-Mit-20	Establishment of a storage site for earthwork wastes, close to the project site, in order to reduce pollution induced by traffic from storage activity	-		-	Included in construction costs

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
	Phy-Kar-Av-21	Proceed to an impact assessment of the extraction site and have the material origin validate prior the works phase	-		20000	ESIA cost if new extraction site
	Karst monitoring plan		Observation well implantation In conjunction with geotechnical investigation work	To be implemented by the Contractor Under RRA and ARL's control	100000	Installation of minimum 10 observation wells (depending on the result of the geotechnical campaign)
			Groundwater Monitoring campaign Groundwater monitoring program during works and operation		25000	Monthly sampling of at least 10 wells during works

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
			Caves monitoring: visual inspection, 3 sismometers per cavity (in 3 caves)		15000	Visual inspection (250€/visit + expenses) = 5000 9 sismometers = 10000
Biodiversity	BioT-Av-1	Avoid remarkable trees located at the edge of the project Targeted species*: Antirhea bifurcata, Elaeodendron orientale, Fernelia buxifolia, Hyophorbe verschaffeltii, Terminalia bentzoe subsp. rodriguesensis*	These 19 trees must be marked prior to the works phase with permanent devices (fences, ribbons, paintings) and tagged with an identification number (ID) in order to be properly followed during the works phase	External biodiversity specialists / RRA services Under RRA and ARL's control	4 500 €	- Tree marking and identification 2500,00 - Monitoring for 5 years 2000,00
	BioT-Av-2	Moving the control tower out of the nature reserve	The official boundaries of the nature reserve will be provided by the forestry services	External biodiversity specialists / RRA services Under RRA and ARL's control	None	

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
	BioT-Mit-3	Creating an arboretum of endemic species inside the airport landscaping	A partnership with the Forestry Services or the Mauritius Wildlife Fondation will be conducted in order to produce seedlings of native species from seeds, cuttings or juveniles collected from the nature reserves of Rodrigues and/or Mauritius. Collection of plant material will be authorized in advance by the reserve managers in any case. A specific protocol will be designed for tree transplantation.	External biodiversity specialists / Contractor Under ARL's control	12 500€	- Collection of plant material (seeds, cuttings..) 2500,00 - Nursing (production of plants) 4000,00 - Planting 4000,00 - Monitoring for 5 years 2000,00
	BioT-Mit-4	Transplant remarkable trees and ferns intended to be cut down during the works phase	A competent and trained external coordinator on the transplantation protocol will be mobilized	External biodiversity specialists / RRA services Under RRA and ARL's control	25 000€	For 20 trees: 20 x 2,500€
	BioT-Mit-5	Genetic conservation of populations of impacted rare species : production and reintroduction of clones and genetic ancestors of these species	A partnership with the Forestry Services or the Mauritius Wildlife Fondation will be conducted in order to produce seedlings of native species from seeds, cuttings or juveniles collected from the specimen located within the project footprint.	External biodiversity specialists / RRA services Under RRA and ARL's control	11 000€	- Collection of plant material (seeds, cuttings..) 3 000,00 - Nursing (production of plants) 3 000,00 - Planting 2 000,00 - Monitoring for 5 years 3 000,00
	BioT-Comp-6	Action plan towards more sustainable agricultural practices for native biodiversity.	This action plan can be approached by: 1- the inventory and consultation of all agricultural	External biodiversity specialists / RRA services	Approximately 35 000€	

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
			and ecologist partners throughout the project; 2- the establishment of the development challenges of livestock breeding in Rodrigues; 3- drawing up an inventory of actions that can improve the quality and productivity of livestock farming by promoting local biodiversity; 4- proposing a fine cartographic work accompanied by spatialized actions throughout the Rodrigues territory	Under RRA and ARL's control		
	BioT-Comp-7	Ecological restauration within the limits of the Anse Quitor nature reserve	- Check the watering quality of the plants; - Identify, locate and count exotic species and define appropriate control methods against invasive and potentially invasive exotic species; - Quantify the mortality rate and health status of native species. - Establish corrective measures if necessary, in order to always orientate this rehabilitation project in an ecologically correct direction.	External biodiversity specialists / RRA services Under RRA and ARL's control	100 000€	- Harvesting from wild specimens and arboretums 3000,00 - Production of 500 individuals 10000,00 - Planting 4000,00 - New fence within the shared limits between the airport and the nature reserve (1,2 km approximately): 80 000,00

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
	BioT-Mit-8	Collect arthropods from the Tropiphodora genus before and during earthwork	Learn how to distinguish the two different species recorded on site	External biodiversity specialists / Contractor Under ARL's control	Approximately 10 days of sampling effort at 500€ per day 5 000€	
	Biodiversity management and monitoring plan		The only costs non included in the above lines is ARL's management	-	-	Included in conception costs
	BioM-Mit-1	Installation of a floating boom to confine sediments and prevent their resuspension in the marine environment	-	Contractor Under ARL's control	-	Included in construction costs
	BioM-Mit-2	Monitoring for the possible presence of turtles in the project area and egg laying site on Crab Island	-	Shoals Rodrigues / SEMPA Under ARL's control	-	Included in the monitoring plan costs (see further)
	BioM-Av-3	Avoid coral heads located at the edge of the project	-	Contractor Under ARL's control	-	Included in conception costs
	Marine environment monitoring plan	Coral Reef Protection and monitoring	Ecological diagnostic and assessment	Shoals Rodrigues / SEMPA + Contractor Under ARL's control	50 000	Cost of a marine specialist (1000 /day + expenses) 1 visit / month during 1,5 year
		Marine environment management and monitoring during the works	Ensure that the major environmental issues in the project area are preserved (coral reef at Pointe Palmiste and marine turtles)			
Infrastructures and solid waste management	Inf-Mit-1	Transfer materials out of high traffic periods	-	To be implemented by the Contractor Under ARL's control	-	Included in construction costs
	Inf-Mit-2	Anticipate and supervise exceptional convoys	-		-	Included in construction costs
	Inf-Mit-3	Rehabilitate roads that were used during	-		-	Included in construction costs

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
		construction and at the end of works				
	Inf-Mit-4	Adapt the period of work	-		-	Included in construction costs
	Inf-Mit-5	Use generators	-		-	Included in construction costs
	Inf-Mit-6	Recycling and reuse materials	-		-	Included in construction costs
Air quality	Air-Mit-1	Institute a speed limit on all unpaved roads around the site (max 30 km/h)	-	To be implemented by the Contractor Under ARL's control	-	Included in construction costs
	Air-Mit-2	Regularly water the main roads and areas producing dust	-		-	Included in construction costs
	Air-Mit-3	Limit the storage and handling of materials that may create dust	-		-	Included in construction costs
	Air-Mit-4	Reduce road traffic to a minimum by optimizing the truck loading for the site supply	-		-	Included in construction costs
	Air-Mit-5	Minimize on-site travel distances and avoid as much as possible traffic close to inhabited areas	-		-	Included in construction costs
	Air quality and noise environment management and monitoring plan		Air and noise monitoring	To be implemented by the Contractor Under ARL's control	20000 per month if permanent monitoring	30000 per campaign if no permanent monitoring is implemented
Noise	Noi-Mit-1	Avoid night work and limit work during evening period	-	To be implemented by the Contractor Under ARL's control	-	Included in construction costs
	Noi-Mit-2	Choose the least noisy techniques and equipements	-		-	Included in construction costs

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
Landscape	Land-Mit-1	Limit the vegetation clearing area during construction	-	Contractor Under ARL's control	included in construction costs	-
	Land-Mit-2	Prevent encroachment of areas outside designated boundaries	-	Contractor Under ARL's control	included in construction costs	-
	Land-Mit-3	Minimize the lighting of construction sites	-	Contractor Under ARL's control	included in construction costs	-
	Land-Mit-4	Minimize visual intrusion	-	Detail Design Engineer and Architects ARL Contractor Under ARL's control	6000	-
	Land-Mit-5	Ensure that platforms and construction work areas are maintained in a clean and orderly manner	-	Contractor Under ARL's control	included in construction costs	-
	Land-Mit-6	Perform temporary seeding	-	Detail Design Engineer and Architects ARL Contractor Under ARL's control	included in construction costs	-
	Land-Mit-7	Temporary fences and earthworks will be arranged to reduce visual intrusion	-	To be implemented by the Contractor Under ARL's control	included in construction costs	-
	Land-Mit-8	Ensure that earth and material storage areas are not located directly on the coast	-	Detail Design Engineer and Architects ARL	included in construction costs	-

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
	Land-Mit-9	Plantings are designed and arranged to form visual screens to mitigate visual impacts	-	Contractor Under ARL's control	4 000 000	-
	Land-Mit-10	Rehabilitate areas that were temporarily used during construction.	-		included in construction costs	-
	Land-Mit-11	Favor dispersed relocation building in existing communities	-	RRA Under RRA and ARL's control	-	-
	Land-Mit-12	Relocate families outside of the Zone of Visual Influence	-		-	-
	Land-Mit-13	Community support in construction process	-		-	-
	Land-Mit-14	Establishment of an Airport Urban Development Master Plan to monitor and frame urban development related to airport activity and ensure sustainable good living conditions	-	RRA Under RRA and ARL's control	50000	-
	Land-Mit-15	Airport buildings and infrastructures to reach architectural quality and soundness	-	Detail Design Engineer and Architects ARL Under ARL's control	0 to 20 % extra construction cost	-
	Land-Mit-16	Touristic infrastructure to respect the scale of Rodrigues' landscape and sense of place	-	RRA Under RRA and ARL's control	-	-
	Land-Mit-17	Urban development to foster the development of	-		-	-

Theme / Issue	Title and ID of the measure / Plan		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
		public places and public amenities				
	Land-Mit-18	Establishment of local Urban Development Master Plan to monitor urban development related to tourism growth, to value and enhance the local landscape	-		30 000€ to 80 000€ for each of the 12 public beaches and other locations identified in the PASIDS tourism master plan	-
	Landscape management and monitoring plan				-	Included in the project's costs

Table 141: ESMP Cost Estimate Construction Phase - Environmental Aspects

12.1.2 Operation phase

Theme / Issue	Title and ID of the measure		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
Marine environment	Phy-Mar-Mit-6	Prevent spills and accidents : train staff to avoidance of spills.	-	ARL	-	Included in construction and exploitation costs
	Phy-Mar-Mit-7	Implementing methodologies for quick confining and treatment of pollutants and protocol for depollution in case of spill	-	ARL	-	Included in construction and exploitation costs
Hydrology - Stormwater management Waste water management / Water resource and water supply	Phy-Hyd-Mit-5	Treat chronic or accidental sources of pollution	-	ARL	-	Included in construction and exploitation costs
	Phy-Hyd-Mit-2	Stormwater network	Water treatment plant within an integrated water management plan for the airport facilities at operational phase	To be implemented by the Detail Design Engineer Under ARL's control	1,75 M	All included: Water tratement plant, buffer storage pond for stormwater, storage capacities for rainwater, industrial water, drinking water before distribution, connecting pipelines and discharge lines at sea, ancillaries including building, access roads
	Phy-Hyd-Mit-3	Stormwater ditch located to restore the watershed boundary				
	Phy-Hyd-Mit-4	Climate change adaptation: buffering storage and works facilitating infiltration				
	Phy-Hyd-Mit-6	Vegetation of slopes and ditches and collection of infrastructure runoff				
	Phy-Wat-Av-6	Integrated water management plan				
	Phy-Wat-Mit-7	Water treatment plant				
	Phy-Wat-Mit-8	Reuse water plan				

Theme / Issue	Title and ID of the measure		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
	Surface stormwater run-off, drinking and wastewater management and monitoring plan		Operation Monitoring	ARL (or external specialist engineer under ARL and RRA's control)	67 000€/year	Basic monitoring tasks & survey = 12,000 €/y Specific O&M tasks on the Treatment Plants: - Sewage Treatment Plant (50 m3/d) = 90 € / day, i.e. around 25,000 € per year. - Drinking Water Treatment Plant (60 m3/d) = 110 €/day, i.e. around 30,000 € per year.
Karst	Phy-Kar-Av-22	Supplementary geotechnical and geophysical investigations to characterize the karstic network (caves and voids)	-	To be implemented by ARL or an external specialist Contractor (as part of the 10-year guarantee) Under ARL's control	-	-
	Phy-Kar-Mit/Comp-23	In situ investigation diagnostic of infilled cavities (televisual cavity inspections)	-		-	-
	Phy-Kar-Mit/Comp-24	Additional laboratory testings (Aggregate testings) to characterize the erosive potential of in situ geological formations	-		-	-

Theme / Issue	Title and ID of the measure		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
	Phy-Kar-Av-25	All operations involving hydrocarbons must comply with current standards to prevent spills and, if necessary, implement emergency measures	-	ARL	-	Included in exploitation costs
	Phy-Kar-Mit-26	Do not allow groundwater use downstream of airport infrastructure	-	To be implemented by the Detail Design Engineer Under ARL's control	-	Included in construction costs
	Karst monitoring plan		Groundwater monitoring program during operation	To be implemented by ARL or an external specialist Under ARL's control	25000/year	Monthly sampling
			Post-commissionning caves monitoring	To be implemented by ARL or an external specialist Contractor (as part of the 10-year guarantee) Under ARL's control	5000	
Infrastructures and solid waste management	Inf-Mit-7	Restore road connections	-	To be implemented by the Detail Design Engineer and Contractor (as part of the 10-year guarantee) Under RRA and ARL's control	-	Included in construction costs
Air quality	Air-Mit-6	If possible, limit the taxiing distance	-	To be implemented by ARL or external specialist engineer	-	Included in exploitation costs

Theme / Issue	Title and ID of the measure		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
	Air-Mit-7	Opt for technologies that limit aircraft pollutant emissions during taxiing	-	Under ARL and RRA's control	-	Included in exploitation costs
	Air-Mit-8	Encourage pilots to shut down unneeded engines when taxiing	-		-	Included in exploitation costs
	Air-Mit-9	Limit congestion (aircraft queues) by making departures as fluid as possible	-		-	Included in exploitation costs
	Air-Mit-10	Minimize the use of the APU and GPU	-		-	Included in exploitation costs
	Air-Mit-11	Develop and implement procedures to limit the use of the thrust reverser	-		-	Included in exploitation costs
	Air-Mit-12	Make ecological performance a criterion of choice for service vehicles and ground equipment	-	To be implemented by the Detail Design Engineer	-	Included in exploitation costs
	Air-Mit-13	Develop an efficient public transport system to limit the use of private vehicles	-	Under ARL's control	-	Included in exploitation costs
	Air quality and noise environment management and monitoring plan		-	To be implemented by ARL or external specialist engineer Under ARL and RRA's control	60000 per year (2 campaigns)	Included in exploitation costs
Noise	Noi-Mit-3	Limit air traffic at night and the use of noisy equipement	-	To be implemented by ARL or external specialist engineer	-	Included in exploitation costs
	Noi-Mit-4	Raise the ILS glide slope to reduce noise emissions during landing	-	Under ARL and RRA's control	-	Included in exploitation costs

Theme / Issue	Title and ID of the measure		Implementation	Responsible for management and implementation	Estimated costs (EUR)	Comments
	Noi-Mit-5	Adapt departure procedures to minimize noise exposure on the ground during take-off	-		-	Included in exploitation costs
	Noi-Mit-6	Limit the use of reverse thrust	-		-	Included in exploitation costs
	Noi-Mit-7	Develop an efficient public transport system to limit the use of private vehicles	-	To be implemented by the Detail Design Engineer Under ARL's control	-	Included in exploitation costs
Landscape	Land-Mit-19	Set up of green and blue grids	Environment study to carry out and measures to implement	RRA	-	-
	Land-Mit-20	Set up of sustainable and resilient city guidelines and architectural guidelines	-	RRA	50000	-
	Land-Mit-21	Investment in woodland planting to feed the timber industry	-	RRA	(supported by private sector)	-
	Land-Mit-22	Set up sustainable timber management plan	-	RRA	-	-
	Land-Mit-23	Ravine preservation and sanctuarisation of associated woodlands	-	RRA	Fencing cost (eg, 220 000€ for Anse Quitor) + fence and site maintenance	-

Table 142: ESMP Cost Estimate Operation Phase - Environmental Aspects

12.2 Social measures costs

The following table deals with a cost estimation of the various social plans previously presented. Those costs are not to be considered as a project commitment, they are just indicative and will have to be revised afterwards.

It should be noted that the below estimated costs take into account some costs exclusively concerning the Resettlement Plan (RAP) which has already been undertaken by the Rodrigues authorities through the Executive Committee of the Rodrigues Regional Assembly which has specifically established a Relocation Committee with the objective of preparing, organising and implementing the RAP of the communities identified as directly impacted by the project. Those estimated costs are mentioned in brackets in the table below.

#	Mitigation measures / Plan	Implementation	Responsible	Estimated costs (EUR)	Comments
SE-Comp-1	Resettlement Action Plan	Regular community consultations, household census and inventories, crop and livestock inventories, fisherman and breeder consultations and inventories, land and cadastral surveys, house buildings…	Rodrigues Regional Assembly Resettlement Committee	(1000000)	As it has been noticed in this report, the resettlement action plan has already been initiated by the Rodrigues Regional Assembly who specifically created a Resettlement Committee for the relocation plan. All direct induced costs will be borne by the Rodrigues Regional Assembly.
SE-Comp-2	Ensuring agricultural lands provision	Land and cadastral surveys, villager (moved and hosts) consultations, access facilitation to farming materials, financial support for fencing.	Rodrigues Regional Assembly Resettlement Committee	(30000)	The costs will be integrated into the Resettlement Action Plan. No land will be bought as lands already belong to the State and are allocated through lease agreement.
SE-Mit-3	Communication, grievance management and support plan after resettlement	Regular community consultations, creation of a complaint bureau, appointment of a dedicated officer (key contact)	Rodrigues Regional Assembly Resettlement Committee / ARL	18000	Budget of EUR 6000 per year for 3 years.
SE-Comp-4	Ensuring grazing lands and fishing posts provision	Land and cadastral surveys, fisherman, breeder and villager (moved and hosts) consultations, financial	Rodrigues Regional Assembly Resettlement Committee	(125000)	The costs will be integrated into the Resettlement Action Plan. No land will be bought as lands already belong to the

#	Mitigation measures / Plan	Implementation	Responsible	Estimated costs (EUR)	Comments
		support for fencing (if penned livestock)			State and are allocated through lease agreement.
SE-Mit-5	Communication plan for external workers integration	Communication releases using radio and newspaper, creation of a communication access point, regular consultations with local communities and external workers	ARL / Rodrigues Regional Assembly / Promoters	15000	Budget of EUR 7500 per year for 2 years.
SE-Mit-6	Management plan for influx	Survey on accommodation accessibility, communication releases using radio and newspaper, assistance for housing renovation	ARL / Rodrigues Regional Assembly / Promoters	100000	Financial support may be necessary for villagers to renovate available rooms to welcome people.
SE-Mit-7	Communication plan and recruitment management	Communication releases using radio and newspaper, creation of a specific bureau of recruitment and dedicated staff	ARL / Promoters	150000	Budget of EUR 25000 + 5000 + 20000 = EUR 50000 per year for 3 years.
SE-Mit-8	Communication plan and grievance management about recruitment	Community regular consultations, creation of a complaints bureau, appointment of a dedicated staff	ARL / Promoters	15000	The complaint bureau depends on the recruitment office specifically created. Additional budget may be EUR 5000 per year for 3 years

#	Mitigation measures / Plan	Implementation	Responsible	Estimated costs (EUR)	Comments
SE-Mit-9	Assistance plan on agricultural techniques	Appointment of a dedicated office and extension officer, regular consultations to farmers, training sessions for extension officers for natural agriculture implementation	Rodrigues Regional Assembly (through Commission of Agriculture)	30000	Budget of EUR 7000 + 1500 + 1500 per year for 3 years
SE-Mit-10	Resettlement Action Plan follow up	Regular community consultations, complaint management bureau	ARL / Rodrigues Regional Assembly Resettlement Committee		The costs may be integrated into the Resettlement Action Plan and will be upon the third mitigation measure's budget of EUR 6000 per year for 3 years.
SE-Mit-11	Communities consultation plan and follow-up on agro-pastoralism evolution	Appointment of a dedicated office and extension officer, regular consultations with farmers, training sessions for extension officers for farming and livestock breeding implementation	Rodrigues Regional Assembly (through Commission of Agriculture)	15000	Budget estimated may be integrated into the one allocated for the assistance plan on agricultural techniques. Can be considered an additional cost of EUR 5000 per year.
SE-Mit-12	Assistance plan on livestock farming techniques	Appointment of a dedicated office and extension officer, regular consultations with farmers, training	Rodrigues Regional Assembly (through Commission of Agriculture)		

#	Mitigation measures / Plan	Implementation	Responsible	Estimated costs (EUR)	Comments
		sessions for extension officers for livestock breeding implementation			
SE-Mit-13	Communication plan and grievance management of fishermen	Regular fishermen community consultations, creation of a complaint bureau, appointment of a dedicated staff for fisheries	ARL / Rodrigues Regional Assembly (through Commission of Fisheries)	15000	The complaint bureau may depend on an office of the Commission of fisheries. A budget may be EUR 5000 per year for 3 years
SE-Mit-14	Community assistance and communication plan for the development of income generating activities	Regular local community consultations and meetings, appointment of a local development bureau and a dedicated staff for assistance, training sessions for successful entrepreneurship	ARL / Rodrigues Regional Assembly (through the Commission of Small Entrepreneurship)	30000	Budget of EUR 7000 + 1500 + 1500 per year for 3 years
SE-Mit-15	Households economic assistance plan	Appointment of a local development bureau and a dedicated staff for assistance, training sessions for successful entrepreneurship	ARL / Rodrigues Regional Assembly (through the Commission of Small Entrepreneurship)		
SE-Mit-16	Communication plan on road safety	Road safety survey for adequate road safety measures implementation, regular	ARL / Promoters	22500	Budget of EUR 7500 per year for 3 years.

#	Mitigation measures / Plan	Implementation	Responsible	Estimated costs (EUR)	Comments
		communication release using radio and newspaper, meeting with communities			
SE-Mit-17	Pedestrian security and road signaling management plan	Road safety survey for adequate road safety measures implementation, road safety measures set up.	ARL / Promoters / Rodrigues Regional Assembly	250000	
SE-Mit-18	Health and Safety training coordination plan with promoters	Appointment of a health and safety department, set up of health and safety training sessions, regular consultations with project workers and surrounding communities	ARL / Promoters	120000	Budget of EUR 10000 + 30000 per year for 3 years
SE-Mit-19	Community communication plan about the project security measures	Regular consultations and meeting with project surrounding communities	ARL / Promoters		

Table 143: ESMP Cost Estimate Construction Phase - Social Aspects

13 References

13.1 Physical environment

13.1.1 Climate and meteorological conditions

13.1.1.1 Current

Schott, F. A., S.-P. Xie, and J. P. McCreary Jr. (2009), Indian Ocean circulation and climate variability, Rev. Geophys., 47, RG1002, doi:10.1029/2007RG000245.
Assessment of the wave potential at selected hydrology and coastal environments around a tropical island, case study: Mauritius. Available from: https://www.researchgate.net/publication/322591524_Assessment_of_the_wave_potential_at_selected_hydrology_and_coastal_environments_around_a_tropical_island_case_study_Mauritius
Wolanski et al., 1993; Kraines et al., 1998, 1999; 31 Tartinville and Rancher, 2000; Andréfouët et al., 2001; Kench and McLean, 2004; Angwenyi and Rydberg, 32 2005; Hench et al., 2008; Lowe et al., 2009; Taebi et al., 2011; Hoeke et al., 2013; Chevalier et al., 2014, 2015
World Risk Report 2022; Bündnis Entwicklung HilftRuhr University Bochum – Institute for International Law ofPeace and Armed Conflict (IFHV); 2022

13.1.1.2 Wave

Shoreline Change Detection Modelling for Le Morne Coast of Mauritius, Chapter VI, p. 118-158

13.1.1.3 Water level

(Lynch et al. 2002)
UNECO, Sea Level Measurement and Analysis in the Western Indian Ocean, National Report, Mauritius
R. LOWRY ET Al., 2008, Observations of Seiching and Tides Around the Islands of Mauritius and Rodrigues, 28p.
ASCLME 2012. National Marine Ecosystem Diagnostic Analysis. Mauritus. Contribution to the Agulhas and Somali Current Large Marine Ecosystems Project (supported by UNDP with GEF grant financing). Unpublished report.
Acclimate project, 2011, Indian Ocean Comission (COI)
Ministry of Environment, Sustainable Development, and Disaster and Beach Management – TNC Report 2016
Tropical cyclones
D.P. Callaghan et al., 2005, Atoll lagoon flushing forced by waves, / Coastal Engineering 53 (2006) 691–704
IBTrACS - International Best Track Archive for Climate Stewardship, version 4, website: https://www.ncdc.noaa.gov/ibtracs/

13.1.2 Geology and geotechnics

Stratagem974 (2018). New runway – Sir Gaëtan Duval Airport, Plaine Corail Geophysical survey, Rodrigues Island (February 2018), 45p.
GIBB (Mauritius) Ltd (2018). Extension of Runway at Plaine Corail Airport – Rodrigues Geotechnical Interpretative Report (September 2018), 119p.
Water Research Co Limited (2018). Factual Report - Geotechnical investigation for Extension of Runway at Sir Gaetan Duval Airport – Phase B (April 2018), 365p.

13.1.3 Marine and shores geology and marine turbidity

13.1.3.1 Marine shores geology

COPPEJANS E. and al., The Marine Green and Brown Algae of Rodrigues (Mauritius, Indian Ocean°, Journal of Natural History, 2004, 38, 2959-3020, ISSN 0022-2933 print/ISSN 1464-5262 online 2004 Taylor & Francis Ltd
Beach Erosion management in Small Island Developing States: Indian Ocean case studies, WIT Transactiions on Ecology and the Environment, Vol 126, 2009, ISSN 1743-3541 (online)
Final SIDPR, Rodrigues Regional Assembly, July 2009
Ministry of Energy and Public Utilities, Hydrology Data Book 1999-2005, Chapter 7: Hydrology of Rodrigues and Agalega, Figure 7.3, p.7
Mnistery of Agriculture, Food Technology & Natural Resources – Republic of Mauritius, Management Plan for Crab Island. Development of a Management Plan for the Conservation and Management of Offshore Islets for the Republic of Mauritius. 2004, Available from: https://www.researchgate.net/publication/269929648_Management_Plan_for_Crab_Island_Development_of_a_Management_Plan_for_the_Conservation_and_Management_of_Offshore_Islets_for_the_Republic_of_Mauritius
The current compiled oceanographic data necessary to quantify the influence on the currents and sediment transport is summarized as follows:

- Bathymetry:
  The large scale model bathymetry data would be forced from the General Bathymetric Chart of the Oceans (GEBCO) with 0.5° resolution, approximately 430m.

Closer to Rodrigues, the GEBCO bathymetry would be supplemented by a thinner data set close to the coast and inside the lagoon. Discussions are underway with the Hydrographic Section of the Ministry of Housing and Land of Mauritius to obtain accurate data both inside and outside the lagoon.

- Shoreline:

The shoreline was defined using data obtained from the Database of Global Administrative Areas (GADM) with approximately a 30 m resolution and re-delineated if necessary.

- Hurricane tracks:

The tracks of the Indian Ocean Hurricane were downloaded from the Joint Typhoon Warning Center (JTWC) website from 1986 to 2016. Trajectories are defined by 6 hour elapsed time points defined by its localization, intensity, maximum wind speed, and minimum SLP.
Sea level:
Port Mathurin's tide gauge is part of the Global Sea Level Observing System (GLOSS). Controlled sea level data are checked and processed in order to establish sea level value more suitable for studies of long term sea-level change. Historical hourly level data are available in Rodrigues from 1986 to 2016.
Tide Harmonic:
The LEGOS[9] produced global finite element solutions (FES) tidal atlases computed from the tidal hydrodynamic equations and data assimilation. Harmonic constants, amplitude and phase, are extracted in the surrounding of the island.
Coral Reef:
Coral reef distribution around the island is extracted from the global distribution of coral reefs in tropical and subtropical regions, version 4.0 of November 2018. The dataset[10] is compiled

[9] Laboratoire d'Etude en Géophysique et Océanographie spatiales
[10] UNEP-WCMC, WorldFish Centre, WRI, TNC (2018). Global distribution of coral reefs, compiled from multiple sources including the Millennium Coral Reef Mapping Project. Version 4.0, updated by UNEP-WCMC. Includes contributions from IMaRSUSF and IRD (2005), IMaRS-USF (2005) and Spalding et al.

from various sources such as the UNEP World Conservation Monitoring Centre (UNEP-WCMC) and the WorldFish Centre, in collaboration with WRI (World Resources Institute) and TNC (The Nature Conservancy). The GIS layer has a consistent 30 m resolution and mostly originates from images acquired between 1999 and 2002.
Climatology Statistics:
An analysis was performed by MeteOcean to characterize the meteo-oceanic conditions in the vicinity of Rodrigues. Waves, winds, water height, salinity and temperature statistics are available at a deep water point (2989m from the MSL) located at -63°12'E 20°S, in the South of the island.

Figure 189: Location of the analysis point: -63°12'E,20°S (WGS84)

At the present time, some data are still being gathering, they will be taken into account in the next version of the report. This is the case of bathymetry and sediment characteristics (granulometry) data.

13.1.3.2 Seawater turbidity

Final SIDPR, Rodrigues Regional Assembly, July 2009

13.1.4 Hydrology

(M. Bakalowicz 2002)
(Milanović, 2004)
(Williams, 2008).
(Evans, 2005
(ADP, December 2000).

13.1.5 Hydrogeology

13.1.5.1 Ground water

The list of reviewed documents is shown below:

Factual Report Geotechnical Investigation For Extension Of Runway At Sir Gaetan Duval Airport- Phase B April 2018 OPG 17067 ROD
Factual Report Geotechnical Investigation For Extension Of Runway At Sir Gaetan Duval Airport- Phase C September 2018 OPG 17067 ROD
Extension of Runway at Plaine Corail Airport Rodrigues Geotechnical Interpretative Report for preliminary design phase Report No: M019/031
Stratigraphy and chronology of karst Features on Rodrigues island, southwestern Indian ocean Karst Geotechnical investigation

(2001). Cambridge (UK): UNEP World Conservation Monitoring Centre. URL: http://data.unepwcmc.org/datasets/1

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13.5.1 Cultural heritage resources

13.5.2 Archeology and paleonthology

Gregory Middleton letters and mails.

13.5.3 Landscape and visual environment

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14 Appendices

14.1 Stakeholder Engagement Plan

The stakeholder engagement plan (SEP) is a tool to identify and mobilize all the people, groups and institutions impacted by the project.
It helps to clarify, to better manage, the interests, fears, motivations, and expectations of the various stakeholders in the project. It leads to the development of a structured communication system and proposals for collaboration based on the motivations and skills present locally. The SEP also participates in the multiplication and structuring of the interactions between the different stakeholders and asserts the social legitimacy of the project.

14.1.1 Legislative and regulatory framework

The public consultation in the framework of an environmental and social impact assessment (ESIA) process is governed by national legislation and international regulations. These are listed and discussed in the sections below:

The legislation and guidelines of the Government of Mauritius;
International standards and guidelines

14.1.1.1 Mauritian legal framework

14.1.1.1.1 The Environment Protection Act, 2002

The Environment Protection Act, Law No. 19 of 2002, is the legal instrument governing the production of environmental impact studies in Mauritius.

Paragraph 92 establishes the specific regulations for Rodrigues: the Regional Assembly may, after consultation with the Rodrigues Environment Committee, make regulations applicable to the island of Rodrigues. These include projects requiring preliminary environmental reports and environmental impact assessment licences.

With respect to the consultations, the Environment Protection Act, in paragraph 19, establishes that the environmental impact assessment should defer the details of any public consultation held in the project area. The act therefore contains a very clear indication that any environmental impact assessment process should include a stakeholder consultation approach.

14.1.1.1.2 The 2004 guidelines

The guidelines for the environmental impact assessment, published in 2004 by the Environment Department of the Ministry of the environment of Mauritius, provide specific guidance on the requirement and nature of the reporting of consultations to be carried out within the framework of the EIA. It indicated that the engagement documentation should include (paragraph 4.5.2):

Statutory bodies, environmental and accreditation groups and local residents likely to be affected by the proposals;
The means to contact and advertise the project (leaflets, public postings, questionnaires, letters, etc.);
A brief summary of their responses detailing the emphasized issues of concern and their contribution to the EIA.

For any development project namely the construction of hotels, golf courses, piers, etc. in the coastal area, the developer must consult the fishermen in the area to explain their project. The consultation is under the aegis of the ministry of fishing.

14.1.1.2 International standards

14.1.1.2.1 Equator Principles

Adopted in 2003 (and updated in 2013), the 89 Equator Principles form a reference document for the financial sector. Voluntarily adopted by financial institutions, they aim to take into consideration (identification, evaluation and management) the social and environmental risks in project financing. Principle 5 aims, in particular, at ensuring the effective participation of stakeholders in a continuous and structured process adapted to the local culture of affected communities and other stakeholders.

14.1.1.2.2 IFC performance standards and good practices

The eight performance standards of the International Finance Corporation (IFC) are a series of guidelines for partners benefiting from IFC direct investments. These are aimed at identifying environmental and social risks and impacts so that they are minimized and properly managed, in order to conduct activities in a sustainable manner and enhance development opportunities. In this regard, these performance standards also cover the obligations of partners to collaborate with stakeholders and to provide them with information on project-level activities.
IFC performance standard no. 1, entitled "environmental and social risk assessment and management", includes specific requirements for stakeholder engagement in projects, including communication and grievance management (paragraphs 25 to 36). This standard no. 1 emphasizes the following aspects:

Ensure that people who are likely to be affected by or may be interested in projects are involved as stakeholders, with particular attention to vulnerable and/or disadvantaged groups;
Manage external communication in order to reach relevant stakeholders and facilitate dialogue between projects and stakeholders;
Adapt stakeholder engagement to the specificities of projects and those of affected communities, ensuring that an information and consultation approach tailored to the local and effective context is implemented;
Disseminate relevant project information to assist stakeholders in understanding the risks, impacts and opportunities associated with them (including issues related to the objective, nature, scale, duration of projects, potential associated environmental and social impacts as well as proposed mitigation measures, stakeholder engagement process and project complaints and grievances management mechanism);
Ensure that a dual process of information and consultation is carried out, from the outset of the project planning phase with all relevant stakeholders, that it is conducted appropriately from a cultural point of view, free from any intimidation or coercion and that it is duly documented and finally that the stakeholders are able to express their opinion and that it is genuinely taken into consideration by the projects.
For the IFC, an effective consultation process should:

Start at an early stage in the process of identifying risks and environmental and social impacts and continue as long as risks and impacts materialise;
Be based on the prior disclosure and dissemination of relevant, transparent, objective, useful and readily accessible information presented in one or more indigenous languages, in a culturally acceptable form, and understandable by the affected communities;

Focus on inclusive participation of directly affected communities rather than other communities;
Be free from manipulation, interference, coercion or intimidation by others;
Allow real participation, where applicable; and
Be described in the reports.

14.1.1.2.3 Specific FDA guidelines

In the guidelines for the realisation of an environmental impact assessment of an airport project, the French Development Agency (FDA) clearly indicates the incentive to public consultation from the outset of the project: "The FDA encourages the project initiator to leverage the ability of individuals, groups and communities to assert their views and concerns in relation to the projects that affect them. To this end, the FDA supports the initiatives of the project developer in matters of public consultation ". Communication plans are to be foreseen for this purpose. The FDA also recommends that public consultations be started at the study stages, involving all parties concerned. Also "if particular communities are likely to be affected by the project, it is suggested to the project initiator to document the potential impacts of the project on these communities. To this end, he will have to report on the exchanges he has had with them in order to inform them and, when appropriate, the measures taken to optimise the project according to its consequences relating to the particular communities."

The guideline also mentions – Chapter 1.2 – the requirement for a process description of the consultations conducted to understand the needs, perspectives and concerns of the population. A report must also be made concerning the results of these consultations. "In addition to public information and consultation sessions, the project initiator is encouraged to collect, as comprehensively as possible, all the concerns and perspectives of individuals, groups and communities involved in a project using methods such as questionnaire surveys, individual or group interviews, documentation reviews, etc. (...) The study must also highlight the main economic, social and environmental strengths or constraints that the initiator must take into consideration in planning the project".

14.1.2 Approach for the analysis and planning of the engagement of the stakeholders

The stakeholder engagement plan (SEP) aims to guide the informed consultation and participation activities that will be conducted throughout the process of updating the impact studies and subsequent stages of the project. This SEP was carried out in parallel with the realisation of the basic socio-economic study.

14.1.2.1 SEP study area

The study area for the development of this SEP encompasses all the areas taken into consideration in the basic socio-economic study. The project area covers a set of towns located in:

Directly impacted areas;
The areas that can accommodate people and activities likely to be impacted and resettled.

Table 144: Names and demographics of villages and areas of activity affected by the project

Impact area	Town	Job	Job type	Estimated population (2019)
Plaine Corail	Sainte Marie	Village	Living place	44
	Bangélique	Activity area	Fishing and livestock breeding	0
	Pointe Corail	Activity area	Fishing	0
	Plaine Corail	Village	Living place	40

14.1.2.2 Engagement activities already carried out

The community engagement activities began formally with regular relations and meetings between the Executive Council of the Rodrigues Regional Assembly and the directly impacted populations. These community engagement activities took place on the following timeline;

25 June, 2018
An internal meeting chaired by Davis Hee Hong Wye, Island Chief Executive (ICE), was held at the Central Administration conference room (Island Chief Executive's Office) in Port Mathurin for the community relocation plan. The main objective was to establish a steering committee composed of representatives of the various government entities and other stakeholders involved in the resettlement.

28 June, 2018 and 2 July, 2018
Preliminary census by the officers of the Land Registry Office and the officers of the Agriculture Commission for the identification of families eligible for resettlement and inventory.

5 July, 2018
An internal meeting chaired by Davis Hee Hong Wye (ICE) was held at La Résidence (Chief Commissioner's Office) in Port Mathurin to review the initial information already collected in the field and to assess the need to refine the data available, particularly with regard to the Agriculture Commission and the Fishing Commission.

13 July, 2018
Consultative assembly in the conference room of the Plaine Corail police station bringing together the entire Executive Council, the villagers of Sainte Marie and all those having an activity in the area concerned. The objective was to officially provide information about the project to expand the airport runway and therefore the need for relocation of homes in the impacted area and supporting those individuals who carry out an activity there.

9 August, 2018
Meeting of the Steering Committee established in June with the villagers concerned in order to collect their grievances and their choices or preference for the type of support procedures (compensation or relocation).

20 August, 2018
Development of a census timetable and sending of letters to the people concerned in order to communicate the dates of beginning and closing of the census.
22 - 24 August, 2018

Detailed census of dwellings and families taking into consideration their properties, main activities and attached buildings as well as the services and facilities available in the area.

31 August, 2018
Submission of the detailed census report.

4 September, 2018
Internal meeting of the Executive Committee for a presentation to the various Commissioners of the situation and progress concerning the relocation of the villagers of Sainte Marie.

12 September, 2018
Visit to the residential relocation sites proposed by the Commissioners, the Steering Committee of the resettlement project and the inhabitants to be relocated from the village of Sainte Marie.

27 September, 2018
Meeting of the Executive Committee chaired by Davis Hee Hong Wye (ICE) with the villagers of Sainte Marie, who have not approved the relocation site originally proposed.

26 October, 2018
Submission by the Land Registry Office of potential sites for the relocation of Sainte Marie's households to the Executive Committee.

22 November, 2018
Meeting of the Executive Committee chaired by Davis Hee Hong Wye (ICE) with villagers who had not approved the proposed relocation site initially for a presentation and visit of new proposed sites. Then presentation to all the villagers of Sainte Marie of a draft of the agreement documents for resettlement.

27 November, 2018
Submission by the land registry office of the report of the land parcels approved by the villagers of Sainte Marie.

10 January, 2019
Internal meeting of the Executive Committee with the Steering Committee of the resettlement project to take stock of all the advances made and measures taken during the last few months.

28 February, 2019
Submission of a report by the Agriculture Commission concerning the offers of compensation to the villagers of Sainte Marie in relation to food crops.

6 March, 2019
Submission of a report by the Fishing Commission on the compensation mechanism for the abandonment of net fishing activities (in accordance with the national budget of 2014).

8 March, 2019
Submission of the valuation report of the market value of the houses of the villagers of Sainte Marie by the evaluation department of the Ministry of Finance and Economic Development of Mauritius.

15 March, 2019
Submission of the report of the Fishing Commission concerning the census of fishing posts in the impacted area.

19 March, 2019
Submission of a report by the Agriculture Commission on the compensation mechanism for villagers engaged in animal husbandry.

2 April, 2019
Sending of letters by the Executive Committee to all the villagers of Sainte Marie to inform them of the amounts assessed by the evaluation department of the Ministry of Finance and Economic Development of Mauritius and to establish a date of meeting in order to discuss these announced amounts.

11 April, 2019
Meeting of the Executive Committee with the owners of the fishing posts of the impacted area of Plaine Corail.

14.1.2.3 Methodology, approach and means

A team from Insuco made up of two international experts, a national consultant and a national investigator, undertook a mission in the study area from 1 to 17 April, 2019, to collect the data necessary for the drafting of this SEP.

Stakeholder engagement involved meetings with the various stakeholders at the local level, from the Regional Assembly with the various communities directly and indirectly impacted, as well as those connected with the Rodrigues airport. This SEP was conducted by Insuco concomitantly with the update of the socio-economic baseline study (SEBS).

14.1.2.3.1 Methodology for project definition of the engagement and consultation of the stakeholders

The methodology used consists of:

Identifying stakeholders who may have an interest in the project and those that may be affected, to establish a typology and an analysis of their relationships;
Monitoring and initiating discussions with different types of stakeholders, in participatory public consultations targeting each of the identified groups in the study area, individual or restricted discussion groups, or official meetings. The objectives of these discussions are to share the information available on the project, and on the other hand to collect over a short time the perceptions (fears and expectations and even recommendations) of all stakeholders involved. These public or restricted meetings and interviews have been the subject of minutes and detailed reports. In addition, the attendance lists of the consultations obtained in the towns visited and a register of the people consulted are reported.
Capitalizing on the perceptions collected from stakeholders and then developing a SEP.

14.1.2.3.2 Approach

The actions taken to develop the SEP have been focused on three key elements of the engagement, namely:

Exchanges of information concerning the project, mainly aimed at verifying the current state of knowledge of the project of the communities and understanding through which channels the information has been acquired and circulating. A comprehensive and solid information flow is an essential condition for the facilitation of the circulation of information to reduce the risks associated with a misunderstanding of the project's implementation process.
Stakeholder consultations to identify their views, concerns, expectations and recommendations with respect to key issues related to the implementation of the project, so that the targeted effective mitigation measures that are needed can be developed.
In the course of the consultations, aspects of the flow of information and mechanisms facilitating communication, dialogue and consultation have been highlighted and have been a specific focus.

In order to do this, participatory public meetings were held with villagers from the towns impacted by the project. The public consultations were organized in two specific towns affected by the project. This ensured an effective participation of the representatives of the impacted communities, but above all permitted us to take into consideration the particular issues affecting each of the towns. It was also important to assess the balances and territorial relationships between the two towns identified, in order to anticipate possible problems of marginalisation of certain communities.

The public consultations affected more than 20 people in the two small towns – whose presence was formally recorded and documented – some people also attended public meetings without necessarily leaving a written record of their presence. Particular attention has been paid to the participation of women. In this regard, it should be noted that women were free to participate in the consultations without the need to be expressly invited to speak.

14.1.2.3.3 Communication media

Language elements were prepared and used for the presentation of the mission during the SEP. This included the key elements of the project's presentation to ensure a harmonized discussion of one community with another. An information document concerning the context of the rather succinct project was also developed, but the need for its use in the field did not occur.

14.1.2.3.4 Limits

Despite a sometimes limited flow of information, particularly at the indirectly impacted town level (proposed to be the place of relocation), most of the participants in the consultations seemed to have sufficient knowledge to form a realistic opinion as to the specific issues related to the project implementation and the impact on the territory. This lack of continuity of information circulation did not seem to impose any particular limit on the animation of the discussions during the consultations.

14.1.3 Identification and analysis of the stakeholders

For the purposes of this SEP, the stakeholders are identified on the basis of the IFC definition[11] as "persons or groups that are directly or indirectly affected by a project as well as those with interests in a project and/or the ability to influence its results, whether positively or negatively. Stakeholders may include locally affected communities or individuals as well as their official and unofficial representatives, local or national government authorities, politicians, religious leaders, civil society groups and organisations with their special interests, the educational world or other enterprises".

The table below lists by type the main stakeholders identified. The list of stakeholders will continue to evolve for the duration of the project.

Table 145: List and typology of stakeholders

Entity	Main referents	Prerogatives/description
Regional administration		

[11] IFC - Handbook of good practices for enterprises conducting business in developing markets, May 2007

Entity	Main referents	Prerogatives/description
Executive Committee of the Rodrigues Regional Assembly (RRA)	*Island Chief Executive*	The *Island Chief Executive* is a key position as secretary of the Executive Committee. It is defined under the title of *Island Chief Executive.* His mission is to ensure the implementation of all the measures taken at the meetings of the Executive Committee by each of the Commissioners.
The company initiating the project		
Airport of Rodrigues Limited	*Airport Manager* *Operations and Maintenance Manager*	The Airport of Rodrigues, with a desire to increase its passenger and air cargo capacity, is at the initiative of the project to expand the runway, supported for years by the Rodrigues Regional Assembly.
Communities		
Villagers of Sainte Marie	Spokesperson of Sainte Marie	All the people living in the town, who will be directly impacted by the project. The estimated number of people is 44 inhabitants. The inhabitants of Sainte Marie are the people who will be the subject of a relocation of their homes
Villagers of Plaine Corail		All the people living in the town primarily proposed to be the resettlement location of the inhabitants of Sainte Marie. The estimated number of people is 70 inhabitants throughout the area.
Net fishermen	Fishing station managers	The fishermen of the impacted area of Plaine Corail are positioned in the three subdivisions called Bangélique, Caverne Bouteille and Pointe Corail. Their method of operation is closer to the cooperative system. These fishermen do not have their main residence in the area but are users with fishing infrastructures.
Bangélique livestock breeders		Livestock breeders who use old unused fishing posts as infrastructure, which are readapted as a holding pen for their animals overnight. They use the area as a free grazing area during the day.
Cooperating Actors with the development		
Financial partners	FDA / EU	Actors providing financial support in the development cooperation sector.
Media		
Radio Rodrigues		Only radio transmission on the island that plays a role in the transmission of information related to the different projects of the island and if necessary in relation to information about the village assemblies organized by the local government.

14.1.3.1 Analysis of the leverage of influence of stakeholders in the project

The analysis of stakeholder leverage helps to determine the potential interactions of stakeholders concerning the project. This exercise helps to guide the stakeholder engagement strategy, both in the planning phase and in the follow-up and evaluation phases of the engagement plan.

The listed levers of influence were categorized in the following table in terms of positive influence (potential strengths for the project) and negative influences (potential brakes for the project). Influences are evaluated according to the degree of potential impact (high, medium, low) on the project.

Stakeholders	Close guardianship authorities		Initiating company		Directly impacted resident community	
	Executive Committee – Regional Assembly		Airport of Rodrigues Limited (ARL)		Villagers of Sainte Marie	
	Importance	Interference	Importance	Interference	Importance	Interference
Potential levers of stakeholders concerning the project	Administrative facilitation Community awareness program Facilitation of negotiations Intervention in case of problems	Very weak capacity to slow down project activities Very weak capacity to slow the evolution of the project	Administrative facilitation Intervention in case of problems	Very weak capacity to interrupt project activities	Full acceptance of the project Weak role of influence on other user communities in the area	Weak capacity to block project activities In case of disagreement, moderate capacity to demobilize the population
Intensity of influence	Strong	Week	Strong	Weak	Moderate	Weak

Stakeholders	Directly impacted user community		Directly impacted user community		Indirectly impacted community	
	Fishermen (fishing posts)		Bangélique livestock breeders		Villagers of Plaine Corail	
	Importance	**Interference**	**Importance**	**Interference**	**Importance**	**Interference**
Potential levers of stakeholders concerning the project	Full acceptance of the project Weak role of influence on other user communities in the area	Weak capacity to block project activities	Full acceptance of the project Weak role of influence on other user communities in the area	Weak capacity to block project activities	Full acceptance of the project Weak role of influence on other user communities in the area	Moderate blocking and disturbance capacity In case of disagreement, weak capacity to demobilize the population

Intensity of influence	Weak	Weak	Weak	Weak	Weak	Weak

Stakeholders	**Financial partners**		**Media (radio)**	
	Importance	**Interference**	**Importance**	**Interference**
Potential levers of stakeholders concerning the project	Indispensable partners for the financing and therefore the implementation of the project Potential partners for the promotion of transparency and good governance	Strong capacity to block the operation of the project in case of non-compliance with the standards	Community awareness program Facilitation of the circulation of information	Relay of rumours to the population in case of lack of or insufficient communication from the company
Intensity of influence	Strong	Strong	Weak	Weak

14.1.4 Stakeholder consultation: a summary of perceptions of the project

14.1.4.1 Presentation of the consultations performed

During the preparation of the SEP, the following meetings and consultations were carried out.

Phase	Date	Place of consultation	Entities represented/persons consulted	Medium
Exploratory	04/03/19	Plaine Corail	Airport Operational & Maintenance Manager ESIA project manager and SETEC consultants Environmental impact consultants	Meeting
Exploratory	04/03/19	Port Mathurin	Island Chief Executive and Assistant Airport Manager Airport Operational & Maintenance Manager ESIA project manager and SETEC consultants	Meeting
Exploratory	04/06/19	La Ferme	Island Chief Executive and assistants Airport Manager Airport Operational & Maintenance Manager External socio-economic study consultants	Lunch meeting
SEP	04/10/19	Caverne Bouteille	Fishing station manager (individuals)	Individual consultation
SEP	04/11/19	Sainte Marie	Village spokesperson	Individual consultation
SEP	04/11/19	Sainte Marie	Inhabitants of Sainte Marie	Public consultation
SEP	04/11/19	Sainte Marie	Fisherman of Sainte Marie	Individual consultation
SEP	04/12/19	Maréchal	Fishing station manager (Bangélique)	Individual consultation
SEP	04/13/19	Plaine Corail	Resident of Plaine Corail	Individual consultation
SEP	04/14/19	Sainte Marie	All the inhabitants of Sainte Marie	Public consultation
SEP	04/15/19	Plaine Corail	All the inhabitants of Plaine Corail	Public consultation
SEP	04/15/19	Bangélique	Bangélique livestock breeder (non-resident)	Individual consultation
SEP	05/03/19	Anse Quitor	Anse Quitor village committee	Public consultation
SEP	05/03/19	Cascade Jean Louis	President of the village of Cascade Jean Louis	Individual consultation
Exploratory	05/08/19	Port Mathurin	Resettlement Committee (RRA)	Meeting
Exploratory	05/09/19	Citronelle	Director of agricultural services	Meeting

14.1.4.2 Knowledge and general opinion of the stakeholders concerning the project

14.1.4.2.1 Information concerning the Rodrigues project

The project to expand the runway of the Rodrigues airport has been discussed for some years (since about 2011) on the island. The information, which was eventually officially declared only in July 2018, had had time to circulate very easily throughout the territory of Rodrigues during these years. Today, the entire population of the island is aware of the airport project.

14.1.4.2.1.1 Information concerning the directly impacted populations

The official announcement of the launching of the stages of the project was made during a public meeting held at the conference room of the police station of Plaine Corail and where the inhabitants and users of the affected area, namely the inhabitants of the village of Sainte Marie, fishermen users of fishing posts and finally livestock breeders using the area as pasture were primarily invited.

During the various community and individual consultations, the inhabitants and users of the area impacted by the project displayed a very high level of knowledge concerning the project, even going to the limits of impact.

The special nature of this project lies in the fact that the local authorities are already very advanced in the discussions with the inhabitants and users of the impacted area. Thus, communication and information has been able to circulate fairly regularly since the initial official announcement of July 2018. However, given the level of progress regarding the relocation plans of the inhabitants of the village of Sainte Marie, there is still some missing information or at least questions from the villagers that must be displaced. These questions are mainly based on the issue of livestock breeding for the villagers (the main activity for the vast majority).

As for the users (non-residents) of the impacted area, fishermen of the fishing posts still in operation and Bangélique livestock breeders, they seemed rather well informed on all the elements of the project and did not display any concern over the need to relocate their activity.

14.1.4.2.1.2 Information concerning the populations indirectly impacted

Like the inhabitants of the impacted area, the inhabitants of the town of Plaine Corail, which is the main resettlement location of the villagers of Sainte Marie, have had the information of the airport project for a number of years prior to the official announcement made by the local authorities.

While the information circulated more frequently after the official announcement of July 2018, no direct consultation has been carried out to date with the inhabitants of the town,

The villagers of Plaine Corail know indirectly that their village is the resettlement area, especially after observing a site visit of the authorities and the villagers of Sainte Marie in their town. Some villagers of Plaine Corail even claim to know exactly where the families of Sainte Marie will be resettled.

14.1.4.2.2 General opinion of the stakeholders concerning the project

From all the consultations, interviews and meetings conducted in the field through Rodrigues or in areas directly and indirectly impacted, it is important to note that the airport project is the subject of a consensus. No one encountered any opinion against the introduction of the new airstrip.

14.1.4.2.2.1 General opinion of people directly impacted

Despite the fact that the villagers of Sainte Marie have to leave their living place and the quality of life specific to their town, the opinion of the inhabitants on the project is always favourable: "We cannot go against such projects for the development of our island, this airport project is a good thing for Rodrigues, even if it is us who are directly affected" expresses the spokesperson of Sainte Marie. "We are well aware that our lifestyles will change and we hope that we can adapt quickly to the living area where we will be resettled."

It is exactly the same for fishermen and livestock breeders in the impacted area. The approval of the project is general and despite the fact that the methods of operation will change in a certain way for them, they fully endorse the implementation of the project.

14.1.4.2.2.2 General opinion of people indirectly impacted

For the inhabitants of Plaine Corail, it is the same observation. All are in agreement with the project despite the concern about the new methods of organisation (especially with regard to livestock breeding) that they will have to put in place if the inhabitants of Sainte Marie settle in their town in order to ensure good social cohesion.

The airport project is for them also an opportunity to improve the standard of living with certainly new work opportunities that will be created. They hope, of course, that their community will be voluntarily integrated into this future development.

14.1.4.3 Positioning in relation to the main issues

14.1.4.3.1 Loss of land and relocations

The issue of physical and economic relocations caused by the footprint of the project is central to the local public debate. The question is debated both at the level of the community that is supposed to be displaced, and at the level of the communities that inhabit the proposed areas for resettlement. The idea that resettlement is a necessary event is, as indicated previously, commonly accepted by the locals. The local discussion is mainly structured in relation to the conditions for implementing and monitoring this process.

The issues that are at the centre of the concerns regarding resettlement are dealt with in the following paragraphs.

14.1.4.4 The challenge of pursuing livestock breeding activities

While the physical displacement of dwellings is not the main concern of the inhabitants, who are supposed to leave the project's direct impact zone, the issue that is most important is certainly livestock. Livestock breeding is considered to be the main economic activity in the area and concerns both the inhabitants of Sainte Marie, as well as the non-resident livestock breeders who frequent the Bangélique plain, and the inhabitants of the area of Plaine Corail, which was approached for the relocation of the people affected by the project.

14.1.4.4.1 The inhabitants of Sainte Marie

For the inhabitants of Sainte Marie, who practice an extensive type of pasturing with free grazing, the matter of maintaining an economy highly based on this activity is a central issue. It is formulated in the following manner:

To what extent will the resettlement conditions permit the continuation of the livestock breeding activity?
To what extent will the resettlement support initiatives permit the integration of technical innovations that enable the continuation of pastoral activity on smaller areas?
What are the support measures for conversion to other income-generating activities, as an alternative to livestock breeding?
The inhabitants of Sainte Marie are aware that extensive and free-range livestock breeding is not possible in the new resettlement areas. Space is less abundant, and it is already subject to the grazing of the cattle of the inhabitants of Plaine Corail. To this is added an additional constraint: the large pasture reserves that have permitted until today the maintenance of an extensive pastoral model in the area – the site of Eau Vert, for example, where some livestock breeders of Sainte Marie leave their herds is severely threatened by a species of invasive acacia (*Acacia nilotica* or *pikan loulou*) which greatly reduces its capacity.

"In Eau Vert, *pikan loulou* has spread so much in recent years that I think that within three to five years it will be impossible to practice livestock breeding in the area as we do today" (Livestock breeder concerning the site of Eau-Vert. Resident of the village of Sainte Marie)

In perspective, pastoral spaces are doomed to be reduced throughout the entire area. This is a fact that the livestock breeders of Sainte Marie take into consideration. The challenge for them is to obtain guarantees in relation to the support measures that the regional government could put in place in order to support a transitional phase that permits:

Integration of less extensive techniques to reduce the size of herds (with the necessary infrastructures and equipment);
Development of alternative economic activities to livestock breeding, which secure household incomes and permit young people to stay in the area.
Considering the fact that, according to the livestock breeders of Sainte Marie, their animals would have difficulty adapting to a model of non-extensive farming, the necessity of supporting a technical conversion is considered to be the most important and very urgent.

In summary, the solutions proposed by livestock breeders who need to be relocated, are structured in relation to three (non-exclusive) options:

Active public intervention, aimed at the maintenance and conservation of remote grazing areas. This solution is highly dependent on the technical capacity to counteract the expansion of invasive plants.
Effective support – technical and financial – for the integration of a less extensive farming model, needing less space.
Temporary support during the period of conversion to other economic activities.

14.1.4.4.2 The inhabitants of Plaine Corail

For the inhabitants of Plaine Corail, an area proposed for the resettlement of most of the families of Sainte Marie, the reception of the new neighbours is not a problem in itself. On the other hand, the fear is very high with regard to the impact caused by the herds of the inhabitants of Sainte Marie in terms of pressure on local resources.

"We cannot refuse to welcome the inhabitants of Sainte Marie, we are all human and this could very well have happened to us. The problem is that they have a lot of animals. How are we going to organize to accommodate so many animals in the area? (Farmer-livestock breeder of Plaine Corail)

The inhabitants of Plaine Corail tend towards the practice of a livestock breeding model based on the constant penning of the animals and the development of the pastoral space in fenced and contained parcels (also equipped with operating permits). It is indeed a model opposite to the one that is practiced in the plain of Bangélique.

Above all, both models are not considered compatible. The prospect of receiving a large influx of animals left in freedom is causing a real fear among the inhabitants of Plaine Corail. This fear threatens a peaceful process of welcoming and integration. Faced with this challenge, the inhabitants of Plaine Corail propose solutions very similar to those proposed by the inhabitants of Sainte Marie: the maintenance of pasture areas dedicated to extensive livestock breeding, distant from the village; and conversion to a holding area model and physical delimitation of forage parcels.

It should be noted that the establishment of a process of consultation and dialogue concerning this type of technical solutions and support measures, which permits members of both communities to understand that they share the same fears and are considering the same solutions, would be very productive.

14.1.4.4.3 Non-resident livestock breeders of Bangélique

Non-resident livestock breeders who leave their cattle in free grazing in the Bangélique area face the same problem of loss of grazing space. Alternative areas are scarce and are likely to be less and less suitable for grazing because of the expansion of invasive plants. Relocation options are reduced.

It would be desirable for them to be actively involved, as economically displaced people, in the process of consultation and engagement in relation to shared solutions, with the communities of Sainte Marie and Plaine Corail.

The issue of resettlement depends largely on the option of a policy of preservation, on the part of the regional authorities, of grazing areas by actively protecting them from the expansion of invasive plants such as the *pikan loulou*.

Also, for some livestock breeders, the option to reduce the size of the herd, if the extensive model is no longer possible, is quite feasible.

A characteristic of the livestock breeding in Bangélique, indicated in discussions with owners of non-resident herds, is that the maintenance of the herd on the site does not represent only an economic activity. Livestock breeding also has a contemplative function, highly connected to the landscape. In this specific case, the reduction of the herd would not be *a priori* an option to refuse, as long as maintaining a minimum number of heads permits them to maintain an activity the main value of which is personal well-being.

"I would be ready to reduce the herd, if I can keep coming to see my cows at the seaside" (non-resident livestock breeder. Bangélique)

14.1.4.5 The issue of access to fishing sites

An economic relocation proposal was made to the fishermen in the impacted area. However, the issue of restoring current conditions is not fully resolved, because for the fishermen a number of concerns remain unresolved.

14.1.4.5.1 At the level of fishing posts *(fishing posts)*

The displacement of the fishing posts raises various issues. The area of Les Salines is proposed for the reconstruction of the structures and the mooring location. The fishermen of Bangélique fear that this option may have economic consequences on their activity because, in order to go to the usual fishing sites, the distances would be more significant and the fuel costs could increase significantly. At present the fishing boats use sails primarily. The area proposed in Les Salines is little protected inside the Baie Topaze and the use of an engine will become practically obligatory.

14.1.4.5.2 At the level of individual professional fishermen

The fear expressed by the managers of the fishing posts is the same as that evoked by the individual fishermen who gravitate around the mooring areas of Bangélique: the distance to the fishing site. For them, the issue is perhaps more important because they are more likely to use an engine, even if they try to limit their use and their fishing sites lie behind Crab Island, one of the largest parts of the island's lagoon.

"Today, during the windless periods during which I have to use the engine, I spend Rs 150 to go, come back and go again the next day to my fishing site. While from the inside of Baie Topaze, I will practically have to spend this Rs 150 just to get to the site" (Individual fisherman. Sainte Marie)

The fishermen of Sainte Marie prefer the fishing sites in the lagoon, and avoid the reefs. This helps to reduce the risk of loss of material – traps, in particular – that you take when you are closer to the coral reef. With the relocation of the mooring site and the remoteness of the known sites in the lagoon, fishermen fear that they must also orient themselves towards the reefs, which they can control less well than the lagoon and which is not part of their current practices.

14.1.4.6 The issue of the loss of farmland

According to the various consultations and interviews conducted in the field, the loss of farmland is apparently not a major issue, since it is anticipated, based on discussions already initiated with the local government, that exploitable surfaces will be made available in the relocation sites.

However, the inhabitants of Sainte Marie spoke of the fact that their know-how in agro-pastoral procedures had allowed them to obtain today a quality of soil that is not negligible and this particularly in an area where the rock is mainly outcroppings. It will be difficult to find or restore the same levels of soil quality. It is an operation that requires work and support measures. The issue, from the point of view of the inhabitants of Sainte Marie, is to have guarantees that they will be supported in this process.

14.1.4.7 The issue of physical resettlement

The relocation of dwellings, for the inhabitants of Sainte Marie, does not seem to be at the centre of a major concern. In fact, very prompt action has been taken by the regional government to reassure people who may be physically displaced. This implies the fact that all the houses would be rebuilt elsewhere, according to standards at least equal, and probably better, than those of the current houses. The steps already begun in that the inventory of goods, the calculation of surfaces, and the identification of relocation sites have prevented the issue of housing from causing fears or uncertainties for the population of Sainte Marie.

For the inhabitants of Sainte Marie, resettlement has a major advantage: to get closer to the paved road and thus to public transport, services and schools.

14.1.4.8 The demographic issue and cohabitation in resettlement places

Although the physical displacement generated by the project is very limited (a maximum of fifteen families), in view of the socio-demographic configuration of Plaine Corail and the current size of human settlements, the resettlement process represents a large demographic issue locally.

The population of the Plaine Corail area, which is being proposed for relocation, also has about fifteen households. Most are concentrated in the area located at the top of the site of Les Salines. The basic social study has shown that it is a community structured mainly around kinship relationships. Integrating a part of the families of Sainte Marie into the territory corresponds to doubling the local population. For the inhabitants of Plaine Corail, the reception of the families of Sainte Marie is not a concern. It is rather considered a duty to welcome new neighbours. The greatest concern, therefore, involves the livestock breeding activity and the maintenance of an extensive pastoral model.

It is thus important to stress again that, since these concerns concern both the host population and the displaced population, a support for dialogue remains a priority to ensure that the quality of cohabitation is not threatened.

There are still two underlying issues:

The first one is mentioned mainly at the level of Plaine Corail. The site is experiencing a water supply problem. The fear is that the increase in the number of users can further degrade the conditions of supply. The solution envisaged by the inhabitants is that the settlement of the people affected by the project is above all an opportunity to improve the conditions for the provision of services in the reception area.
The second issue is not always explicitly mentioned, but it is evident on several occasions. If displaced families were to receive substantial resettlement assistance, creating a situation of inequality in relation to the host population, this would be considered an act of injustice and would be an obstacle to the process of integrating the two communities. The desired option is for the host community to benefit from equivalent benefits, in terms of services and support measures, as the displaced population. This aspect is all the more important since, according to the basic social study, the current economic conditions of the population of Sainte Marie are, in many aspects, better than those of the population of Plaine Corail. The differences are not very significant, but obviously the families of Sainte Marie, developing an economy strongly based on diversification and integration between different activities (fisheries/agriculture/livestock breeding), and a strong propensity for self-consumption, has succeeded in creating relative wealth. In the confrontation with the host community, it is very important that the gap between economic situations is not perceived as an issue that could jeopardize social relations.

14.1.4.9 The issue of support measures for resettlement

Among the inhabitants of Sainte Marie, the question of relocation is formulated in a very clear way. A period of adaptation will be necessary to restore a standard of living and production. In addition, it will be difficult to reproduce the same economic conditions on the relocation site. Thus, for physically displaced people, it is essential that support measures be taken, in order not to make families vulnerable during the transitional period.

The focus is on the desirability of creating new opportunities and reconversion projects to strategic economic sectors. This has to be done with a view to decreasing income from livestock breeding. The option envisaged by the inhabitants of Sainte Marie is that of support for the emergence of small individual or family businesses. The women of the village are the most engaged in promoting this idea of an economic model. The opportunities would come from the development of the activities and the passage in the vicinity of the airport. Small craft businesses (food processing and conservation), lodging and restaurant activities, for example, are mentioned as individual projects that could be promoted as part of a resettlement assistance campaign.

With regard to the issue of equal opportunities between the host community and the relocated community, the idea that support for the promotion of the individual or family craft business concerns both the inhabitants of Sainte Marie and the inhabitants of Plaine Coral is to be considered seriously. In particular, projects involving women from both families could be a lever for a good resettlement process.

The establishment of a livelihood restoration plan, as advocated by international standards (IFC, ADB), is an implicit recommendation made by both communities.

14.1.4.10 Issues related to the physical environment

The question of the physical environment is mentioned only in a very sporadic way by the inhabitants of the directly impacted areas, and by the inhabitants of the resettlement sites.

"There are too few trees here and no animals apart from our cows and sheep and dogs, it is a difficult environment here" (Farmer-livestock breeder. Sainte Marie)

14.1.4.10.1 Issues related to air quality and living environment

The inhabitants of Plaine Corail are the only ones who have mentioned the already existing discomfort from the noises and smells of kerosene coming from arriving planes, especially during the warm and humid period of summer. They then express a concern about this, knowing that there will be larger carriers who come to park in front of the terminal. The locals then wonder if the noise and fuel smells will be more significant because the planes will be bigger.

"Sometimes, in the summer, when it's hot, the smell is so strong that you have to close the windows of the house, and it sometimes gives you a headache" (Inhabitant of Plaine Corail.)

14.1.4.11 Communication mechanisms, information, public consultation, dialogue

The inhabitants of Sainte Marie have been informed that the project will certainly result in their physical and economic resettlement. The communication and information system on this subject was very quickly implemented by the Executive Committee of the Rodrigues Regional Assembly. This has certainly helped to open up an effective communication and information channel. Up until now, it is within this framework that the conditions for resettlement have been negotiated. The Executive Committee of the Rodrigues Regional Assembly is the main interlocutor of the community.

In this regard, a concern expressed by the inhabitants of Sainte Marie is that, if the Rodrigues Regional Assembly remains the only institution that is discussing with the population, the negotiating framework may be too strict. The expansion of the framework to a wider

consultative table would be desired by the community. The reason indicated is that in case of disagreement, a recourse to mediation by other actors (institutional, civil society) would make it easier to unblock the situation. The community would also feel better ensured if the framework for engagement activities were to be designed in a broader manner.

The inhabitants of the proposed areas for the reception, for their part, believe that communication with the regional authorities would be more fluid and easier, if the community was organizing in a small committee, in order to centralise the flow of communication and, if necessary, to request more information.

14.1.5 Stakeholder engagement strategy

14.1.5.1 Key elements of the proposed engagement strategy

The aim here is to propose a stakeholder engagement strategy aligned with the respective needs of the project, populations and local dynamics. This strategy is based on a set of key points for the participation of stakeholders in the project:

The IFC's good practices recommend stakeholder involvement at the earliest, in order to build good relationships, which will be reinforced over time. Dialogue with stakeholders from the outset of the project establishes a positive dynamic in relationships that will benefit in particular during potentially difficult periods or tensions. Engaging stakeholders to encourage them to collaborate on the project involves the development of direct relationships between them and the developer, based on a participatory approach. The establishment of effective and sustainable communication mechanisms (in terms of consultation, information and community participation, including the registration and management of complaints) is therefore the keystone of the engagement strategy.
Respect for the reality (and especially in relation to livestock breeding activity and all that it implies) of local authorities is essential to ensure their full cooperation and thus facilitate relations with the villagers. It is therefore important to involve them in the evaluation phases of the impacts and the PGES, as well as in the subsequent phases. The engagement strategy therefore relies on consultation and maximum association of local authorities.
The establishment of representative village committees providing external and internal communication to communities is an asset because, even if the committees are not yet fully structured or functional, they are solid instruments from a legal and institutional viewpoint.
The balances between communities (in particular the host community of Plaine Corail and the integrated community of Sainte Marie) can be a significant risk for the maintenance of good conditions of social understanding during the course of the project and of course thereafter. For this reason a very important pro-active policy of communication, consultation and transparency, is necessary to avoid that some individuals feel harmed by certain decisions made.

14.1.5.2 Stakeholders' engagement plan

On the basis of the analyses outlined above (stakeholder identification, influence levers analysis, key strategic points definition), the following stakeholder engagement activities are focused around the thematic area priorities identified during the consultations, while specifying the recommended levels of engagement. The suggested engagement levels are as follows:

Collaboration – which is the search for the participation of stakeholders in the project, their involvement, but without joint execution or sharing of responsibility (the stakeholder participates for validation purposes, but not for execution);
Active association – which consists of an active contribution from the stakeholder, a joint execution of activities and a sharing of responsibilities;

The consultation – which refers to the solicitation of the stakeholders' opinion, of their contributions, with the aim of taking into consideration the opinions and recommendations formulated;
Information / awareness – which corresponds to a unilateral action by the developer aimed at transmitting and explaining information to stakeholders.

Stakeholders	Main referents	Favoured engagement method	Frequency	Short-term actions proposed for ARL	Priority level
Executive Committee of the Rodrigues Regional Assembly	Island Chief Executive and recognized members of the Committee	Regular and extraordinary meetings	When necessary	Support the establishment of the Regional Assembly communication system with the communities	High
		Regular meetings and mailings	Continuous	Promote the maintenance of communication and the transmission of information collected concerning the airport area	High
Villagers of Sainte Marie	Spokespersons and heads of households	Monitoring the proper application of the livestock breeders' resettlement process	When necessary	Support for the creation of a livestock breeders' committee concerning the relocation site	High
		Monitoring good village integration	Continuous	Ensure the maintenance of communication and the collection and transmission of grievances	Medium
		Dialogue on the progress of the project	Quarterly	Disseminate information about the project.	Medium
Fishermen in the impacted area (fishing posts)	Station managers	Monitoring the proper functioning of new fishing posts	Quarterly	Support, information dissemination	Weak
Livestock breeders	Bangélique livestock breeders and livestock breeders of Plaine Corail (host and resettlement areas)	Monitoring the proper application of the livestock breeders' resettlement process	When necessary	Support for the creation of a livestock breeders' committee concerning the relocation site	High
		Monitoring of the proper functioning of the use of the pastures	Monthly	Ensure the maintenance of communication and the collection and transmission of grievances	High
Villagers of Plaine Corail	Representatives of the inhabitants of Plaine Corail before the installation	Monitoring the proper application of the livestock breeders' resettlement process	When necessary	Support for the creation of a livestock breeders' committee concerning the relocation site	High
		Monitoring good village integration	Continuous	Ensure the maintenance of communication and the collection and transmission of grievances	Medium
Programs and Development project	Directors and agents of national and international programs	Meetings	When necessary	Search for articulation and support for the implementation of community projects	Weak
Media	Local radio	Press releases	When necessary	If necessary, transmit information and support creation of discussions	Weak

14.1.6 Complaint and grievance management mechanism

Establishing a complaint and grievance management system is one of the recommendations of the IFC, (Performance Standard 1, IFC, 2012). Such a system should allow people to express their complaints and grievances, whether they are registered, classified, analysed and to receive an appropriate response within "reasonable" time frames.

Complaints can have many origins, ranging from the need for attention from a stakeholder, to misunderstandings between the project and stakeholders due often to a lack of communication, to internal and/or external social and political manipulations, to internal project failures, etc.

In order to better manage these grievances and complaints, the project must therefore establish an out-of-court dispute resolution and management mechanism based on mediation, arbitration and constant dialogue.

14.1.6.1 Establish a complaint and grievance management mechanism that is accessible and effective

It is important for the project to quickly establish a complaint and grievance management mechanism, identified as such by all stakeholders in the area (and outside the area). The structuring of this mechanism must be elaborated by the institutional structure in charge of relations with local communities and the piloting of the resettlement and clearing processes. Once established, this mechanism must be popularized and all inhabitants of the social influence area of the project, informed of its method of operation. Its main features are the following:

Known from major populations (or their representatives on a local scale);
Easy to access and use;
Easy to mobilise by everyone;
Effective
Just
Ongoing in nature
Within the projects, responsibility for the structuring and management of this mechanism usually rests with the department in charge of the communities. In the case of the Rodrigues airport runway extension project, it is above all the regional authorities that have managed, until now, the issues related to population relations. It is therefore within the regional institutional structures that a specific complaint management mechanism could be designed and housed, in agreement with the project holder.

14.1.6.2 The different steps for management and processing of complaints

Figure 190: Complaint and grievance management steps

The above diagram summarizes the steps for management of complaints and grievances. Several other complementary activities may be required for each step.

Step 1: Receive the complaint at the access point (the access point could be a referral person, reachable by all stakeholders, responsible for this task through the regional institution or through any type of committee that controls the procedures), to document, to investigate, when necessary, and to refer the matter to the responsible people within the project.

Step 2: Assessment of the complaint: seriousness, magnitude, actors present, motives, etc. Acknowledge receipt of the complaint and present to stakeholders the manner in which it will be dealt with (specifying one or more deadlines). Based on this assessment, the level of complaint processing within the project should be determined (alert management and possibly authorities, or manage at the community team level).

Step 3: Decide on a complaint handling strategy, divide the tasks and responsibilities between the teams and members of the project. Consider investigating the complaint (involve local authorities as needed to ensure the legitimacy of the investigation), identify options for solutions. Respond to the complainant by stating the findings of the investigation and the proposed regulations.

The survey takes place according to the following steps:

Travel to the site of the complaint to observe the situation in the field and meet the complainant(s);
During this travel or after, depending on the possibilities, discuss it with the complainant(s) in order to obtain his (their) proposals for solutions, discuss with him (them) the different procedures for resolving the complaint, have him (them) provide proposals and determine his (their) preferences;
Select a balanced solution to resolve the complaint with the complainant(s);
Transmit the selected solution to the supervisor for validation (investigation report).
If the complainant is satisfied the complaint can then be terminated, if not, then an appeal should be considered.
Step 4: It is necessary to respect the shortest possible deadlines for resolution of the complaint, to ensure a follow-up evaluation (with the complainant and internally) and then to

proceed to the official closure of the complaint (with the signature of both parties), and finally to file the folder in the archives.

14.1.6.3 Specify delays in processing of complaints

The implementation deadlines must be decided and clarified with the entire project team, the collaborators and the relevant stakeholders. The table below provides an example of how to structure complaint processing times. It can be discussed as a team and adapted to the means available to the project.

Steps	Time
Introduction and receipt	Immediate
Evaluate and assign roles and tasks	5 working days
Acknowledge receipt	Immediate
Investigation	Between 10 and 45 working days (depending on the complaint)
Response	5 working days
Possible appeal(s)	Depending on the appeal - to be determined
Monitoring, closing and archiving	Between 5 and 45 working days.

14.1.6.4 The different approaches advocated for the management of complaints

Several mechanisms can be implemented to deal with the complaint according to its gravity and scale:

Mediation: explain and clarify a conflict situation with regard to the rights and duties of each, the commitments made on both sides in the framework of the project. Recommended recourse to local authorities;

Implementation of actions and/or corrective measures: when it is proven that a third party, impacted by the activities of the project is adversely affected, the project will be responsible for proposing corrective actions. These measures should never be taken under threat and/or blackmail. A tense social situation should be appeased before new commitments to stakeholders are made.

Arbitration: the arbitration situation is strongly advised because it has the advantage of mobilizing local authorities (e.g. villagers) in order to produce a return to either a local agreement or the Law.

14.1.6.5 A mechanism that must always be kept open is the use of judicial procedures

It may be envisaged that the management of an internal complaint does not lead to an acceptable resolution for either party or both parties. The complainant must therefore retain the prerogative to exercise other remedies.

Any judicial process remains a solution for resolving disputes, despite the existence of a complaint and grievance management mechanism established within the project. While legal

remedies are lengthy and costly, the complainants will need to be informed, if the project mechanism does not allow an acceptable resolution, that they also have this recourse.

14.1.6.6 Develop an internal database for the compilation of complaints

In order to ensure proper management of the mechanism, the project has a specific database for the management of complaints. Through an Excel file, the project will be able to compile all the information on the complaints that has been filed. This is not only a matter of establishing a history and guaranteeing archiving, but also of establishing an effective tool for tracking complaints during processing.

This file will specify:

History of complaints (closed)
Nature of complaints
Magnitude
Location
Relevant stakeholders
Resolution mechanisms
Processing period
Solution found
Processing times

14.1.7 Monitoring and reports of activities in which stakeholders are engaged

14.1.7.1 Monitoring of activities in which stakeholders are engaged

Stakeholder engagement activities will need to be monitored and controlled to ensure that consultation and information efforts are effective and in particular that stakeholders have been duly consulted throughout the process; the monitoring will include the following elements:

Audit of the implementation of the stakeholder engagement plan;
Monitoring of formal and informal consultations with communities and government authorities;
Control of the effectiveness of engagement processes in the context of impact management, recording feedback from engagement activities and compiling and monitoring the level of implementation of community engagement;
Monitoring of grievances and their resolution.

14.1.7.2 Periodic reports on the activities in which stakeholders are engaged

Periodic reports will permit the summarizing and documenting of all activities conducted. Quarterly reports will be able to include all the activities carried out for the period concerned. They will present a summary of the issues and grievances raised and how they were dealt with. These reports will include:

The total number of stakeholders involved in each stakeholder category;
The geographical location of stakeholders in and outside the project area;
The number of comments and requests received and the responses made;
The issues raised and the levels of support and opposition to the project;
The nature and number of complaints and grievances registered and processed;
The deadline for resolution of the grievances and handling of the complaints.
A stakeholder engagement report should also be published annually. It will present a summary of the main problems raised by stakeholders, the number and subjects of grievances, a summary of the main actions carried out to address the concerns raised, an analysis of the trends of key performance indicators, and operational plans of engagement for the next period.

14.1.8 Conclusion

As the strategy for engaging stakeholders in the project is now formulated, it will then be the responsibility of the Airport of Rodrigues (ARL) to define the means it wants and to be able to mobilize to engage the stakeholders. The determination of these means will be an indispensable prerequisite for the operation of the strategy of engagement of the stakeholders proposed herein, in order to be able to break down the various strategic axes of engagement in planned and budgeted operational activities.

14.1.9 Annexes of the stakeholder engagement plan

14.1.9.1 Annex 1 – Consultation report 1

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Boardroom of the Airport of Rodrigues
Project area	Plaine Corail
Date	April 3rd, 2019
Duration	20 minutes
Towns represented	None
Number of persons consulted	5
Group(s) consulted	**Exploratory meeting:** ARL / SETEC / CYATHEA

A first exploratory and presentation meeting took place on Wednesday, April 3rd, 2019 in the meeting room of the Airport of Rodrigues. The following were present:

Armand Perrine – ARL
Maïlys Delhommeau – SETEC
Frédéric Tranquille – SETEC
Pierre-Yves Fabulet – Cyathea
Stéphane – Cyathea
Luigi Arnaldi and Julien Boulle – Insuco

This meeting had been organized on the initiative of Maïlys Delhommeau so that the teams involved in the social and environmental impact assessment (SEIA) could present themselves and explain their area of study and their respective mission(s).

SETEC represents the study office that oversees the SEIA mission and responds directly to the project applicant, ARL.

Cyathea is a study office in La Réunion specialized in the study of the specific flora and fauna of the Indian Ocean. Cyathea is responsible for the environmental impact part (terrestrial fauna and flora) of the impacted area.

Insuco is responsible for the social impact part of the project by proposing a study of the populations directly impacted on the area.

Armand Perrine proposes to visit the various parts of the site of the future construction of the new airport runway, then to go to Port Mathurin to meet the local authorities through the Island Chief Executive, Davis Hee Hong Wye.

14.1.9.2 Annex 2 – Consultation report 2

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Island Chief Executive Office – Port Mathurin
Project area	Plaine Corail
Date	April 3rd, 2019
Duration	1 hr.
Towns represented	None
Number of persons consulted	6
Group(s) consulted	**Exploratory meeting:** RRA / ARL / SETEC

A second exploratory and presentation meeting took place on Wednesday, April 3rd, 2019 in the Office of Davis Hee Hong Wye, Island Chief Executive, active authority and representative of the Rodrigues Regional Assembly (RRA). The following were present:

Davis Hee Hong Wye – RRA
Stenny Emilien – RRA
Gail Leong Kye- ARL
Armand Perrine – ARL
Maïlys Delhommeau – SETEC
Frédéric Tranquille – SETEC
Luigi Arnaldi and Julien Boulle – Insuco

This meeting had been organised on the initiative of Armand Perrine so that the teams involved in the environmental and social impact assessment (SEIA) could present themselves and explain their field of study and their respective mission(s) to the local authorities of the Rodrigues Regional Assembly.

Maïlys Delhommeau presented the teams involved in the study project commissioned by ARL, the meetings carried out by SETEC in Mauritius prior to the meeting and the management focus of the SEIA study.

Davis Hee Hong Wye explained that the RRA has taken the lead in some field studies, including geological studies with numerous core drillings carried out in the area, but also a relocation plan for people impacted by the project for the construction of the runway.

Davis Hee Hong Wye indicated that negotiations are already very advanced with the inhabitants and users of the impacted area and that in no case will the social impact study conducted by Insuco in the field interfere with the discussions already initiated between the RRA and villagers to avoid a climate of misunderstanding within communities.

Luigi Arnaldi and Julien Boulle shared their full understanding of this situation and that it is indeed important not to create unnecessarily tense situations between the different stakeholders in the light of these negotiations already underway. It was then well explained that the social impact study carried out by Insuco with the villagers and users of the area will be based on a thorough study of the company(ies) directly and indirectly impacted and the current workings of the area in order to propose recommendations through a plan to monitor the economic and social evolution of the populations taken into consideration.

Davis Hee Hong Wye supported Insuco's proposal and rightly encouraged the proposal for recommendations for monitoring the project. He proposed to give the Insuco team all the compiled documents concerning the action plan already initiated and led by the RRA for the relocation of the affected people. These documents will be presented by Stenny Emilien, who will be the main point of contact between RRA and Insuco.

Davis Hee Hong Wye proposed a new meeting via a meeting lunch on Saturday, April 6th, 2019.

14.1.9.3 Annex 3 – Consultation report 3

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	John Resto – La Ferme
Project area	Plaine Corail
Date	April 6th, 2019
Duration	1 hr.
Towns represented	None
Number of persons consulted	6
Group(s) consulted	**Exploratory meeting:** RRA / ARL / Deloitte

A third exploratory meeting was organized by the office represented by Davis Hee Hong Wye, *Island Chief Executive*, Saturday, April 6th, 2019 in the form of a *lunch meeting* at John Resto de la Ferme. The following were present:

Davis Hee Hong Wye – RRA
Stenny Emilien – RRA
P. Sooprayen – RRA
C. Colin - RRA
Gail Leong Kye- ARL
Armand Perrine – ARL
Consultant Maurice – KPMG- Deloitte
Luigi Arnaldi and Julien Boulle - Insuco

The objective of this meeting was to summarize the information discussed at the previous meeting at the office of Mr. Davis Hee Hong Wye in Port Mathurin to discuss the topics of the consultations brought up and to come together with the RRA and the villagers of Sainte Marie, and then to bring together the different study bodies integrated into the project.

A first point was made on the progress of discussions between the RRA and the impacted inhabitants of the Sainte Marie area. The documents that had been forwarded by Stenny Emilien to Insuco made it possible to better understand these advances in the discussions and to learn about the magnitude of the work that had been done previously by the RRA.

In view of these advances in the discussions, it was reiterated by Insuco that the study carried out will not and would not initially cover the themes of the compensation of the impacted villagers. It is expected that the mission will be an in-depth study of the company(ies) directly and indirectly impacted and the current operations of the area in order to propose recommendations through a plan to monitor economic and social developments of the populations considered.

The contact with the consultant especially dispatched from Mauritius from the KPMG-Deloitte Office for a socio-economic study related to the project with the aim of clearly delineating the areas of action of the Deloitte and Insuco studies. The Deloitte mission is a general study on the socio-economic aspects generated by the airport project on the whole of Rodrigues Island. The Insuco mission is a social study focusing only on the project's direct impact area. The idea is to ensure that the two studies are not carried out on the same topics and that there is no 'double-work' performed.

Davis Hee Hong Wye indicated that the negotiations are already very advanced with the inhabitants and users of the impacted area and that the next individual meetings will be held on Wednesday, April 10th in Port Mathurin with all the villagers of Sainte Marie concerning the relocation file.

14.1.9.4 Annex 4 – Consultation report 4

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Caverne Bouteille fishing post (Agner Ithier)
Project area	Plaine Corail
Date	April 10th, 2019
Duration	1 hr.
Towns represented	Plaine Corail
Number of persons consulted	1
Group(s) consulted	**Individual consultation:** Agner Ithier

This individual consultation following an impromptu visit to the fishing post of Caverne Bouteille. The individual consultation was carried out through discussions with Agner Ithier, 80 years old, head and manager of the fishing post in question.

14.1.9.4.1 Fishing station information

The fishing post was founded and managed by the father of Agner Ithier. The latter took over control following the death of his father.

Agner Ithier holds the drag net fishing licence and defends his fishing position as a privately operated position, compared to the other two fishing posts in the area that are managed primarily by fishermen's cooperatives.

Agner Ithier lives mainly in the fishing post where the boats and equipment are kept.

The "Agner fishery" consists of one head of the fishery, twelve fishermen, one cook and one person for repairs and other works. The latter, more specifically known as "Parts Maker" in Rodrigues, has the main responsibility to repair the nets, when needed.

The fishermen live in the station during weekdays and leave on Fridays in the afternoon to spend the weekend at their homes. Directly, the fishery creates employment for fifteen families in the region.

14.1.9.4.2 Fishing method

In general, fishermen go out to the sea aboard five boats, two to transport and install the drag net and three for "beating". The beating consists in the practice of beating on the water in order to scare the fish that will converge towards the net to be trapped there.

The boats use sails as often as possible to travel in the lagoon and in case of a lull in the wind, three engines are available at the station. Motorboats can tow those that are not motorized.

14.1.9.4.3 Operation of the fishery

The sale of fish is done directly at the fishing post, with the arrival of the buyers (or "*bayans*" in Rodrigues) upon the return of the boats.

Salaries for the week are paid on Saturdays. It should be noted that the wage levels each week are based on the overall productivity of the fishery: the wages obtained for each will therefore depend on the amount of fish caught during the week and experience (a fisherman with more experience will have a higher wage share than apprentices). The salary is therefore set according to a "share system" which was established by Agner Ithier advised by the fishing heads on the boats. Thus, the head of the station and the head of the fishery have one share each. The other fishermen, depending on their experience, have a three-quarters (3/4) share and a (1/2) half-share. The cook and the "net placer" receive a three quarters (3/4) share each.

14.1.9.4.4 General opinion

Mr. Agner agrees with the project to expand the airport in Plaine Corail because he is aware that it will be very important for the country.

However, he is personally affected by the fact that he is subject to displacement. His biggest concern is the fishermen who live in the area and who work for his fishery: they have informed him of their intention to stop fishing in case of displacement at the proposed new site of Pointe Palmiste, because the distance is not viable for them to make a living.

Agner also referred to a potential site in Dans Cocos/Anse Quitor but its only problem is that the area is located just near the Marine Park, known as the SEMPA "South East Marine Protected Areas". He informed us that his proposal was not favourable because activity is not permitted in the marine park.

14.1.9.5 Annex 5 – Consultation report 5

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Village of Sainte-Marie
Project area	Plaine Corail
Date	April 11th, 2019
Duration	1 hr.
Towns represented	Plaine Corail
Number of persons consulted	1
Group(s) consulted	**Individual consultation:** Jean Bernard Ste Marie

This individual consultation took place at the residence of Mr. Jean Bernard Ste Marie, 50 years old, resident and spokesperson of the village of Sainte Marie.

14.1.9.5.1 The village of Sainte-Marie

The village of Sainte Marie was founded in 1962 by George Abel STE MARIE, the father of Jean Bernard STE MARIE (called Bernard), who lived in the village of Maréchal. The village of Sainte Marie is not a real one: it is recognized informally by the Regional Assembly of Rodrigues (RRA), but it is not registered as such with the RCSS. Officially, the village of Sainte Marie depends on the neighbouring village of Corail – Anse Quitor.

Bernard was born in 1969 and is now appointed as the spokesperson for the village. He was not elected, simply appointed by a consensus of the village people who are all of the same family. While the villagers went to the meetings of the community centre of Corail – Anse Quitor, they do not go there anymore, because they do not see any interest, judging that the inhabitants of Corail – Anse Quitor act concerning localized actions and do not act on those not concerning them.

14.1.9.5.2 Jean Bernard STE MARIE's activities

Bernard's main activity is livestock breeding, then fishing and finally agriculture.

LIVESTOCK BREEDING

The animals raised by Bernard are cows, small goats, sheep and poultry such as chickens, ducks and guinea fowl. He is not interested in pig farming.

Cattle breeding

In the past, everyone in the village practiced cattle breeding, but during an episode of foot-and-mouth disease in 2016, the herds of most villagers were voluntarily diminished. Today, only Bernard and his cousin Roland still possess a few cows.

The breeding of cows (and other animals in general) on the area remains very extensive. Cows graze freely in the area. There is no particular boundary; they go where they want. In the evening, Bernard goes looking for them and ties them up for the night at the place where he finds them or moves them, if they are too close to a dwelling or a cultivated field. They are released the next morning for a new day of free grazing.

The cows drink freely in the afternoon at a drinking trough built for this purpose near a water desalination unit. The water was previously pumped from a cavern of this karstic area with the name of Caverne Bouteille, which, in fact, gave the name to the area stretching from the desalination unit to the fishing post governed by Mr. Agner Ithier. This cavern is very large and contains large amounts of brackish water. Today, however, the water is no longer pumped by the desalination unit, even if the pipe still exists there. It is from two other places. Bernard does not know the reason for this.

Bernard also mentions that a watering trough had been built closer to the village on the initiative of an independent community project in Sainte Marie about 15 years ago. This was made of fibreglass, powered by a pump connected to Caverne Bouteille. No one took the initiative concerning the maintenance of the pump, which quickly broke down. This project would never have worked.

Bernard has 4 cows: 3 females and a male who was born recently. There is no specific interest in the sex of the animal. Females are considered to be reproductive and are kept for up to 15 - 20 years. Males are kept for 2 1/2 years to 3 years and sold according to their weight. There

is no specific planning or agreement between breeders concerning reproduction. As the animals are free during the day, mating is conducted naturally.

Bovine production is exclusively intended for meat production and the vast majority is destined for export to Mauritius. The sale of animals is constantly carried out on site with the regular visitation of buyers (always Mauritian) possessing a vehicle suitable for their transport. The sales system is most often "in the old fashioned way" by estimating the weight of the animal and agreement on the price between the livestock breeder and buyer. Since the outbreak of foot-and-mouth disease in 2016, a meat-sector-specific weighing system has been established in Port Mathurin. At that time and until the end of 2018, a form of embargo remained in Rodrigues concerning beef. While a large proportion of the cattle herds in Rodrigues was slaughtered at the height of the crisis, only one sales circuit was authorized through the Rodrigues Trading & Marketing Company (RTMC) and the Mauritius Meat Authority (MMA).

Goat and sheep livestock breeding

Most of the livestock breeding of Bernard STE MARIE is in Eau Vert, a large area dedicated to livestock breeding and recognized by the RRA; lying north of the West coast of the island, overlooking Baie des Lascars. He goes there several times per week by motorbike.

The area of Eau Vert brings together a large number of livestock breeders who let their animals graze freely but own a holding pen, if they want to gather their herds, for observation or when it is necessary to provide care. There are no permits specifically issued by the authorities for land use.

Bernard owns there between 30 and 40 small goats and more than 40 sheep. This production is destined for the export of meat to Mauritius. Potential buyers contact Bernard about the availability of animals. He then transfers the desired number of animals to the village of Sainte Marie which keeps them penned up to permit their fattening with the help of specific foods produced in Mauritius, especially during the dry period at the end of the calendar year. Otherwise, the fattening is carried out by distribution of cut grasses.

However, Bernard notes that, according to him, the Eau Vert livestock breeding area will no longer be viable within 3 to 5 years because of the growing invasion of *Acacia nilotica*, locally *called pikan loulou*, an extremely invasive plant that poses real environmental problems on the island. According to Bernard, the methods that RRA could employ will never be sufficient to eradicate the *pikan loulou* of the area given the level of invasion reached today.

Poultry breeding

Poultry breeding remains anecdotal for Bernard. The animals are free to move around his house and they represent a supply of eggs and a little white meat.
For their food, he gives them cooked rice mixed with the food he buys from the neighbouring villages of Cascade Jean-Louis or Grand la Fouche Corail. He refuses to buy industrially manufactured food, indicating his doubts about the ingredients used.

Pig farming

Bernard is not interested in pig farming because it requires a lot of maintenance, especially in terms of cleaning; but also in terms of food.

The pig is the only animal raised in Rodrigues that is slaughtered and consumed on the island, because of a lack of a market on Mauritius because it is less consumed in general. For personal consumption, the pig is slaughtered on the spot, some of the meat or other pieces that are cut

off are sold by the owner of the animal. But pigs can also be sold live to any buyer (of the island) presenting himself and, following the estimation of the price and the agreement, the animals are brought by the buyer in his town to be slaughtered in the nearest slaughterhouse.

FISHING

When the weather is favourable, Bernard who owns a boat, fishes off the coral reef ("off-lagoon"). The type of fishing is bottom-line fishing, permitting him to catch fish such as jack or captain fish.

It is an activity that he rarely practices because the legislation requires him to possess two engines, the maintenance and fuel of which appears to be quite costly.

AGRICULTURE

Bernard operates a fairly large plot (one acre) but it produces little. He cultivates corn and “vine” plants such as giraumon, calabash, watermelon, etc. A part is self-consumed (about one quarter of the production); the rest is for sale but it does not bring him even Rs 1000 per month.

The sheep he keeps penned up near his home during the fattening period to give them the organic matter necessary to operate the field. Jean Bernard never uses a pesticide or synthetic chemical fertilizer.

14.1.9.6 Annex 6 – Consultation report 6

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Village of Sainte-Marie
Project area	Plaine Corail airport area
Date	April 11th, 2019
Duration	2 hrs.
Towns represented	Sainte Marie
Number of persons consulted	4
Group(s) consulted	Inhabitants of Sainte Marie

14.1.9.6.1 General information (presence and intervention of authorities, etc.)

After being introduced to the inhabitants of Sainte Marie by Arnaud Ste Marie, a young resident of the same village working for the Airport of Rodrigues, an initial consultation took place in the presence of four inhabitants of Sainte Marie: Jean Bernard Ste Marie, George Ste Marie and his wife and André Robinson Ste Marie. The meeting took place in the common room of the home of Jean Bernard Ste Marie.

14.1.9.6.2 Information concerning the project

While rumours were already circulating by word of mouth for a few years, information on the airport expansion project had been formally given around 2010 - 2011 by the government at the time through an invitation to meet for all inhabitants of Sainte Marie at the community centre of the village.

Then the years passed without any other information being given about it.

In August 2018, a large public meeting was held at the Conference Room of the Plaine Corail police station and it brought together the Chief Commissioner and the Commissioners of the

Regional Assembly, the inhabitants of the whole area nearby the Plaine Corail airport and those who had an economic activity there. It was announced at this meeting that the expansion project would now take place and that the start of the work was planned for the end of the year 2019.

14.1.9.6.3 Stakeholder opinion concerning the project

The interviewees fully agree with a development project of such a magnitude for Rodrigues because they cannot be against the advancement of the island.

But they are well aware that they are the ones who are going to be directly affected by this project because they feel that their way of life is specific in comparison to the other citizens of Rodrigues. Their concern is then in relation to the ability to regain a quality of life that is the same as they have today.

14.1.9.6.4 Land use of buildings: environmental and ecosystem issues

No concern has been put forward by the inhabitants regarding the possible impact of future constructions and construction sites on the environment in general or on terrestrial ecosystems with little or no diversity in marine vegetation.

14.1.9.6.5 Land use: physical relocation of dwellings

The inhabitants of Sainte Marie do not express any particular concern about the relocation of their habitat itself. They seem to be confident enough to find a house with, at a minimum, the standards of their current dwellings. Their life "does not come down to four walls and a roof".

The concern is still about the change of lifestyle and the relationship with the new neighbourhood: how will their habits, especially with regard to livestock, be perceived by the current inhabitants of the resettlement area?

In connection with livestock, it is also the access to water that is emphasized. Will the resources be sufficient for all the herds? Will the distances to be travelled to permit the animals to drink not be too significant?

The main identified impact is therefore good for livestock breeding. Practically all the inhabitants of Sainte Marie have livestock and the same holds true for the inhabitants of the town that have been approached for resettlement. A certain amount of pressure from the cattle will be exerted on the grazing areas because the cattle density will inevitably increase in the area.

The expectation of the people consulted is clearly related to the support of the local government for this resettlement, in particular with regard to the addition of point(s) of access to water for livestock breeders' animals.

As the rather free livestock breeding procedure of the inhabitants of Sainte Marie will need to change, they recommend an organisation of animal holding pens to facilitate the management of the herds of each livestock breeder and thus limit the pressure of cattle on all pasture areas. Zoning of these livestock holding pens has been proposed on the periphery of Baie Topaze. And it is in this sense that the support of the Regional Assembly is desired.

14.1.9.6.6 Economic issues (employment, other...)

The clear concern at the level of the economic issues is the decrease in activities that represent the main sources of income of the villagers of Sainte Marie, and in particular that of the livestock breeders.

The grazing areas of the island in general are drastically restricted by the invasion of the surfaces by the invasive plant known as *Acacia nilotica* or *pikan loulou.* In addition, the resettlement of the inhabitants of Sainte Marie in an area already occupied by inhabitants, who are also livestock breeders, will inevitably create pressure on the pastures and consequently all livestock breeders shall be forced to reduce their herds, which will inevitably result in a loss on the incomes for everyone.

It was indicated by the people consulted that the local government must take into consideration that livestock breeding in Rodrigues is one of the major economic pillars of the island and the fact that livestock breeding will be restricted from this point forward must be taken into consideration. There are no large industries developed on the island and economic fallback solutions need to be considered.

Especially for the communities of Plaine Corail, the expansion of the airport will generate new economic activities on the island and in particular in the area. The villagers would therefore like the younger generations to be able to be supported as a priority by being actively involved through the proposal of jobs or similar activities.

14.1.9.6.7 Social impact (demography, migrations)

No specific concern was raised by the people consulted on the demographic impact on the resettlement area, except for that related to livestock breeding. The inhabitants who will be relocated already accept the idea of displacement. If they do not frequently associate with the inhabitants of the area of relocation, they know them and do not raise any concern about the relations of neighbourhood.

14.1.9.6.8 Health and safety: impact of infrastructure (accidents, noise, dust)

For the villagers of Sainte Marie, there is no concern raised with regard to the potential impacts connected with the works and developments connected with the project. On the contrary, they consider that they will even be farther from the airport than they are today and they and their animals will be even less affected.

14.1.9.6.9 Cultural heritage issues (damage, loss, access, degraded environment)

In general, the interviewees did not mention specific sites of worship or sites of a heritage character. Only one person mentioned the presence of a small cave in which he likes to commune with himself, but it is not located directly in the impacted area and access should remain possible.

14.1.9.6.10 Current communication loop with the project

The communication has been regular for a few months but the inhabitants of Sainte Marie believe that they are still unclear about their future. While elements have been put forward by the Regional Assembly, nothing concrete has finally been proposed, especially for the issue of livestock breeding.

14.1.9.6.11 Desired communication loop / proposals for improvements for effective communication

The people consulted insist on the importance of local government to ensure regular communication and support throughout the period necessary for their adaptation.

They fear that the authorities will no longer contact them once the physical relocation is carried out. In this regard, they would like a new point of contact with knowledge of the file to be given to them in order to have "a door on which they can knock" in case of lack of communication with the local government.

14.1.9.7 Annex 7 – Consultation report 7

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Village of Sainte-Marie
Project area	Plaine Corail
Date	April 11th, 2019
Duration	1 hr.
Towns represented	Plaine Corail
Number of persons consulted	1
Group(s) consulted	**Individual consultation:** Christian Ste Marie (Guy)

This individual consultation took place at the residence of Mr. Guy Ste Marie, 58 years old, an inhabitant of the village of Sainte Marie.

14.1.9.7.1 The village of Sainte-Marie

The village of Sainte Marie was founded in 1962. The village of Sainte Marie is not a real one: it is recognized informally by the Regional Assembly of Rodrigues (RRA), but it is not registered as such with the RCSS. Officially, the village of Sainte Marie depends on the neighbouring village of Corail – Anse Quitor.

14.1.9.7.2 Activities of Guy STE MARIE

Guy's main activity is fishing and livestock breeding

FISHING

Guy's main economic activity is fishing. Guy learned with the former fishermen of Ste Marie. He owns a boat that he keeps at the "mooring" of Bangélique. This is the third boat he has used for his activities in the sea. His first boat was bought through a loan from the Development Bank of Mauritius. Like him there are eight other fishermen who keep their boat in this "mooring". The other fishermen are Jean-Noel Larcher, Jean Dany Ste Marie, Ludovic Larcher, Antonio Larcher, Fabrice Ste Marie, Harel Ste Marie, Margeot Ste Marie and Ronald Ste Marie.

Guy holds a fisherman's card and he practices fishing in the lagoon and with the "*cagier*". The "*cagiers*" are structures placed in the sea with bait inside to attract fish. The structures are removed from the water after some time in order to remove the trapped fish from inside. He has an engine that he uses when the wind is weak. He practices fishing individually because he believes that individual fishermen have more advantages compared to fishermen who operate in cooperatives. One of the advantages mentioned is the freedom of individual fishermen.

In relation to the relocation of the "mooring" at the new site of Le Saline, he confirms that this will have an economic impact on his fishing activity. The Bangélique site is a 5 minute walk from home and at the new resettlement site, the distance will be more. The fishing potential will be less compared to the site he is currently fishing at unless he fishes near the reefs. Another point is the use of a motor more frequently from Le Saline to the current site. Now he mostly uses a sail to go to his fishing site with a fuel cost of Rs 1,200 per year. With the resettlement, it will be necessary to spend Rs 500 on average per week to buy fuel because the distance will be longer.

LIVESTOCK BREEDING

The animals bred by Guy are small goats, laying hens and local hens.

Goat breeding

Guy owns 9 small goats that he feeds in the village of Ste Marie. The animals are kept in holding pens in the evenings and then released in the morning to go grazing.

Poultry breeding

The other important activity of Guy is the care of the laying hens that he keeps in a small hen house. The eggs are picked up daily and their production is 75 eggs daily. He feeds them with food purchased from local retailers and transported in his own vehicle. He manages to sell all the eggs, which are sold at a shop in Plaine Corail and also to the villagers of Ste Marie.

14.1.9.8 Annex 8 – Consultation report 8

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Home of the fishing post manager, Bruno Capdor
Project area	Plaine Corail
Date	April 12th , 2019
Duration	1 hr.
Towns represented	Plaine Corail
Number of persons consulted	1
Group(s) consulted	**Individual consultation:** Bruno Capdor

This individual consultation took place following an appointment with Mr. Bruno Capdor, manager of the Bangélique fishing post, who proposed to come and meet at his home.

14.1.9.8.1 Fishing station information

The fishing post was previously managed by Bruno Capdor's father. The latter took over the control and was assisted by his brother Gilles.

Bruno Capdor owns a drag net fishing licence and unlike the fishing post of Mr. Agner Ithier, on the Caverne Bouteille area, the fishing post that he manages works with the title of a fishermen's cooperative. This implies that Bruno Capdor does not own all the boats, other fishermen can bring their boats, but it is not necessarily them who fish.

The "Capdor fishery" consists of one manager of the fishery, twelve fishermen, one cook and one person for repairs and other works.

The fishermen live in the station during weekdays and leave on Fridays in the afternoon to spend the weekend at their homes. Directly, the fishery creates employment for a dozen

families. The fishing post consists of a handful of sheds built with coral blocks and sheet roofs. One of the shelters is specifically for fishing equipment in order to keep the precious nets safe.

14.1.9.8.2 Fishing method

In general, fishermen go out to the sea aboard five boats, two to transport and install the drag net and three for "beating". The beating consists of the practice of hitting on the water in order to scare the fish that will converge towards the net to be trapped there. This type of fishing is the same as described by the head of the other fishery, Agner Ithier.

The boats use sails as often as possible to travel in the lagoon and in case of a lull in the wind, three engines are available at the station. Motorboats can tow those that are not motorized.

14.1.9.8.3 Operation of the fishery

The sale of fish is done directly at the fishing post, with the arrival of the buyers (or "*bayans*" in Rodrigues) upon the return of the boats.

Salaries for the week are paid on Saturdays. It should be noted that the distribution of salaries each week is made differently than in the Ithier fishery: While the allocation also works by system of units, these are defined after the head, Bruno Capdor, has taken out his production costs. Then sharing is done with a larger share for the manager, i.e. 2 shares. The head of the fishery has one share. The other fishermen, depending on their experience, have three-quarter (3/4) share and (1/2) half-share.

14.1.9.8.4 General opinion

Bruno Capdor agrees with the proposed expansion of the airport in Plaine Corail and does not oppose a marked reluctance to the fact that this area is no longer accessible.

According to discussions already held with the Committee of the Regional Assembly of Rodrigues, it is anticipated that it will be compensated for the same infrastructures that it possesses today and only be moved a little further in the Baie Topaze, on the seaside called La Saline. The distance to reach the fishing area is a little longer but Bruno Capdor did not seem very affected.

14.1.9.9 Annex 9 – Consultation report 9

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Village of Plaine Corail
Project area	Plaine Corail
Date	April 12th, 2019
Duration	1 hr.
Towns represented	Plaine Corail
Number of persons consulted	1
Group(s) consulted	**Individual consultation:** Richelin Farla

This individual consultation took place at the home of Mr. Richelin Farla, an inhabitant and spokesman of the village of Plaine Corail (the area concerned).

14.1.9.9.1 The village of Plaine Corail

Plaine Corail is the proposed site for the resettlement of the people of the village of Sainte Marie and there are 14 livestock breeders in the region concerned. The people of Plaine Corail are affiliated to the village of Cascade Jean Louis which is duly registered and recognized by the RCSS. The area concerned consists of 8 families.

Richelin was initially a full-time fisherman but since he was employed 15 years ago by "Airport of Rodrigues Ltd" (ARL), he no longer has time to engage in fishing. Fishing was his main source of income followed by agriculture. Previously he lived in another region and then came to settle in Plaine Corail.

14.1.9.9.2 Activities of Richelin FARLA

Richelin's main activity is livestock breeding and farming.

LIVESTOCK BREEDING

The animals bred by Richelin are cows and sheep.

Cattle livestock breeding

Richelin and his wife own cows which they feed in an extensive manner. The cattle are always tied up to avoid physical damage to plantations and other incidents. Cattle breeding is traditionally performed, where even water is transported in buckets to give to the cattle. The tie-up locations of the cattle are changed every day so that they can feed themselves. In comparison to Sainte Marie, cattle are not allowed to graze without supervision.

Sheep breeding

Richelin owns sheep that he feeds on a parcel of land that he contained with fences in order to control access. All his sheep are kept on this same site or the land is divided into two parts, one to keep the beasts and the other intended for grazing. In order to adapt to dry periods when fodder is scarce, Richelin also cultivates fodder plants. At some point, the sheep are released to go grazing in the grass in the vicinity under the supervision of a guard, either Richelin or his wife.

Richelin faces the problem of access to water for livestock breeding and relies on rainwater because the frequency of water distribution on the network is long.

AGRICULTURE

Richelin works on a parcel of land near his house where he cultivates the little Rodrigues pepper (Ti-piment) during the good season, vine plants and also the beans that are very popular on the island with the locals and tourists. He mainly uses natural fertilizers from his sheep breeding, to enrich the land in order to have good harvests.

14.1.9.10 Annex 10 – Consultation report 10

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Village of Sainte-Marie
Project area	Plaine Corail airport area
Date	April 14th, 2019
Duration	1 hr.

Towns represented	Sainte Marie
Number of persons consulted	9
Group(s) consulted	Inhabitants of Sainte Marie

14.1.9.10.1 General information (presence and intervention of authorities, etc.)

After requesting the presence of the villagers of Sainte Marie the day before for a final consultation following the various interviews and surveys obtained during the previous days, nine villagers gathered in front of the small building acting as the Sainte Marie community centre. The meeting was held at this place and the assembly consisted of five women and four men. As confidence was engendered during the survey period, the consultation took place very easily and all the people were able to speak freely.

14.1.9.10.2 Information concerning the project

While rumours were already circulating by word of mouth for a few years, information on the airport expansion project had been formally given around 2010 - 2011 by the government at the time through an invitation to meet for all inhabitants of Sainte Marie at the community centre of the village.

Then the years passed without any other information being given about it.

In August 2018, a large public meeting was held at the conference room of the Plaine Corail police station and it brought together the Chief Commissioner and the Commissioners of the Regional Assembly, the inhabitants of the whole area nearby the Plaine Corail airport and those who had an economic activity there. It was announced at this meeting that the expansion project would now take place and that the start of the work was planned for the end of the year 2019.

14.1.9.10.3 Stakeholder opinion concerning the project

The interviewees fully agree with a development project of such a magnitude for Rodrigues because they cannot be against the advancement of the island. These are also positive points that have been pointed out initially with regard to the project.

But they are well aware that they are the ones who are going to be directly affected by this project, because they feel that their way of life is specific in comparison to the other citizens of Rodrigues. Their concern is then about changing lifestyles and the ability to reproduce an activity that will provide them with incomes that are equivalent to what they are obtaining today.

14.1.9.10.4 Land use of buildings: environmental and ecosystem issues

No concern has been put forward by the inhabitants regarding the possible impact of future constructions and construction sites on the environment in general or on terrestrial ecosystems with little or no diversity in marine vegetation.

14.1.9.10.5 Land use: physical relocation of dwellings

The inhabitants of Sainte Marie do not express any particular concern about the relocation of their habitat itself. While they are OK with livestock breeding in their habitat and implementing the holding pens for their animals, they express concern at the level of the method of organisation to be established to maintain their livestock breeding activity.

The villagers of Sainte Marie still feel that it will be simpler for them in their daily lives to be closer to the main road.

In connection with livestock breeding, it is also the access to water that is emphasized. Access that will become much more difficult for them because the area is likely to be much more densely populated with animals.

The main identified impact is therefore good for livestock. Practically all the inhabitants of Sainte Marie have livestock and the same holds true for the inhabitants of the town that have been approached for resettlement. A certain amount of pressure from the cattle will be exerted on the grazing areas because the cattle density will inevitably increase in the area.

It was also mentioned that a displacement necessarily implies expenses incurred by domestic equipment that they may not be able to transport (old furniture, etc.) and that this has not been taken into consideration in the discussions already obtained.

The expectation of the people consulted is clearly related to the support of the local government for this resettlement, in particular with regard to the addition of point(s) of access to water for the animals raised.

As the rather free livestock breeding procedure of the inhabitants of Sainte Marie will need to change, they recommend an organisation of animal holding pens to facilitate the management of the herds of each livestock breeder and thus limit the pressure of cattle on all pasture areas. Zoning of these livestock holding pens has been proposed on the periphery of Baie Topaze. And it is in this sense that the support of the Regional Assembly is desired.

The villagers still feel that the future remains unclear to them. If proposals have been made orally, no formal written proposal has yet been reached.

14.1.9.10.6 Economic issues (employment, other...)

The clear concern at the level of the economic issues is the decrease in activities that represent the main sources of income for the villagers of Sainte Marie, and in particular that of the livestock breeders.

The grazing areas of the island in general are drastically restricted by the invasion of the surfaces by the invasive plant known as *Acacia nilotica* or *pikan loulou.* In addition, the resettlement of the inhabitants of Sainte Marie in an area already occupied by inhabitants that are also livestock breeders will inevitably create pressure on the pastures and therefore all livestock breeders must be forced to reduce their livestock, which will inevitably result in a loss on the incomes of all: "we have here a certain capability of 90% to feed our animals, and this may fall to 40%".

In addition, it was mentioned that the fact that the inhabitants are closer to the commercial areas (the shops), their consumption and therefore their expenses could increase.

It was brought up by the people consulted that the local government must take into consideration that the livestock breeding in Rodrigues is one of the major economic pillars of the island and that it must take into consideration the fact that the livestock areas are being

restricted to them now. There are no large industries developed on the island and economic fallback solutions need to be considered.

The expansion of the airport will generate new economic activities on the island and in particular in the area. The villagers would therefore like the younger generations to be able to be supported as a priority by being actively involved through the proposal of jobs or similar activities.

The villagers would like the government to support them by offering facilities (financial or otherwise) to enable them to create their own activities, not simply to give them an unchosen job.

14.1.9.10.7 Social impact (demography, migrations)

No specific concern was raised by the people consulted on the demographic impact on the resettlement area, except for that related to livestock breeding. The inhabitants who will be relocated already accept the idea of displacement. If they do not frequently associate with the inhabitants of the area of relocation, they know them and do not raise any concern about the relations of neighbourhood.

14.1.9.10.8 Health and safety: impact of infrastructure (accidents, noise, dust)

For the villagers of Sainte Marie, there is no concern raised with regard to the potential impacts connected with the works and developments connected with the project. On the contrary, they consider that they will even be farther from the airport than they are today and they and their animals will be even less affected.

14.1.9.10.9 Cultural heritage issues (damage, loss, access, degraded environment)

In general, the interviewees did not mention specific sites of worship or sites of a heritage character. Only one person mentioned the presence of a small cave in which he likes to meet with others, but it is not located directly in the impacted area and access should remain possible.

14.1.9.10.10 Current communication loop with the project

The communication has been regular for a few months but the inhabitants of Sainte Marie believe that they, nevertheless, are still unclear about their future. If elements have been put forward by the Regional Assembly, nothing concrete has finally been proposed, especially for the issue of livestock breeding.

14.1.9.10.11 Desired communication loop / proposals for improvements for effective communication

The people consulted insist on the importance of local government to ensure regular communication and support throughout the period necessary for their adaptation.

They fear that the authorities will no longer contact them once the physical relocation is carried out. In this regard, they would like a new point of contact to know the file to be given to them in order to have "a door to which to knock" in case of lack of communication with the local government. They talk about the idea of having the opportunity to have direct contact with donors, "a contact that will give us the assurance that the direction taken is the right one".

14.1.9.11 Annex 11 – Consultation report 11

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Plaine Corail Village
Project area	Plaine Corail
Date	April 13th, 2019
Duration	1 hr.
Towns represented	Plaine Corail
Number of persons consulted	20
Group(s) consulted	Inhabitants of Plaine Corail

14.1.9.11.1 General information (presence and intervention of authorities, etc.)

The consultation of the villagers of Plaine Corail was requested the day before on April 12th, 2019. The presence of Mr. Nicolas Volbert, Deputy of the Regional Assembly (opposition party) and resident of Plaine Corail is worth noting. A large proportion of the members of the village were present. While the women were fairly well represented, there were more men in the assembly. The meeting took place in the living room of Mr. Richelin Farla.

14.1.9.11.2 Information concerning the project

The villagers heard about the project of expansion of Plaine Corail Airport mainly through the radio, about two or three years ago.

Nicolas Volbert, in his role as a deputy, claims to have had the news well before and even indicates that it is the political party to which he belongs that originally had the idea of the project to expand the airport runway in 2006 and then that it was put on the agenda in 2010 by the current government.

The villagers regret that no one from the Regional Assembly came directly to inform them of the progress of the project. They are aware, however, that the villagers of Sainte Marie have been approached to settle in their village, having even seen them take some actions with public servants.

14.1.9.11.3 Stakeholder opinion concerning the project:

The positive point that has been highlighted is that there will be development in their town and probably more employment opportunities. The villagers of Plaine Corail hope, however, that these jobs will be offered to them on a priority basis, because of their proximity to the airport area, as many young people in the town are unemployed.

The inhabitants of Plaine Corail are not against the arrival of the inhabitants of Sainte Marie, but it will be necessary to find a good common ground especially for the organisation of livestock breeding in the area.

14.1.9.11.4 Land use of buildings: environmental and ecosystem issues

The issue of the environmental impact related to the construction and construction sites of the project was not brought up or related by the inhabitants.

14.1.9.11.5 Land use: physical relocation of dwellings

With the arrival of new inhabitants in the town, there is a great concern regarding the restriction of the spaces connected with the livestock breeding and thus the potential obligation to reduce their herds to mitigate the pressure on the pasture areas. Most of the villagers of Plaine Corail obtain their financial resources from their livestock breeding activity.

The idea of a change in the current way of life was also brought up by the villagers, but this always in relation to the organisational relations to be established with regard to livestock breeding. There was no objection brought up to the villagers of Sainte Marie.

The impact clearly identified by the villagers only concerns the livestock breeding and restriction of grazing areas. If solutions are not found, young people in the village could easily find themselves without financial resources.

It is proposed by the village assembly that the authorities support the families to establish land parcels with barriers so that everyone can feed their animals in tranquillity without any ambiguity.

14.1.9.11.6 Economic issues (employment, other...)

The villagers of Plaine Corail are aware of the job opportunities that will be created during the implementation of the project and even thereafter, as the area is considered a showcase of Rodrigues. They hope that the people in their village will benefit from these opportunities because of their proximity as most often the people recruited come from rather far away.

The impacts can be equally positive if local residents obtain work through the opportunities that will be created from the airport expansion project.

But the impacts can also be adverse in the event that the inhabitants of the village are not integrated into the project and if they are not supported by the authorities in the management of their livestock.

It is expected that the local authorities and institutions concerned will offer priority recruitment to the inhabitants of nearby towns. It is important to them that their town is really taken into consideration because it represents the first image of Rodrigues that people will have when they arrive.

14.1.9.11.7 Social impact (demography, migrations)

The population of Plaine Corail will increase with the arrival of the people of Sainte Marie and this inspires concerns about the way of life that will change. It is emphasized, however, that it is not a question of the arrival of population in terms of demographics or newcomers that inspires concern but rather the adaptation that will be necessary, especially with regard to the management of livestock breeding.

The identified impacts are very clear. They concern exclusively the livestock and the pressure of the number of animals on the grazing area of the town. It will be necessary to learn to live in a larger community and try to find a cohesion of functioning concerning the issues of land available for livestock breeding.

Once again, social cohesion will be based on the good understanding and functioning of the livestock breeding methods between the families of the town. It is expected that the authorities can position themselves as an arbiter of the situation to allow the creation of planting and livestock rearing spaces that are well marked off.

Moreover, due to the proximity of the airport and thus the "showcase effect" of the town in relation to the arrivals, it is proposed to create a "recreation space" in order to promote the cohesion of the group and possibly attract visitors.

14.1.9.11.8 Health and safety: impact of infrastructure (accidents, noise, dust)

The villagers of Plaine Corail referred to the smells of kerosene and the engine noises of airplanes that the wind brings particularly in the summer and expressed the fear that the arrival of larger aircraft represents a greater nuisance.

The fact that the project entails a construction site and the movement of very large equipment has also been addressed. But this does not represent a very substantial problem, but a temporary inconvenience. The villagers understand that it is necessary to go through this to permit this level of development.

The issue in particular is the smells of kerosene that have been emitted with questions about possible repercussions that this would have on their health, some of them already bringing up the headaches caused by the current planes and the obligation to close the windows.

14.1.9.11.9 Cultural heritage issues (damage, loss, access, degraded environment)

The villagers consulted did not mention specific sites of worship or sites having a heritage character.

14.1.9.11.10 Current communication loop with the project

The villagers of Plaine Corail indicate that they have never been directly contacted by any institution, regretting that no one has come to meet with them yet.

They have heard, however, that the inhabitants of Sainte Marie have received land proposals for their relocation and deplore the fact that no authority has come to consult them to share the situation with them.

14.1.9.11.11 Desired communication loop / proposals for improvements for effective communication

The inhabitants of Plaine Corail propose the creation of a village committee for which spokespersons will be designated who can represent the town during regular meetings with the Regional Assembly and the Airport of Rodrigues during the period necessary for the new way of life created by the project.

14.1.9.12 Annex 12 – Consultation report 12

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Bangélique
Project area	Plaine Corail
Date	April 13th, 2019

Duration	30 minutes.
Towns represented	Plaine Corail
Number of persons consulted	1
Group(s) consulted	Nicolas Volmally, livestock breeder (non-resident) of the impacted area

This individual consultation took place by chance while passing through the Bangélique area to attend the return of the fish. Mr. Nicolas Volmally was waiting for the return of his herds of cows and sheep to tie them and put them in the structure he occupies for his animals.

14.1.9.12.1 Information on livestock breeding infrastructure

The shed used to pen up the animals is actually an old fishing post, built with coral blocks and a sheet metal roof. Nicolas Volmally, nearly 70 years old, has been coming here since his youth in the Bangélique area and says he comes here, if he can, every day. He is, however, helped by his son Laval, who helps him bring the beasts back when they are too far away.

Nicolas Volmally owns about fifteen cows and forty sheep. As he owns a transport vehicle, he also practices the activity of a *bayan*, a reseller of fish or even octopus caught with a drag net in the area.

14.1.9.12.2 Method of livestock breeding

The method of livestock breeding is very extensive: the animals are kept penned up at night in the huts that are used. Then they are released early in the morning to go to pastures all over the Bangélique strip, wherever they wish to go.

The sale of animals is done like everywhere in Rodrigues with buyers coming directly to the location to agree on a price and take the cattle. These are mainly Mauritians, who are the buyers; the majority of the cattle and sheep are exported standing up by boat to Mauritius.

14.1.9.12.3 General opinion

Nicolas Volmally agrees with the project to expand the airport in Plaine Corail. However, he expresses regret for the loss of the view that he has always known in Bangélique since his early childhood. Nicolas Volmally is a contemplative person.

With regard to his displacement, he knows that he will go to an area he knows well in the Salines because he had worked there during his youth. He does not worry about the possibility of having to reduce his herd in relation to potential pressure on pasture areas after displacement. The number of heads in his herd does not matter to him, as long as he owns a few. The animals are his whole life.

14.1.9.13 Annex 13 – Consultation report 13

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Village of Anse Quitor-Corail
Project area	Plaine Corail
Date	May 3rd, 2019

Duration	1 hr.
Towns represented	Village of Anse Quitor
Number of persons consulted	3
Group(s) consulted	Inhabitants of Anse Quitor

This community consultation was held at the Anse Quitor-Corail Community Centre, a place where the members of the villages affiliated to the Anse Quitor-Corail village Committee meet. The meeting was held in the presence of the Vice President of the village of Anse Quitor, Mr. Andre, Mr. Marclin, the Sports Manager and also Mr. Jean Ley, the Environment Manager.

14.1.9.13.1 The village of Anse Quitor and the affiliated villages

Anse Quitor-Corail is located near the village of Sainte Marie, but is not directly impacted by the project. The village of Anse Quitor is a group of other small villages that are affiliated such as the village of Sainte Marie, Dans Cocos (also known as Plaine Cocos) and Vangasailles. In general, the entire village has 143 families. The village is duly registered with the RCSS and recognized by the Commissions of the Regional Assembly of Rodrigues. The village Committee, which consists of eleven executive members, is democratically voted on through village elections held every two years.

The Community Centre is the meeting place for activities such as meetings, games and working sessions of community groups including the Women's Association, the Youth Group, the Elderly Persons Group, the Village Committee, as well as other community activities.

14.1.9.13.2 Activities of the Villagers of Anse Quitor-Corail

The main activities of villagers are livestock breeding, agriculture and fishing.

LIVESTOCK BREEDING

The animals bred mainly by the inhabitants of the village are cows, small goats and sheep which are mostly kept at Caverne Bouteille. In Anse Quitor alone, there are ten farmers who have cattle in large numbers. According to the ones present, there are about 250 animals, all included, in the region of Caverne Bouteille. It may be that this number can reach a thousand heads if there is no loss of animals from diseases, bad weather and dog attacks.

Cattle breeding

The inhabitants own cattle, which they always fed in an extensive and traditional way in the region. The cattle are always tied up to avoid physical damage to plantations and other incidents. The tie-up locations of the cattle are changed every day so that they can feed themselves. Just as elaborated on in the other reports, the cattle kept at Caverne Bouteille are free to graze in the area. However, the small livestock breeders who feed the cattle in the village of Anse Quitor (all near their houses) tie up their animals.

Sheep and goat farming

The sheep and small goats are fed in the same way or they are free to graze in the area of Caverne Bouteille. In the evenings, animals are put in holding pens built with coral to protect them from bad weather and predators that cause a lot of damage. Every morning the animals are released and left to graze all day in the area without surveillance. There are even livestock breeders who keep their animals inside the pastures that are fenced by the coral walls. These

animals are kept in these pastures during the day in order to better control them. There are structures in Caverne Bouteille for watering animals.

AGRICULTURE

Farming is also practiced in Anse Quitor-Corail, where people grow mostly corn, vine plants, beans, and other plants that grow well in the region. There are also women who work in the agri-food sector where they transform agricultural products for the production of products highly appreciated by visitors.

14.1.9.13.3 Opinion on the project

Those present heard of the development of this project for the first time in 2006 in public meetings and also heard that the relocation of the inhabitants of the village of Sainte Marie would be carried out in 2019;

Officially, they were not informed by local officers in relation to the project and the related activities.

According to the village officials, the project of expansion of the airport is a good project for the island of Rodrigues in general. This project will have many economic benefits including opportunities for entrepreneurs in the region due to an increase in tourists. The François Léguât Nature Reserve is already located in the village. This reserve attracts a lot of tourists every year and there is also another attraction in the area, which is Caverne Patate, which is well known.

14.1.9.13.4 Adverse impacts

Although the project has economic benefits, on the other hand there will be problems related to the project. They agree that any good thing comes at a price, but it is necessary to limit the damage as much as possible.

Throughout all the negotiations, they were not informed about their livestock activities at Caverne Bouteille and wondered whether the current livestock breeding area was impacted or not by the project. The main problems discussed are livestock breeding, fishing and the environment.

Livestock breeders that have many animals do not know if the area is impacted and if so, they do not yet know where they will be relocated to continue their livestock breeding. Farmers will be greatly affected because they will have to reduce their number of heads due to the change in livestock breeding techniques. With the current extensive livestock breeding system, the number of heads is far superior compared to the new system advocated. There will not be as much space for holding areas to keep this many animals. There will be an increase in pressure on the soil as there will be a loss of free pasture spaces at Caverne Bouteille. These livestock breeders might suffer an economic shortfall due to the reduction of the free livestock breeding area.

With regard to the environmental aspect, the coral will be damaged as it will be covered by concrete and other materials. So there will be a loss of a historical landscape in the area after this work. This region may lose several historical items, including multiple caves that are interconnected.

With regard to fishing, it will be necessary to relocate the Agner fishery to Dans Cocos or to Les Salines, but it is still safe. They confirm they heard about a possible relocation of the "Agner or Ithier" fishery to Baie du Nord.

The rehabilitation of the inhabitants of the village of Sainte Marie at the new relocation site will be difficult because they are accustomed to a certain way of life and according to them they will need the unwavering assistance of the regional government for social integration and cultural success. The assistance must not only be financial but also a follow-up on the part of the authority concerned such as in relation to the family, agriculture, community development Commissions and so on. The people of Sainte Marie do not yet know what awaits them at the new site. These villagers have a certain way of raising their animals and they will have to change it when they are relocated.

14.1.9.13.5 Recommendations

Generally, the people present during this consultation recognize the importance of this study of social impacts in order to avoid or reduce the damage due to resettlement. Basically they propose the construction of holding pens and pastures for all livestock breeders impacted by this huge project, as well as appropriate monitoring and assistance.

14.1.9.14 Annex 14 – Consultation report 14

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Village of Cascade Jean Louis
Project area	Plaine Corail
Date	May 3rd, 2019
Duration	1 hr.
Towns represented	Cascade Jean Louis
Number of persons consulted	1
Group(s) consulted	**Individual consultation:** Tony Louis

This individual consultation took place at the home of Mr. Tony Louis who is the President of the village of Cascade Jean Louis and works as a teacher at a primary school. His wife was also present to give important information in relation to their livestock breeding in Bangélique, an area that is directly impacted.

14.1.9.14.1 The village of Cascade Jean Louis

The village of Cascade Jean Louis also includes the region of Plaine Corail, the resettlement area of the inhabitants of the village of Sainte Marie. As mentioned in other reports, there are 14 livestock breeders in Plaine Corail. Plaine Corail is affiliated with Cascade Jean Louis and they participate together in community activities. Cascade Jean Louis is registered with the RCSS and recognized by the authorities. The village as a whole consists of 175 houses and this number will increase with the arrival of the people of the village of Sainte Marie.

Tony Louis is the President and has been democratically elected by the villagers. The elections are held every two years in order to be able to vote for a team that will work for good progress and the advancement of the village. As in all the other villages, the executive team consists of eleven members with very specific responsibilities.

14.1.9.14.2 Activities of Mrs. Louis and the inhabitants of Cascade Jean Louis

The inhabitants of Cascade Jean Louis work in several spheres of the society of Rodrigues such as civil service, the private sector, as well as small enterprises or informal jobs. The main activities in the region are livestock and agriculture which employ many people.

LIVESTOCK BREEDING

The animals bred mainly by the people of Cascade Jean Louis are sheep and small goats.

Sheep and goat rearing

Mrs. Louis owns 60 small goats in Bangélique which she feeds in an extensive way. Sheep and goat farming is an economic activity that dates back to their grandparents. Their grandparents lived in Bangélique where they practiced livestock breeding and fishing. After her marriage, Mrs. Louis left to live in Cascade Jean Louis. After her move she continued her rearing of small goats in Bangélique where her brothers and cousins also engage in sheep and goat rearing. Sheep and small goats are released in this area where grazing is not controlled. In the evening the animals are kept in a holding pen in order to protect them from bad weather and predators. In the morning, the animals are released where they graze throughout the area. In Bangélique, there is no fenced pasture area.

AGRICULTURE

Mrs. Louis and the other inhabitants are working on parcels of land where they cultivate red beans and shooting plants mainly.

14.1.9.14.3 Opinions on the project

Mr. Louis was informed of the relocation of the inhabitants of the village of Sainte Marie and the livestock breeding holding pens of Bangélique. Although the resettlement village is affiliated with Cascade Jean Louis, there was no information or explanatory meeting with the village President and his executive members.

He knows that the directly impacted inhabitants already have a space for their new houses, but that the only problem is the area of land available for livestock breeding and farming activities.

He confirms that the people of the village of Sainte Marie agree with the relocation to the new site, but that we need to find effective solutions for animals, grazing areas and agriculture.

According to Mr. and Mrs. Louis, the project will be very beneficial for the inhabitants of Cascade Jean Louis, the surrounding villages as well as the country in general. For them, it is a positive project that goes in the right direction.

They brought up that the Agriculture Commission is planning to establish integrated livestock farms where animals will be held in holding pens. The fodder will be cut and taken to feed the animals.

There will be more opportunities for the development of small businesses that will create employment for the inhabitants of the project area. The opportunities mentioned are the creation of jobs during and after the construction of the airport. There will also be opportunities for renting rooms/houses during the period of construction work for foreign workers and/or local residents wishing to stay close to the airport. After the construction, there will be a bigger flow

of tourists on the island and this will create more opportunities for the development of tourist businesses such as small craft shops, restaurants / snack bars and also cottages or guest rooms. The sale of local products will also increase with increasing consumption.

14.1.9.14.4 Adverse Impacts

The main adverse impacts of the project will be economic and cultural losses. According to Mrs. Louis, in the new livestock breeding site, the animals will be kept in holding pens and fed with fodder cut in pastures that the Agriculture Commission will put in place. There is a great risk of losing animals after displacement due to stress and the difficulties of adapting to the new climate and rearing system.

There will be a loss of landscape when this historic livestock breeding area disappears.

14.1.9.14.5 Recommendations

In order to alleviate economic losses, it will be good if livestock breeders can have compensation during the period of re-adaptation of the animals.

As the fishermen are going to be relocated too, there is a need to build shelters to keep the tools, the engines and the drag nets.

All planters and livestock breeders must have access to agricultural technical support from the officers of the Agriculture Commission in order to avoid large losses. This technical support will be very important because livestock breeders will change their livestock breeding technique, which requires more economic and physical effort. Mrs. Louis confirms that she will have to spend more money after the relocation to buy food during the dry season. Currently Mrs. Louis buys very little or almost no food for these animals, because they are free to graze in all the area of Bangélique. As they will soon be in the holding pens all the time, livestock breeders will have to buy food more regularly and this will have a direct impact on the profit margins of the activity.

According to Mr. Louis, it is more than necessary to save or archive photos and videos of all this area that will disappear from our landscape. The impacted area is recognized as a historic coral area for the freebreeding of animals and this does not exist in other parts of the island. As we already know that this historical location will disappear, it is essential to keep memories for generations to come.

With increasing pressure due to an increase in the number of animals in a small area, it may be necessary to propose new economic alternatives. A support plan will be more than necessary for the implementation of new enterprises.

14.1.9.15 Annex 15 – Consultation report 15

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Central Office – Port Mathurin
Project area	Plaine Corail
Date	May 8th, 2019
Duration	1 hr.
Towns represented	None

Number of persons consulted	6
Group(s) consulted	**Exploratory meeting:** RRA / ARL / Setec

This exploratory meeting was organized at the request of Maïlys Delhommeau when he first came to Rodrigues at the beginning of April 2019. The objective of this meeting was to make an update on the progress of the project and to meet the heads of the commissions in charge of the project-related files. In fact, the committee appointed by the Regional Assembly met making the connection with the Airport of Rodrigues. This committee is chaired by Davis Hee Hong Wye, *Island Chief Executive*, being present:

Davis Hee Hong Wye – RRA
Stenny Emilien – RRA
P. Sooprayen – RRA
Armand Perrine – ARL
Jean Matthieu Ravina – Director of the Agriculture Commission
Maïlys Delhommeau – Setec
Frédéric Tranquille – Setec
Marc Etienne- Setec
Julien Boulle - Insuco

The first point of discussion was to clarify the probable area of encroachment of the new control tower on a habitat defined as critical according to the IFC standards in the initial report. There will be a need to avoid this impact and the construction of the tower will have to be moved a few dozen meters to avoid this impact.

The second point concerned still has a strictly environmental and engineering impact, concerning grottos or caves (Caverne Petit Lac and Caverne Fougères) which can present a problem if they are impacted during the work.

Other points with environmental or geophysical characters were discussed during this meeting.

An interesting bit of information given by Mr. Davis is that the Regional Assembly has set an objective of increasing its tourist attendance to 100,000 tourists in 2025, compared to 70,000 today (out of 110,000 passengers, the remainder being local travellers).

It was also clarified that the capacity of an A321 aircraft is 3 to 4 tonnes of cargo per flight. This pushes Rodrigues to want to export annually about 100 tonnes of fresh octopus, which implies a gain of 30% to 40% concerning this product that is appreciated in Mauritius and La Réunion.

Discussions concerning the social impact were not addressed in this meeting. It was an advantage to meet Mr. Ravina, who gave us information concerning the situation of the livestock breeding in the area of Plaine Corail. An idea is to establish community pasture systems on large areas in the Salines area, in particular.

A meeting was set up for the next day at the Agriculture Commission for more specific agricultural matters.

14.1.9.16 Annex 16 – Consultation report 16

Objective of the consultation	Analysis and planning of stakeholder engagement Airport of Rodrigues Project
Place of consultation	Agriculture Commission - Citronnelle
Project area	Plaine Corail
Date	May 9th, 2019
Duration	1 hr.
Towns represented	-
Number of persons consulted	2
Group(s) consulted	**Consultation with the authorities:** Dr. Mathieu Ravina and Mr. Davilla Cupidon

This consultation with the authority responsible for agricultural services took place at the headquarters of the Department of Research and Agricultural Extension Services (RAES) in Citronnelle. The meeting was held in the presence of Dr. Mathieu Ravina, the Manager of RAES and Mr. Davilla Cupidon, the "Agricultural Superintendent".

14.1.9.16.1 The Agriculture Commission

The Agriculture Commission is composed of two departments, the administrative department and the technical department, respectively. The Administration is responsible for the management of the entire agricultural policy of the island and also for the management of the commission. The Administration is under the responsibility of a Department Head ("Departmental Head"), assisted directly by an Administrative Officer and an entire team.

The technical department is directed by a technical manager who manages all the agricultural sections or demonstration centres of the island. The manager is assisted by several scientific officers who work on specific projects.

14.1.9.16.2 RAES activities

The technical centre has several responsibilities including food production, livestock breeding, extension, research, quarantine, control of pests and diseases, beekeeping, statistics, milling of corn, and training among others. Agricultural services are decentralized in other parts of the island, namely Trefles, Port-Sud-Est, La Ferme and Baie aux Huitres. There is a demonstration centre (Plantation) in Mourouk, Grand la Fouche Mangue and Baie aux Huitres. The livestock breeding sections are in St. Gabriel where cattle and small goats are raised, in Baie-Topaze for the raising of pigs and Ile aux Crabes for the production of sheep.

14.1.9.16.3 The discussions

There are currently 22 livestock breeders from neighbouring regions who raise animals throughout the Bangélique and Sainte Marie areas according to a census published on March 13th, 2019 by the Agricultural Services. These livestock breeders originate from Cascade Jean Louis, the village of Sainte Marie, Marechal and Grand la Fouche Corail. The livestock breeders are mainly engaged in the production of small goats and sheep. This situation is due to the fact that beef production is more complicated during the bad seasons and that beef production is less profitable.

According to estimates from the technical centre, the average export of cattle and goats/sheep was 1,900 head and 6,000 head, respectively, before the foot-and-mouth disease outbreak. After this episode and the removal of the export embargo, an increase is anticipated in the export of cattle and small goats/sheep of 2,000 heads and 7,500 heads, respectively, in 2019. The export will depend on the availability of places for the transportation of animals.

The probable areas for the relocation of holding pens and pastures are Les Salines, Pointe L'Herbe, Baie-Topaze and La Boucherie.

The Pointe Corail area will not be impacted by the project, so the livestock breeders of Anse Quitor-Corail will not be involved in the relocation.

For a proper relocation, holding pens located in Bangélique, among others, will either be replaced or rebuilt through government grants. The only major challenge of relocation is the movement of animals from the current site to the new site.

According to these officers, there will be no problem with the availability of fodder if the pasture is put in place and maintained properly.

A problem that can arise is the possible decrease in the number of goats and sheep which is due to the fact that in Bangélique there is more protein fodder (*Acacia*) compared to the new relocation of the holding area. In order to limit this situation, community pastures will be established by the Agriculture Commission for the production of quality local fodder plants. To do this, the commission aims to establish a five hectare pasture (50,000 m^2) that will be sufficient to feed the animals.

There will be some worries with the "*cut and carry"* system. It will be very likely that the extensive system will not be completely eliminated for several reasons such as proper production in terms of quantity and quality. It should be noted that the extensive livestock breeding system in Bangélique and the entire area has been proven in terms of production. The extensive system produces better quality animals. In order to avoid a drastic decrease in quantity and production quality, a semi-intensive livestock breeding system will be encouraged at the new site.

It will be necessary to establish a semi-intensive system with the advent of a regulation that will control the stray animals on the island.

Concerning "Delo Vert", another extensive livestock breeding area, the latter is threatened by a massive invasion of *Acacia nilotica*, a tree known as the "*piquant loulou*" in Rodrigues. The invasion of *piquant loulou* is caused in part by the overexploitation of pastures. These invasive trees are responsible for reducing the livestock breeding and grazing area in Delo Vert, where there are animals. According to the officers present, during the dry season the livestock breeders are accustomed to moving the animals of Delo Vert to La Boucherie and other areas where fodder is available. In order to counter this problem of the invasion of *Piquant Loulou*, the Environment Committee has a program to eradicate these trees, although this is a big challenge.

This project will have a positive impact on the economy of the Rodrigues agricultural sector. With the advent of large aircraft there will be opportunities for the rapid export of carcasses and other agricultural products. Of the total production of goats and sheep, 90% is exported to Mauritius and only 10% is kept for local consumption. There is a big difference from exporting

and selling locally, because it is not in the culture of the citizens of Rodrigues to eat the meat of sheep and small goats. In Rodrigues, pork is more appreciated, followed by chicken. Exports will increase because the market is not monopolized and there is no fierce competition with the big international producers. There is a free market where small local or Mauritian buyers/brokers can buy animals and export them to Mauritius. These animals are mainly intended for restaurants and hotels.

In relation to food production, the Agriculture Commission will develop a common plantation area with a land parcel for each planter. The parcel area will depend on the area that the planters had in the village of Sainte Marie. As the people of Sainte Marie have a tendency to produce vegetables in an organic way and are joining the objective of the Rodrigues Regional Assembly (RRA) to achieve a 100% organic agriculture by 2030, this will be an encouraging scenario for the setting up of an organic plantation project in the new area. The planters of Sainte Marie have always produced various vegetables using natural fertilizers from their livestock breeding. In order to encourage the adoption of organic farming instead of conventional agriculture, the government intends to make grants and facilities available to these planters who will act as models for the other planters of the island.

Access to water will be taken into consideration, or livestock and plantation production areas will be connected to the water supply system. The commission will exploit the runoff water at La Boucherie. The water will be stored to be distributed to planters and livestock breeders. The government will also encourage the capture of rainwater in the holding pens.

At the present time there is some resistance on the part of those impacted and as soon as the agreement is given, the commission will begin to develop the new relocation site for plantations and livestock breeding areas.

14.2 Questionnaire for socio-economics study

Select the interviewer:
Specify if other
Select the town's name:
Specify if other
Respondent's first name
Respondent's last name
Is the person being interviewed the head of the household?
Respondent's relationship with the head of the household
First names of the head of the household
Family name of the head of the household
Surname of the head of the household
Sex of the head of the household
Approximate age of the head of the household
Marital status of the head of the household
Has the household always lived in Rodrigues?
Since when has the household been installed in the town?
Where does the head of the household originate from?
Specify if other origin
What is the last educational level completed by the head of the household?
Does the head of the household have their PEC?
Does the head of the household have their SC?
Does the head of the household have their HSC?
Diploma obtained
What was the main activity of the head of the household during the past year?
Specify if other
We will now talk about the composition of the household
How many people are currently composing the household, in addition to the head of the household?
For each household member, answer the following questions:
Household member
First name of $ {rank} th member of the household
Sex of $ {rank} th member of the household
Who is the $ {rank} th member of the household for the head of the household?
How old is the $ {rank} th member of the household
What is the marital status of the $ {rank} th member of the household
What is the last educational level completed by the $[rank] th member of the household?
Household member

The number of household members is different from the total.
We will now talk about the access to care for the household.
Is there a household member(s) who suffers from a disability(ies) or chronic disease(s)?
How many people are involved?
What are the handicaps?
How frequently has/have the member(s) of the household gone to Queen Elizabeth Hospital over the last three years?
How frequently has/have the member(s) of the household gone to the Health Centre (La Ferme or Mont-Lubin) over the last three years?
How frequent has/have the member(s) of the household gone to a health clinic over the past three years?
Does the household have access to cultivatable land?
If yes, on what total area?
Surface Area:
Unit:
For these lands, the household is:
Does your household practice farming?
Annual crops
What type(s) of annual crop(s) did the household produce last year?
Specify if other annual crop(s):
Did you get income from these crops last year?
How much in total for the year in Rs?
Perennial crops
What type(s) of perennial crop(s) did the household produce last year?
Specify if other
Did you receive any income from these productions?
Estimate how much in Rs in all of the year
Consumption
Can you estimate the share of self-consumed agricultural production?
If yes, what is the self-consumed share (%)?
Do you own animals (cattle, goats, sheep, pigs, poultry, beehives…)?
In total how much do you have:
Cows:
Sheep/lambs:
Goats:
Poultry:
Pigs:
Hives:
Livestock breeding

Did you receive income from livestock last year?
Can you estimate the total amount for the year?
Does your household practice fishing?
Fishing
Which registration title(s) does the head of the household own?
What type of fishing does the head of the household practice?
Does the head of the household own a boat?
What is the estimated annual income (in Rs) of all fishing activity?
Average current expenditure (Rs) in fishing equipment (nets, repairs...) for the year
We are going to talk about household possessions:
How many does the household have:
Radios:
Televisions:
Refrigerators:
Washing machines:
Generator sets:
Solar panels:
Smartphones:
Beds:
Bicycles:
Motorbikes:
Automobiles:
Trucks:
Boats:
We will now talk about the access to water.
What is the main source of drinking water in the household?
Specify if other
What is the main source of domestic water (toilet, laundry, etc.)?
Specify if other
Does your household have a toilet in your home?
What kind of toilet is it?
What is the main source of electricity in your home?
In what capacity do you occupy your dwelling?
What is the amount (Rs) of your rent per month?
How many rooms do you use in your household (housing, shop, covered kitchen…)?
Out of what material(s) is your dwelling built?
Specify if other material
Does one of the members of the household have a bank account?
Has a member of the household taken out a loan in the last 12 months?
Did one of the men borrow money?

From which institution(s) did the men in the household take out a loan last year?
What was the main reason for this borrowing by the men?
Specify this other reason:
Is it a loan with interest?
Did a woman (women) borrow money?
From which institution(s) did the women in the household take out a loan(s) last year?
What was the main reason for this/these loans taken out by the women?
Specify this other reason:
Is it a loan with interest?
Does your household receive financial assistance from relatives in Mauritius or abroad?
How many money transfers has your household received last year (in Rs)?
We will now talk about household expenses.
What were the two largest household expenditure items in the last month?
Specify if other:
What is your weekly spending amount on average?
We will try together to estimate your income:
What were the main sources of income in the past year for the men in the household?
What were the main sources of income in the past year for the women in the household?
Estimate the annual revenues from: Industrial manufacturing
Estimate the annual revenues from: Crafts
Estimate the annual revenues from: Construction
Estimate the annual revenues from: Commerce
Estimate the annual revenues from: Mechanical activities
Estimate the annual revenues from: Restaurant activities
Estimate the annual revenues from: Tourism
Estimate the annual revenues from: Education
Estimate the annual revenues from: Public service
Estimate the annual revenues from: Social assistance(s)
Estimate the annual revenues from: Other income
Does the head of the household have a phone?
Phone number
Do you have any comments to make concerning this survey?
Comments
Take the GPS coordinates of the yard.
Thank you for your participation!

14.3 Melbourne Airport Emergency Plan

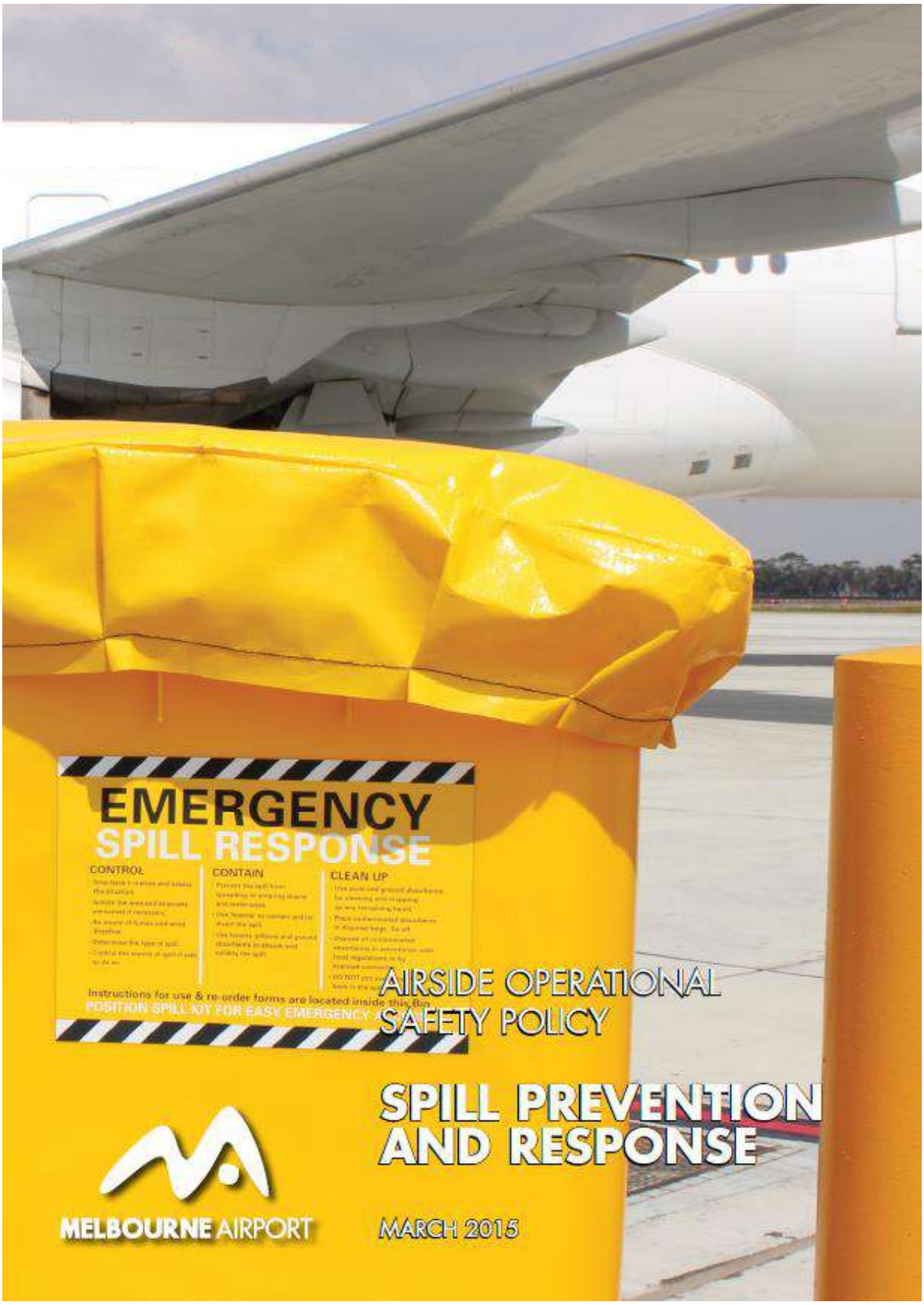

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Table of Contents

Section One Introduction

1.1 INTRODUCTION

Any spill has potential to threaten the safety of people and the health of our environment, as well as causing significant disruption to aircraft operations.

The purpose of this policy document is to outline the Melbourne Airport policy in relation to the prevention of spills and detail the correct response procedures. The policy is a part of, and should be read in conjunction with, the Melbourne Airport Airside Conditions of Use.

The policy applies to all aircraft operators, handling agents, refuelling companies, engineers and all other airside tenants and their staff who engage in any activities on the airside at Melbourne Airport. Spill prevention and response procedures outlined in this document are to be followed in conjunction with the Standard Operating Procedures and requirements of the individual organisations.

1.2 RATIONALE

1.2.1 AIM

This Spill Prevention and Response policy has been produced in the interests of safety and security at Melbourne Airport. It details the spill prevention and response rules for operators on the airside.

This policy aims to provide a safe, clean environment for all airside staff, passengers and aircraft and to ensure that the requirements documented in this policy are relevant and capable of practical implementation by all staff.

1.2.2 AUTHORITY

The Spill Prevention and Response policy has been prepared by Australia Pacific Airports (Melbourne) Pty Limited, hereafter referred to as Melbourne Airport.

1.2.3 SCOPE

This document applies to spill prevention and response which all operators and their staff should follow to ensure a safe working environment on the airside at Melbourne Airport.

1.2.4 ALTERATION

Melbourne Airport may vary this Spill Prevention and Response policy at any time. A reference to the Spill Prevention and Response policy shall be a reference to this Policy as distributed, published or otherwise declared to be in force by Melbourne Airport from time to time.

1.2.5 NO DEROGATION

Nothing in the Spill Prevention and Response policy shall derogate from any responsibility otherwise imposed by law, agreement or other policy, procedure or rule imposed by Melbourne Airport with respect to the same or similar subject matter as this policy.

1.3 DEFINITIONS

Prescribed waste:
Is waste that contains contaminants. This may include industrial wastes such oil, fuel, detergents and chemicals. Prescribed waste has the potential to cause serious environmental damage.

Quarantine waste:
Quarantine waste could potentially introduce foreign diseases or pests into Australia. It is usually generated from inbound international aircraft and can include cabin waste, amnesty bins, and seizures from passenger baggage and from imported cargo. This waste may contain quarantinable pests and diseases.

Hazardous waste:
Is effluent waste from aircraft toilet facilities. This waste can contain infectious diseases, especially from international destinations. Effluent and clean effluent must not be touched as individual's may not be adequately immunized.

Section Two Spill Prevention and Response

2.1 RESPONSIBILITIES

Melbourne Airport

Melbourne Airport is responsible for maintaining current spill prevention and response policies and for ensuring all operators and airside personnel are aware of their obligations regarding spill prevention and response.

Melbourne Airport is also responsible for ensuring regular patrols of the apron and movement areas are conducted and for enforcing and encouraging responsible spill prevention and response practices.

Operators

Under this policy all airside operators have a responsibility to prevent spills from occurring on the airside. Aircraft, equipment and plant used on the airside must be maintained in good working order through a dedicated maintenance program in order to minimise spills of fuel or hydraulic oil.

All Airside Personnel

All airside personnel must be trained in the appropriate handling, storage and transportation of materials. Airside personnel must not do anything that is known to cause, or is likely to cause spillage of materials harmful to the environment.

2.2 PREVENTION

Preparation

- Liquid storage tanks must be bunded in accordance with the Victorian Dangerous Goods (Storage & Handling) Regulations
- All refuelling vehicles must carry absorbent material at all times, ready for immediate use should a spill occur
- All other airlines and ground handling agents must place yellow Spill Response Kits - to be used for the storage of diatomaceous earth (kitty litter) at strategic locations on the apron. These containers are to be clearly marked with the words **Spill Response Kit** (containers should also have a semi-secured lid to prevent staff using them as general rubbish bins)

The Spill Response Kits must contain:

- Non spark (grain) shovel
- Broom
- Disposable gloves
- Safety goggles
- Coveralls
- Disposable masks
- Waste bag with ties for disposing of contaminated absorbent materials
- Absorbent material, e.g. absorbent sheet, diatomaceous earth (kitty litter), cellulose product
- Panther detergent

Spill response kits must be regularly audited and maintained to ensure kits contain the required contents and are in good condition.

Plans and Procedures

All airside operators must have a plan for dealing with any spill that occurs on the airside. The Spill Response Plan is to outline the following:

- Details of the nominated representative responsible for managing spill prevention and response
- Spill prevention plan
- Spill control and containment measures
- Spill cleanup procedures
- Provisions for the disposal of waste generated during clean up

Training

Operators must ensure that all airside personnel and contractors are aware of the correct response procedures should a spill occur.

A training program covering the following subjects, must be developed by operators

- Environmental awareness
- Spill Prevention
- Spill Response (including containment, clean up, correct disposal procedures and contact numbers)
- Safety hazards

2.3 RESPONSE

The response to a spill should involve four stages – Control, Containment, Contact and Clean.

Control

Immediate action should be taken to secure the site and prevent further material from spilling, but only when it is safe to do so. These actions can include:

- Turning off any ignition sources
- In the case of a punctured drum, the drum can be rolled over so the puncture is on top. This should prevent further spilling of material
- Larger containers which are leaking should be moved quickly to a bunded area
- Valves or pumps should be turned off to stop leaks from pipes and fittings

In all cases personnel must not:

- Attempt to lift heavy objects unassisted
- Expose themselves to toxic material without appropriate protective clothing
- Enter a confined space without appropriate breathing apparatus
- Expose themselves to hazardous situations

Containment

Action should be taken as soon as possible to contain the spill in order to stop the material entering stormwater drains, or contaminating soil.

- Spills should be contained using absorbent material
- Any stormwater drain should be protected first by forming a "dam" of absorbent material around the drain
- Spilled material should then be contained by forming a "dam" of absorbent material around the spill

Contact

As soon as practicable, the spill must be reported to:

- The Senior Airside Safety Officer (Car 2) on 0418 335 985
  OR
- The Airport Coordination Centre on 9297 1601, or by pressing the Apron Emergency Call Point button
- The person's immediate Supervisor

Clean

Absorbent materials such as diatomaceous earth or polypropylene are the preferred products for the cleaning of any spills. These products absorb the spilt material leaving no residue and have no detrimental impact on the environment. A list of approved cleaning materials is located in Appendix 1.

In cases of 'heavy oil' spillages it may be necessary to scrub the area of the spill with a light detergent to remove any residue of the product. This residue will also then need to be removed.

Saturated absorbent material should be placed in plastic bags to prevent leaching of the material and then disposed of according to the material spilt as below;

- Prescribed Waste: oil, fuel, detergents, chemicals etc.
- Quarantine Waste: toilet spills, catering spills etc.

The disposal of any waste material must be carried out in accordance with this policy and the Operational Safety Policy – *Airside Waste Management.*

If the operator is either unable to clean the spill, or where clean-up has been attempted and the spill has not been cleaned to the satisfaction of Melbourne Airport, Melbourne Airport will clean the spill and charge the costs to the operator.

The Senior Airside Safety Officer will advise the Supervisor of the Airport Coordination Centre (SACC) when the spill has been cleaned and the bay can be returned to service.

2.4 EMERGENCY FACILITIES

Emergency Fuel Shut Down Buttons

Emergency Fuel Shut Down buttons are located on all aircraft parking bays and on board refuelling vehicles. All airside workers are encouraged to push an Emergency Fuel Shut Down button if they perceive that a genuine risk to the safety of staff, passengers, aircraft, or property exists. The activation of a stop button will shut down all fuel lines to the Airport and it will take a significant time to reactivate refuelling. Locations of Emergency Fuel Shut Down buttons are mapped in Appendix 2.

Emergency Shower and Eye Wash Facilities

Emergency shower and eye wash facilities are provided at various locations on each of the concourses and Southern Apron. These facilities should be used by any airside personnel that come in contact with

hazardous liquids or other material. Locations of the Emergency Showers and Eye Wash stations are mapped in Appendix 2.

Important: Airside personnel who have fuel spilt on their clothing, should not remove the clothing until they are under an emergency deluge shower. Otherwise, static electricity caused by the removal of the clothes, may ignite the fuel.

2.5 EFFLUENT SPILLS

When responding to spills and other hazardous materials, it is important that airside users do not come into contact with the material. Particularly, DO NOT touch effluent or clean effluent as you may not be adequately immunised. Companies are to contact the Airport Coordination Centre or Car 2 to organise for specialised contractors to clean the spill.

The company responsible for the spill is not permitted to conduct their own clean-up of effluent, as a specialized contractor is required.

Section Three Further Enquiries, Contacts and Emergencies

3.1 FURTHER ENQUIRIES

If you have any questions regarding this document, please contact:

Airfield Operations & CASA Manager Policy Coordinator

Melbourne Airport
Locked Bag 16
Tullamarine Victoria 3043
Phone: (613) 9297 1742
Fax: (613) 9297 1995

To obtain copies of the Melbourne Airport Environment Management Plan, please contact:

Environment Manager
Melbourne Airport
Locked Bag 16
Tullamarine Victoria 3043
Phone: (613) 9297 1618
Fax: (613) 9297 1613

3.2 IMPORTANT CONTACTS

Senior Airside Safety Officer (Car 2)
Phone: 0418 335 985

Airport Coordination Centre
Phone: (613) 9297 1813

Aviation Rescue and Fire Fighting (ARFF) Service
Phone: (613) 9286 3199

3.3 EMERGENCIES

In case of emergency contact the Airport Coordination Centre on (613) 9297 1601 or by pressing the Apron Emergency Call Point button.

Section Four Appendices

Appendix 1: Approved Cleaning Materials

The materials approved by Melbourne Airport for cleanup of fuel and oil spills are as follows:

CELLULOSE PRODUCTS

ZEOLITE & ABSORBENT BOOMs
available from:
Global Spill Control
16 Halsey Road, Airport West, VIC, 3042
Phone: (03) 9335 5366

ABSORBENT W

available from:
Powell Industrial Derrimut (FormallyPurple Pig Derrimut)
1/2 Derrimut Dr, Derrimut, Vic, 3030
Phone: (03) 83532835

POLYPROPYLENE ABSORBENT SHEETS

available from:
Global Spill Control
16 Halsey Rd, Airport West, Vic, 3042
Phone: (03) 9335 5366

WOOL ABSORBENT SHEETS

available from:
Global Spill Control
16 Halsey Rd, Airport West, Vic, 3042
Phone: (03) 9335 5366

CLEANING AGENTS – PANTHER LB879 DETERGENT

available from:

Advance Chemicals

4-8 Malton Crt, Altona, Vic, 3018

Phone: (03) 9398 4444 or (03) 9398 4848

NON-SPARK (GRAIN) SHOVELS

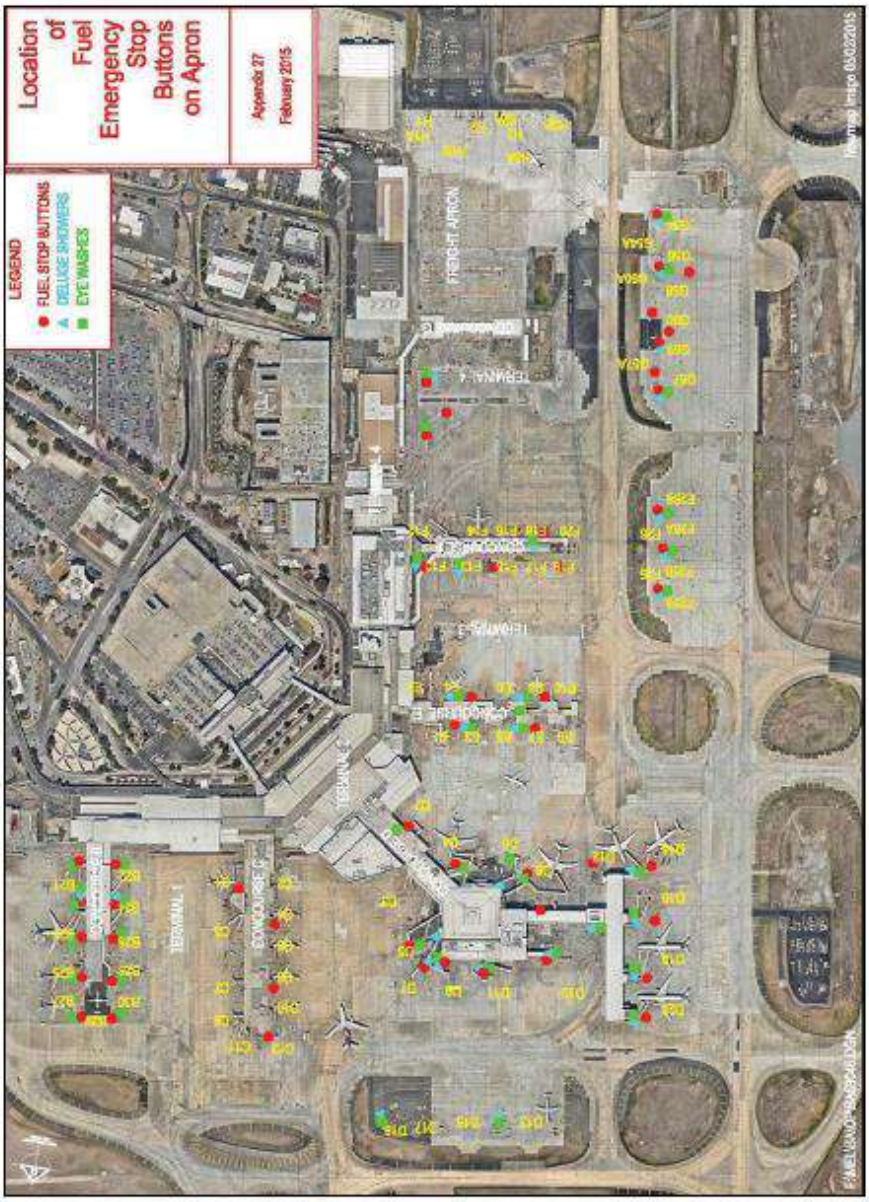
available from:

Tullamarine Hardware

197 Melrose Dr, Tullamarine, Vic, 3043

Phone: (03) 9338 2287

Appendix 2: Emergency Fuel Shut Down and Emergency Shower and Eye Wash locations



NOTES

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