Airport of Rodrigues Ltd

Proposed Expansion of Rodrigues Airport

Environmental and Social Impact Assessment

Final Draft Report

VOLUME 1 of 4

Report Reference – 09053999

Prepared by

setec (Mauritius) Ltd
setec hydratec
setec international
setec énergie environnement
Enviro-Consult Ltd
ECO-MED
INSUCO

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Report Prepared by

NAME	ROLE	COMPANY
ENVIRONMENTAL CONSULTANT TEAM		
Frederic TRANQUILLE	Project Director / Senior Water Engineer	SETEC (Mauritius) Ltd
Nadia DABY SEESARAM	Project Manager / Senior Environmental Engineer	ENVIRO-CONSULT LTD
Fatou DIAGNE	Senior Water / Environmental Engineer	SETEC HYDRATEC
Nassiba BENAZZOUZ	Junior Water / Environmental Engineer	SETEC HYDRATEC
Chloé LESTIENNE	Junior Water / Environmental Engineer	SETEC HYDRATEC
SPECIALIST TEAM		
Antoine MARIE / Pierre PEETERS	Marine Environment and Hydrodynamics	SETEC HYDRATEC
Stella MARMIN / Mathieu PINAULT	Marine Biodiversity	SETEC ENERGIE ENVIRONNEMENT / MAREX
Pierre-Yves FABULET / Antoine BAGLAN	Terrestrial Biodiversity	ECO-MED
Veenoy DABEE	Geological & Geotechnical	SETEC (Mauritius) Ltd - Independent Geotechnical Engineer
Sophie MERAT / Camille DURAN	Hydrology / Stormwater Drainage	SETEC (Mauritius) Ltd and SETEC HYDRATEC
Marc ETIENNE	Hydrogeology	SETEC (Mauritius) Ltd – Independent Hydrogeologist
Fatou DIAGNE / Frédéric TRANQUILLE	Potable Water / Wastewater	SETEC HYDRATEC
Jean-Isamu TAGUCHI / Julien BOULLE / Luigi ARNALDI	Cultural Heritage, Socio-Economics, Labour & working conditions / Social aspects of community H&S	INSUCO
Slim DRIDI	Traffic Management and Impact	SETEC (Mauritius) Ltd & Specialist sub-consultant Luxconsult (Mtius) Ltd
Samuel LAVEAUD / Pierre-Yves NADEAU / Pauline JAUSSERAND	Air Quality and Noise	SETEC INTERNATIONAL & specialist sub-consultant CIA

List of Acronyms

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
EPA	Environment Protection Act
E&S	Environmental & Social
ESIA	Environmental and Social Impact Assessment
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
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
GRM	Grievance Redress Mechanism
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
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
RPUC	Rodrigues Public Utilities Corporation
RRA	Rodrigues Regional Assembly
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
VEC	Valued environmental and Social component
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
ZTV	Zone of Theoretical Visibility
ZVI	Zone of Visual Influence

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0 EXECUTIVE SUMMARY

0.1 INTRODUCTION

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

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

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

This ESIA document was prepared, as an update of the initial ESIA 2019 based on the additional studies identified and required to meet the requirements of the World Bank Environmental and Social Framework (ESF) and with the integration of the updated airport design. The ESIA will be finalized based on the finale designs, if there are any substantial changes to the design.

0.2 PROJECT DESCRIPTION

The proposed expansion of Rodrigues airport will be conducted in two phases, of which only the activities under phase 1 are currently supported under this Project.

The scope of works under phase 1, and for which the present Environment and Social Impact Assessment applies, is listed below:

Airport Infrastructure works

- New Runway 2100 m x 45 m wide with 2.5m shoulders on both sides (Total width 50m)
- Earthworks, Land Reclamation and Rock Revetment Works associated with the new runway
- Existing Runway to be downgraded to Taxiway
- Taxiway (15m wide with 5m shoulders)
- Aprons to accommodate 3No. A321 Neo type aircraft
- Isolated Apron
- Lighting (Airfield Ground Lighting, Approach Lights, Flood Light Masts)
- Precision approach path indicators
- Communications, Navigation and Surveillance Systems for Air Traffic Management and Landing Procedures
- Landside Car Park

Airport Buildings

- Air Traffic Control Facility (relocated at Mont Travers)
- Rescue and Fire Fighting Services (relocated at Mont Travers)
- Ancillary facilities
- Power Centre
- Quarantine building
- Meteorological building
- Solid Waste Management Facility / Incinerator
- Airport Perimeter Road

- New Passenger Car Park

Ancillary Utilities and Services

- Surface Water Drainage
- Potable Water Supply
- Wastewater Treatment Plant

Facilities Associated with Construction

- Temporary workers camp, site establishment, yard, etc
- Desalination Plant - or atmospheric water generators - to supply potable water
- Temporary Wastewater Treatment Plant
- Strengthening of existing perimeter track road to be used as haulage route

Quarry/borrow area

- Ste Marie Hill (to be cut for the airport expansion - located within airport perimeter)
- Mont Travers (to be cut for the airport expansion)
- Mont Topaze (was considered as an alternative – it is most probably not required any further)

Demolition of vacated existing building within the airport expansion footprint

0.3 OVERVIEW OF THE PROJECT AREA OF INFLUENCE

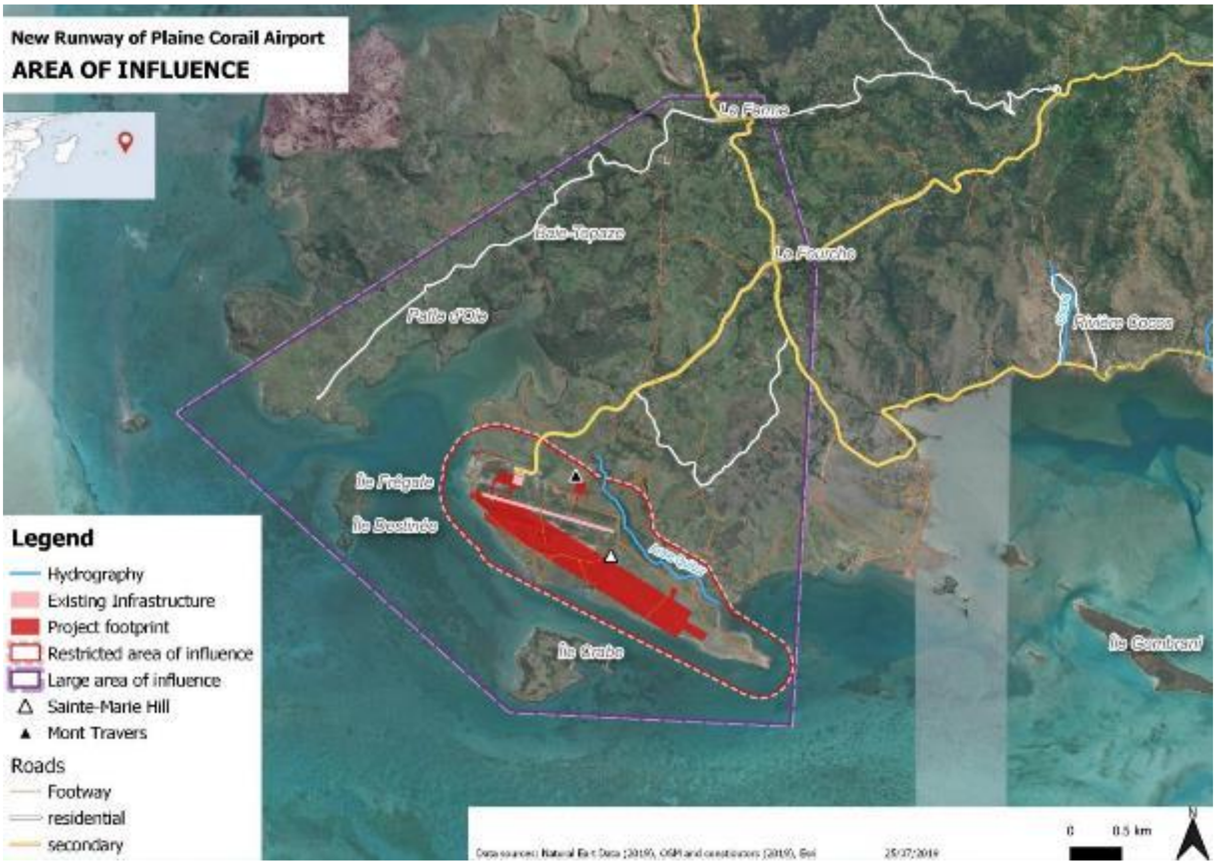
The present Environmental and Social Impact Assessment has been prepared based on the definition of several specific areas of influence when considering the following components:

- Physical environment (climate, geology, coastal and marine environment, river, estuary, hydrology and hydrogeology)
- Biological environment (terrestrial and marine biodiversity)
- Traffic infrastructure and services
- Social environment including areas used for livelihood activities, for resettlement
- Airshed for air and noise
- Heritage and visual environment

Figure 0-1 below provides an overview of the project site and the areas that may be affected by the project's direct and indirect impacts.

Given the type of project and the size of the island (108km2), the area that may be affected by the project's cumulative impact can be as large as the island itself in as much as traffic impacts, social impacts (both positive and negative) amongst others, are concerned.

Figure 0-1: Overview of the Area of influence



0.4 Environmental and Social Baseline Conditions

The physical, biological and socio-economic aspects have been identified and their sensitivity rated using the following rating: 1 "low", 2 "medium", 3 "high" or 4 "major" and a colour code associated thereto.

0.5 Physical Environment Sensitivity

The Physical Environment Sensitivity is summarised in Table 0-1 below.

Table 0-1: 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

0.6 Biological Environment Sensitivity

The Biological Environment Sensitivity is summarised in Table 0-2 below.

Table 0-2: Summary of Biological Environmental 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	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	*Foetidia rodriguesiana, Hyophorbe verschaffeltii, Latania verschaffeltii, Polyscias rodriguesiana*	Major
		Zanthoxylum paniculatum, Antirhea bifurcata, Clerodendrum laciniatum, Diospyros diversifolia, Fernelia buxifolia, Mathurina penduliflora, Pandanus	High

Theme	Sub-theme	Receptor	Sensitivity
		heterocarpus, Pleurostylia putamen, Terminalia bentzoe subsp. rodriguesensis, Adiantum rhizophorum, Sarcanthemum coronopus	
		Phyllanthus dumentosus, Camptocarpus sphenophyllus, Secamone rodriguesiana, Nephrolepis biserrata, Phymatosorus scolopendria	Medium
		Dodonaea viscosa, Dracaena reflexa, Elaeodendron orientale, Ficus reflexa, Ficus rubra, Premna serratifolia, Thespesia populnea, Cynanchum viminale	Low
	Terrestrial fauna	*Tropidophora articulata & T. desmazuresi (Gastropoda)*	Major/High
		Pteropus rodricensis (Chiroptera)	High
		Omphalotropis littorinula (Gastropoda)	Medium
		All other native species	Low
	Marine habitats	Bare soft substrate habitats	(very) Low
		Algae bed dominated by Rhodophyta assemblage	(very) Low
		Algae bed dominated by Caulerpa spp	Low
		Seagrass bed dominated by Halophila spp	Low
		Sublittoral rocks dominated by Ochrophyta assemblage	(very) Low
		Fringing reefs dominated by *Acropora muricata*	Medium
		Detrital fringing reef dominated par Ochrophyta assemblage	Low
		Detrital reef flat with sparse corals and algae	Low
		Outer reef flat with sparse corals	Low
		Outer slope with corals, soft corals , gorgonians and crustose algae assemblage	High
	Marine fauna	Marine turtles	High
		Marine mammals	Low

0.7 SOCIAL AND ECONOMIC SENSITIVITY

The Social and Economic Sensitivity is summarised in Table 0-3 below.

Table 0-3: 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

0.8 AIR QUALITY 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 and to road traffic.

The Air and Noise Sensitivity is summarised in Table 0-4 below.

Table 0-4: Summary of Air and Noise Sensitivity

Theme	Sub-theme	Receptor	Sensitivity
Air quality and noise	Air quality	Population exposed	High
	Noise	Population exposed	High

0.9 HERITAGE RESOURCES AND VISUAL ENVIRONMENT

The Cultural and Visual Environment Sensitivity is summarised in Table 0-5 below.

Table 0-5: 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

0.10 Temporary impacts during Construction Phase and mitigation or compensation measures

The summary of Temporary Impacts during Construction Phase and mitigation or compensation measures is given in Table 0-6 below.

Table 0-6: Summary of Temporary impacts during construction phase and mitigation or compensation measures

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	
		Phy-Mar-W-Temp-4	WTP treated water discharge	Adverse	Low	None	None	Low
		Phy-Mar-W-Temp-5	Desalination plant diluted brine discharge	Adverse	Low	None	None	Low
	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. (The exact number will be determined in the traffic management plan, as field work has just been completed in March 2023.)	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 cut 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	Excavation Noise	Adverse	High	Phy-Kar-Mit-7	No use of explosive charge, decreasing noise impact	Medium
						Phy-Kar-Mit-8	No use of explosive charge	
						Phy-Kar-Mit-9	Work only during the day and inform local authorities and communities about the health and safety plan applicable on work site, as the allowable working hours are 45 hours per week.	
						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	Choose the closest extraction site for fill material / no export of excess material	Medium
	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

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
		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. Note: This is part of the discussions that will be held with Rodrigues Public Utilities Corporation (RPUC) during their rehabilitation works of the desalination plants on the island. Thus, temporarily provide drinking water from sea water to people currently connected to Caverne Bouteille plant Coordinate the water supply option according to Water Development Strategies of Rodrigues Island (updated in 2022 by BRL Report)	Negligible
		Phy-Wat-W-Temp-3	Works wastewater	Adverse	Major	Phy-Wat-Av-3	Provide a temporary wastewater treatment plant dedicated to the site.	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 - Emergency preparedness and response plan	Negligible
		Phy-Wat-W-Temp-5	Desalination plant	Adverse	High	Phy-Wat-Av/Mit-5	Good engineering design to reduce the impacts (namely intake via a borehole rather than directly from the sea, diluted brine discharge via borehole or zero liquid discharge via an evaporator)-More details in relevant section. Importance of ESMP & ESCP in the contractor’s contract	Negligible to low
Biological	Terrestrial habitat	None	-	-	-	-	-	-
	Terrestrial flora	None	-	-	-	-	-	-
	Terrestrial fauna	BioT-Fau-W-Temp-1	Impact on Pteropus rodricensis (Chiropter)	Adverse	Low	None	None	Low
	Marine habitat	BioM-Hab-W-Temp-1	Effects of suspended matter and water turbidity on ecosystems	Adverse	High	None	Apply measures to reduce water turbidity (Phy-Mar-Mit-1 to 5)	Medium
		BioM-Hab-W-Temp-2	Effects of siltation and modification of the seabed on ecosystems	Adverse	Low	None	Apply measures to reduce water turbidity (Phy-Mar-Mit-1 to 5)	Low
		BioM-Hab-W-Temp-3	Effects of WWTP and desalination plant discharge on ecosystems	Adverse	Low	None	Low volumes discharged and low sensitivity of adjacent ecosystems	Low
	Marine species	BioM-Spe-W-Temp-1	Marine turtles	Adverse	(To define) Medium	BioM-Mit/-1	Type and orientation of lighting can reduce the impact of artificial light on wildlife	Low
						BioM-Mit/-2	Lamps with a broad spectrum or white light should be avoided in favour of lamps with yellow, amber to red light	
		BioM-Spe-W-Temp-2	Marine mammals	Adverse	Low	None	Low attendance of marine mammals at the study site (too shallow depths).	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 which requires a police escort for the mobilization of construction equipment.	
						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 works as much as possible during electric underload periods.	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	
				Adverse	Low	SE-Mit-7	Communication and hiring management plan	Negligible

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
		SE-Demo-W-Temp-3	Social tensions arising from hiring conditions			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	
						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 inhabitants of 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	Air-W-Temp-1	Alteration of air quality due to construction activities	Adverse	Medium	Air-Mit-1	Impose speed limits on all unpaved roads around the site (max 30 km/h)	Low
						Air-Mit-2	Regularly water sprinkle 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 works and limit works during evening period: from 7h00 pm to 6h00 am.	Low
						Noi-Mit-2	Machinery and equipment must be regularly maintained in accordance with the manufacturer's requirements.	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 by avoiding significant works at night	
						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	Planting is 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	-

0.11 PERMANENT AND IRREVERSIBLE IMPACTS DURING CONSTRUCTION PHASE AND MITIGATION OR COMPENSATION MEASURES

The summary of Permanent and Irreversible Impacts during Construction Phase and mitigation or compensation measures is given in Table 0-7 below.

Table 0-7: Summary of Permanent and Irreversible Impacts during construction phase and mitigation or compensation measures

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 settlement/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	Low	Phy-Wat-Comp-5	-	Low
		Phy-Kar-W-Def-4	Pollution of groundwater	Adverse	Medium	Phy-Kar-Av/Mit-18	Daily maintenance and inspection of mobile construction equipment and plant	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-2	Relocation of the intake of Cavern Bouteille (replacement by seawater). To be addressed within the Water Development Strategies of Rodrigues with RPUC and RRA.	
		Phy-Kar-W-Def-5	Cut and fill balance: impacts of material extraction and use	Adverse	Medium	Phy-Kar-Mit-21	Impact assessment of the borrow area/quarry and have the site validated by the client	Low
						Phy-Kar-Mit-11	Choose the closest extraction site for fill material / Forbid the export of excess material. The Design Consultant GIBB is currently creating a 3D model of the earthworks to determine the appropriate balanced volume of materials and avoid any spoil. The previously determined excess volume was a rough estimate. The aim is to minimize excess material. Any eventual excess material will be used within the project area anyway.	
	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	

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
							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	Low	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	Negligible
						BioT-Mit-3	Moving the control tower out of the nature reserve (done in 2023)	
						BioT-Mit-4	Creating an arboretum of endemic species inside the airport landscaping	
						BioT-Mit-5	Transplant remarkable trees and ferns intended to be cut down during the works phase	
						BioT-Comp-6	Genetic conservation of populations of impacted rare species	
						BioT-Comp-7	Action plan towards more sustainable agricultural practices for native biodiversity.	
		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	Low	none	None	Low
		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	Low	none	None	Low
	Terrestrial flora	BioT-Flo-W-Def-1	Impact on native species with a major sensitivity	Adverse	High	BioT-Av-1	Avoid remarkable trees located at the edge of the project	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-2	Impact on native species with a high sensitivity	Adverse	High	BioT-Av-1	Avoid remarkable trees located at the edge of the project	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-3	Impact on native species with a medium sensitivity	Adverse	Medium	BioT-Av-1	Avoid remarkable trees located at the edge of the project	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	

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-Flo-W-Def-4	Impact on native species with a low sensitivity	Adverse	Low	BioT-Av-1	Avoid remarkable trees located at the edge of the project	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	
	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 ssp & Omphalotropis ssp* (Gastropoda)	Adverse	Medium	BioT-Mit-8	Collect molluscs from the Tropiphodora & Omphalotropis genus before and during earthworks	Low
		BioT-Fau-W-Def-3	Impact on Lygodactylus lugubris (Reptilia)	Adverse	Low	None	None	Low
	Marine habitat	BioM-Hab-W-Def-1	Effect of alteration of the shoreline on ecosystems	Adverse	Medium	BioM-Av-1	Avoid or move sparse coral heads located at the edge of the project t	Low
		BioM-Hab-W-Def-2	Effect of modification of the sediment transit on ecosystems	Adverse	Negligible	none	-	Negligible
	Marine species	BioM-Spe-W-Def-1	Marine turtles	Adverse	(to define) Low	BioM-Mit/-1	Appropriate choice of orientation and type of lamp	Low
						BioM-Mit/-2	Appropriate choice of lamp diffusion spectrum	
		BioM-Spe-W-Def-2	Marine mammals	Adverse	Low	none	Low attendance of marine mammals at the study site (too shallow depths)	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
	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	

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
	Community mobility	SE-Mob-W-Def-1	Resettlement of displaced people from the main road line	Positive	Medium	None	-	Medium
Heritage resources and visual environment	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
						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	
	Palaeontology	Kar-W-Def	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 '-'

0.12 PERMANENT IMPACTS DURING OPERATION PHASE AND MITIGATION OR COMPENSATION MEASURES

The summary of Permanent Impacts during Operation Phase and mitigation or compensation measures is given in Table 0-8 below.

Table 0-8: Summary of Permanent Impacts during Operation Phase and mitigation or compensation measures

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
		Phy-Mar-Op-3	WTP treated water discharge	Adverse	Low	Phy-Mar-Mit-8	Location of the outfall	Low
						Phy-Mar-Mit-9	Outfall sizing	
		Phy-Mar-Op-4	Desalination plant diluted brine discharge	Adverse	Low	Phy-Mar-Mit-10	Location of the outfall	Low
						Phy-Mar-Mit-11	Outfall sizing (diffuser)	
		Phy-Mar-Op-5	Stormwater drainage	Adverse	Medium	Phy-Mar-Mit-12	Relocation of southern discharges	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	Additional laboratory tests (Aggregate test) 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 wastewater	Phy-Wat-Op-1	Pollution of soil and surface water	Adverse	Major	Phy-Wat-Av-6	Integrated water management plan	Negligible

Context	Sub-context	Impact	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
		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	-	-	-	-	-	-
	Terrestrial flora	None	-	-	-	-	-	-
	Terrestrial fauna	None	-	-	-	-	-	-
	Marine habitat	BioM-Hab-Op-1	Effect of accidental spillage on ecosystems	Adverse	High	none	Apply measures to reduce accidental impact (Phy-Mar-Mit-6 and 7)	Low
		BioM-Hab-Op-2	Effects of WWTP and desalination plant discharge on ecosystems	Adverse	Low	none	-	Low
		Bio-Hab-Op-3	Effects of stormwater drainage on ecosystems	Adverse	Low	none	-	Low
	Marine species	BioM-Spe-Op-1	Marine turtles	Adverse	Medium	BioM-Mit/-1	Appropriate choice of orientation and type of lamp	Low
						BioM-Mit/-2	Appropriate choice of lamp diffusion spectrum	
		BioM-Spe-Op-2	Marine mammals	Adverse	Low	None	Low attendance of marine mammals at the study site (too shallow depths).	Low
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

Context	Sub-context	Impact	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
						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	
	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 (Auxiliary Power Unit) and GPU (Ground Power Unit)	
						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		Adverse	Medium	Noi-Mit-3	Limit air traffic at night and the use of noisy equipment	Medium

Context	Sub-context	Impact	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
			Noise impact due to increased air traffic			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	
						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	
	Palaeontology	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 '-'

0.13 SUMMARY OF THE CUMULATIVE IMPACTS

Theme	Positive impacts	Negative impacts
Tourism	Economic growth	
	Employment creation and additional accommodation.	
	Job creation	
	Increase income potential for the communities	
	Potential to create collaborative partnerships and operational opportunities between local communities	
	Potential to reinforce the professional skills of the surrounding populations	
		Carrying capacity of the island difficult to assess and may be exceeded
		Increase in tourist arrival having potential to impact the fragile eco-system of the island (terrestrial and marine)
		Potential to deplete local resources and to have to rely on import of good and services
Demography	Reversing the migration trend	
	Strengthening manufacturing, and primary sectors	
	Remigration adding value to the local economy	
	Education, wealth, and experience accumulated abroad contributing to improving socioeconomic conditions and quality of services offered	
Power, governance and civil society		Involuntary displacement of inhabitants, livestock breeders, and fishermen may cause tension between communities
Land resource		Increase in social tensions in relation to the land resource
		Potential to deplete local resources and to have to rely on import of good and services
Water supply	Boosting of the development and modernisation of the water supply infrastructure in order to cope with the demand generated by tourism development	Risk of water scarcity in Rodrigues due to tourism development generating a bigger demand

Theme	Positive impacts	Negative impacts
Wastewater management	Boosting of the development of the wastewater management infrastructure in order to cope with the resulting need generated by tourism development	Increased wastewater generation to be managed to avoid ground and underground pollution
Stormwater management	Boosting of the development of the stormwater management infrastructure in order to cope with the resulting need generated by the development works	Potential modification of natural drainage paths and infiltration areas due to modification of land use and construction leading to further erosion
Solid waste management	Boosting of the development of the solid waste management plan and infrastructure in order to cope with the resulting need generated by tourism development	Increased solid waste generation to be managed to avoid littering and pollution
Education and training	strengthening of the education system	Need for additional staffing and equipment
		lack of access to vocational training
Health	Increase in the capacity of health infrastructure and services.	
	Improved quality and coverage of health services through telemedicine and regular visits from medical practitioners.	
	Facilitation of evacuation and repatriation of patients.	
		Exposure of local population to imported diseases, lack of preparedness from medical professionals
		Medical facilities in Rodrigues are limited ; risk of health facilities being overwhelmed
Food production and supply		
Agriculture	Rehabilitation of abandoned agricultural lands could increase the amount of agricultural land available for cultivation, which could lead to higher levels of agricultural production and increased food security.	Increased pressure on natural resources, particularly water resources, which could exacerbate existing water scarcity challenges in Rodrigues.
	Measures for increased water production could improve water availability for agricultural purposes, which could support expanded agricultural activities.	Increased use of chemical fertilizers and pesticides could have negative environmental impacts, including soil degradation and water pollution.
	Improved training in modern agricultural production techniques could increase the efficiency and productivity of agricultural operations, potentially leading to higher yields and greater profitability.	Depending on the types of crops grown, expanded agricultural activities could contribute to deforestation or other types of habitat destruction

Theme	Positive impacts	Negative impacts
	Development of a land suitability map could enable better land planning and management, which could lead to more sustainable agricultural practices and higher levels of productivity.	Possible overproduction or an oversupply of certain crops, which could depress prices and negatively impact the incomes of local farmers.
		Decrease in income from agriculture during the adjustment period
		Relocated Sainte Marie villagers will need to cultivate new parcels of land that have not been previously farmed
		Agricultural harvests are expected to be lower during the first few years of cultivation, leading to a decline in agricultural incomes
Livestock breeding	Livestock farming provides a source of income for the island's inhabitants through both local consumption and export to Mauritius.	Intensive methods used for raising some types of livestock can have negative environmental impacts, such as water pollution and soil degradation.
	The tradition of raising livestock has cultural significance and can be an important part of local identity.	If livestock farming is not managed properly, it can lead to overgrazing and deforestation
	Livestock farming can contribute to food security on the island.	Water scarcity and land management policy challenges may limit opportunities to produce and export more meat.
	Genetic improvements in cattle, better animal health and nutrition, expected to increase average weight of cattle from 300 kg to 400 kg.	
Off-Lagoon fisheries	Increase in availability of choices of demersal fish for consumption	
	Off-lagoon fishing represents significant potential for economic growth	
	Higher supply of superior grade fish	
	Creation of a robust value chain for off-lagoon industry which will stimulate local entrepreneurship among youth	
	Increase in employment and revenue for off-lagoon fishing activities	
	Increased revenue for fishermen fishing in the lagoon	
		Potential to deplete local resources and to have to rely on import of good and services
The reduction of traditional agriculture, livestock, and fishing activities	Creation of opportunities for new economic activities	It may have an impact on the income of households in the airport area, which could lead to a ripple effect on their financial stability and have a significant

Theme	Positive impacts	Negative impacts
		impact on the social and economic functioning of the local communities.
	Increase in local development initiatives	It may increase the prices of locally produced goods and services, which could negatively affect the purchasing power of households who rely on these goods and services
		It may have a negative impact on some households who rely on these traditional activities for their primary source of income.
Critical Habitat: Change in land use		Potential impact on critical habitats following the use of available land for the development of new infrastructure for the increasing population (remigration for example, in addition to tourists)
Critical Habitat: Marine	Like for Water Supply and Wastewater themes above, boosting of the development of the water supply and wastewater management infrastructure in order to cope with the demand generated by tourism accommodation development and activities	Potential impact on marine habitat due to discharges at sea with increased water usage and wastewater generation, tempering with marine habitats due to touristic activities, increased pressure on marine resources
Critical Habitat: Terrestrial		Potential impact on terrestrial habitat due to development of new hotels and tourism activities, tempering with terrestrial sensitive habitats due to touristic activities, increased pressure on terrestrial resources
Noise & Air Quality		No significant impact regarding Noise due to the new types of flights. Potential impact on air quality due to increased road traffic

0.14 SUMMARY OF THE STAKEHOLDER ENGAGEMENT PLAN (SEP)

The stakeholder engagement plan (SEP) is a tool to identify and mobilize all the project affected people, groups, institutions and those that might have an interest in the project.
For this Project 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 to plan and implement the resettlement. These engagement activities were led mostly by local authorities and particularly Rodrigues Executive Council. Airport of Rodrigues Limited, although it is the Project owner, was involved in a limited manner.

As of April 2023, a limited number of consultations related to the Project itself - not the resettlement - were held. One consultation outside of the ESIA field mission was organized. The stakeholder engagement activities falling outside of the resettlement process took place on the following date:

- 3 May 2019 in the village of Anse Quitor Corail and in Cascade Jean Louis;
- 30 January 2020, in the airport of Rodrigues, with 38 representatives of 38 villages to present the content of the ESIA;
- 14 March 2023: key informant interview with Aurèle André, director of the Réserve François Leguat and President of the Tourism office in Rodrigues;
- 14 and 18 March 2023: meetings with the communities of Plaine Corail;
- 21 March 2023: key informant interview with Jean Teddy Labour, representative of the civil society organization Rodrigues Council on Social Services at Baie-aux-Huîtres;
- 22 March 2023: consultation with residents of Cascade Jean Louis;
- 23 March 2023: focus group discussion with women in Dans Coco;
- 24 March 2023: key informant interview with Reshad Jhangeer, Mauritian Wildlife Foundation.

It should be noted that several stakeholders have not been met because of time constraints. These include public authorities at the national level in Maurice, the Delegation of the European Union to the Republic of Mauritius and the Republic of Seychelles as well as the civil society organizations operating in the field of sustainable development in Maurice such as Platform. These stakeholders must be consulted as soon as the SEP is validated and operationalized.

During the field mission carried out in March 2023, communities and stakeholders have complained about the lack of engagement. This opinion was also shared by civil society organizations that are not directly involved in conservation activities on the island. According to them, the only information they received was through radio or television. During the field mission in March 2023, the team had often heard “No one came to meet us since Insuco’s mission in 2019”. The communities added that they have fears regarding the development of the Project, and that they do not have the appropriate knowledge to understand whether these fears are justified. For instance, during the resettlement, technical services officials of the Commission on agriculture did not explain that it is not recommended to breed pigs together with chicken and small ruminants in the same place for sanitary reason. This has created the feeling among affected individuals that the RRA did not care about their practice of livestock breeding. Additionally, women expressed during a focus group that their fear were very basic and may be not right, such as the airplane flying right above their houses, but they wanted to hear the answers to their questions from technical and competent individuals. This lack of engagement is perceived as an attempt to develop the Project at the communities’ expenses. As at March 2023, no measures have been put in place to improve stakeholder engagement.

Another issue is that the Executive Committee of the Rodrigues Regional Assembly is the main interlocutor of the community. In this regard, a concern expressed by the resettled inhabitants of Sainte Marie is that, if the Rodrigues Regional Assembly remains the only institution discussing with the population, the negotiating framework may be too strict. With this respect, as detailed later in this SEP, ARL must lead the stakeholder engagement activities and engagement must include other stakeholders such as civil society organizations. Moreover, the changes in the RRA as a result of elections does not allow to maintain solid engagement and communities do not know to whom they should go to express their concerns.

The expansion of the framework to a wider consultative table is 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 Plaine Corail, for their part, believed that communication with the regional authorities would be more fluid and easier, if the community was organizing in a small committee, in order to centralize the flow of communication and, if necessary, to request more information. Suggestions in this sense are provided in the SEP.

During the consultations carried out for the development of the ESIA in 2019, the inhabitants of Plaine Corail were 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 expressed a concern about this, knowing that there will be larger carriers that will park in front of the terminal. The locals then wondered if the noise and fuel smells will be more significant because the planes will be bigger. They have raised this issue again during the consultation held in March 2023 adding that they are glad if the Project brings benefits to the island, but they do not wish to be the victims of such development. The fears of disturbances have also been raised by inhabitants of other communities during the consultations to present the result of the ESIA in 2020. Finally, during a focus group discussion organized in March 2023, the women in Dans Coco expressed fears regarding risks of pollution and noise that could disturb their children at school, as well as risks of airplane accidents.

During consultations that took place in 2019 and 2023, inhabitants agreed that the Project will support the development of tourism on the island. However, there are fears that larger carriers will lead to less jobs for taxi drivers. Whereas drivers can currently provide services for 3 flights per day, there will be only 2 flights of larger carriers per day, hence less income for them. This must be balanced with the fact that more tourists on the island could mean more work outside of the airport as well.

Another key indirect impact that was mentioned during consultations in March 2023 relates to the preservation of the island authenticity and the Rodrigues' culture. All stakeholders met – governmental agencies, civil society and communities, agree to develop tourism but in a sustainable way that maintain Rodrigues' environment, culture and way of life.

In order to address the fears and impacts of the Project and to improve the Project's relation with communities, the SEP includes a Grievance Redress Mechanism (GRM). This mechanism will apply to those affected by the Project and will provide structured means of receiving and resolving this concern raised by an individual or community who feels that they have been adversely affected by the Project.

ARL's Project Implementation Unit will be in charge to receive and manage the complaints according to the following principles: collection via dedicated channels, registration of complaints including real or fictious, written or oral, and prompt resolution. In the resolution of complaint, ARL will seek to prioritize amicable settlement of issues raised.

It should be noted that the procedure excludes certain types of complaints such as complaint regarding employment, recruitment process, working conditions and non-compliance with labour law and health and safety requirements, complaint of commercial nature by providers of services or construction material, request on Corporate Social Responsibility (CSR) initiatives or activities, and complaint on an issue already brought to a court

0.15 Conclusions

The present ESIA has been undertaken for phase 1 expansion of Rodrigues airport in line with the national legislation and international World Bank ESF.

Extensive studies have been undertaken in 2019 and updated as required in 2023 to understand the baseline conditions of the site and the areas of influence (terrestrial, marine, airshed, etc) of the project.

Potential impacts on the natural and social environment have been identified both for the construction and the operation phases; these impacts have been rated according to a risk matrix.

Significant risks are associated with impacts on

- the natural environment
    - marine physical and biological environment
    - terrestrial physical and biological environment
    - the hydrology and geology of the karstic environment
    - the water resources
    - the generation of pollution (solid and liquid waste, noise and vibrations, air emissions, etc)
- the social environment
    - involuntary resettlement
    - change in living conditions of inhabitants and livelihood

Mitigation measures, in the form of good engineering design and/or best site practices, have been recommended to reduce and/or abate the impacts, both during construction and operation.

Irreversible impacts have been identified during the construction phase, for which compensation plans have been recommended.

A set of management plans are required for the construction phase and the operation phase to ensure mitigation measures spelt out in this ESIA are implemented; associated monitoring plans are required to measures the effectiveness of the management plans.

Cumulative impacts both positive and negative have been identified. Given the type of project and the size of the island, some impacts may have an island-wide dimension.

It can be said that this project is a major development for Rodrigues and, given the geographical, environmental, social and financial context, the project risk level is considered as high.

1 PROJECT DESCRIPTION

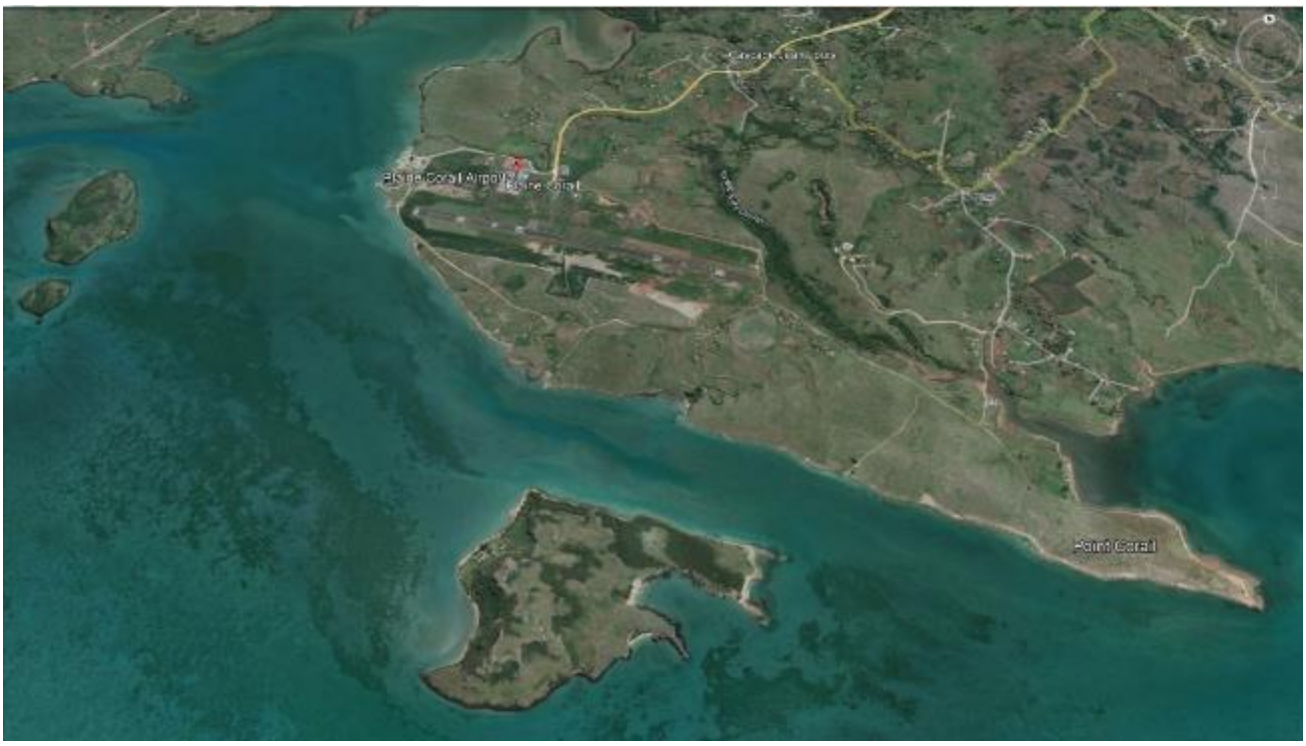
1.1 PROJECT BACKGROUND AND LOCATION

The project refers to the Expansion of Rodrigues airport located at Plaine Corail, Rodrigues Island.

Plaine Corail is located to the south-west of the island as shown on Figures 1-1 and 1-2 below.

Figure 1-1: Rodrigues Island (Google Earth)

Figure 1-2: Rodrigues Airport at Plaine Corail (Google Earth)



Rodrigues is a constituent island of the Republic of Mauritius with an economy mostly based on agriculture, handicraft and fishing. The island, the smallest of the Mascarene archipelago, is situated at latitude 19°43’S and longitude 63°25’E in the Indian Ocean.

Stretching over a surface area of 108 km2, Rodrigues Island is 18 km long, 8 km wide and lies some 650 km to the north-east of Mauritius. Born from volcanic activity between 1.3 and 1.5 million years ago, it is a mountainous island with many valleys.

The island enjoys a tropical climate with temperatures varying between 28°C and 35°C during the Southern summer, and between 18°C and 27°C in winter. The cyclonic season begins in the month of November till April.

Since October 2001, Rodrigues Island has an autonomous status within the Republic of Mauritius with its own Regional Assembly and an Executive Council for the framing and implementation of its socioeconomic policies. It is administered by a Regional Assembly and elections are held every five years.

As of 01 July 2021, the island had an estimated population of 44 427 with 21 729 males and 22 698 females. The number of youth population (younger than 14 years) in Rodrigues stands at 11278, while the elderly population (65 years and older) is 4 010. (Source Statistics Mauritius).

The airport is managed by Airport of Rodrigues Ltd. (ARL), a fully-owned subsidiary of Airports of Mauritius Ltd. (AML).

The project to equip Rodrigues with a new and longer runway stems from a political will shared by the Rodrigues Regional Assembly (RRA) and the Government of Mauritius (GoM) 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.

Indeed, the airport is currently equipped with a runway 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 2,100 m long 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.

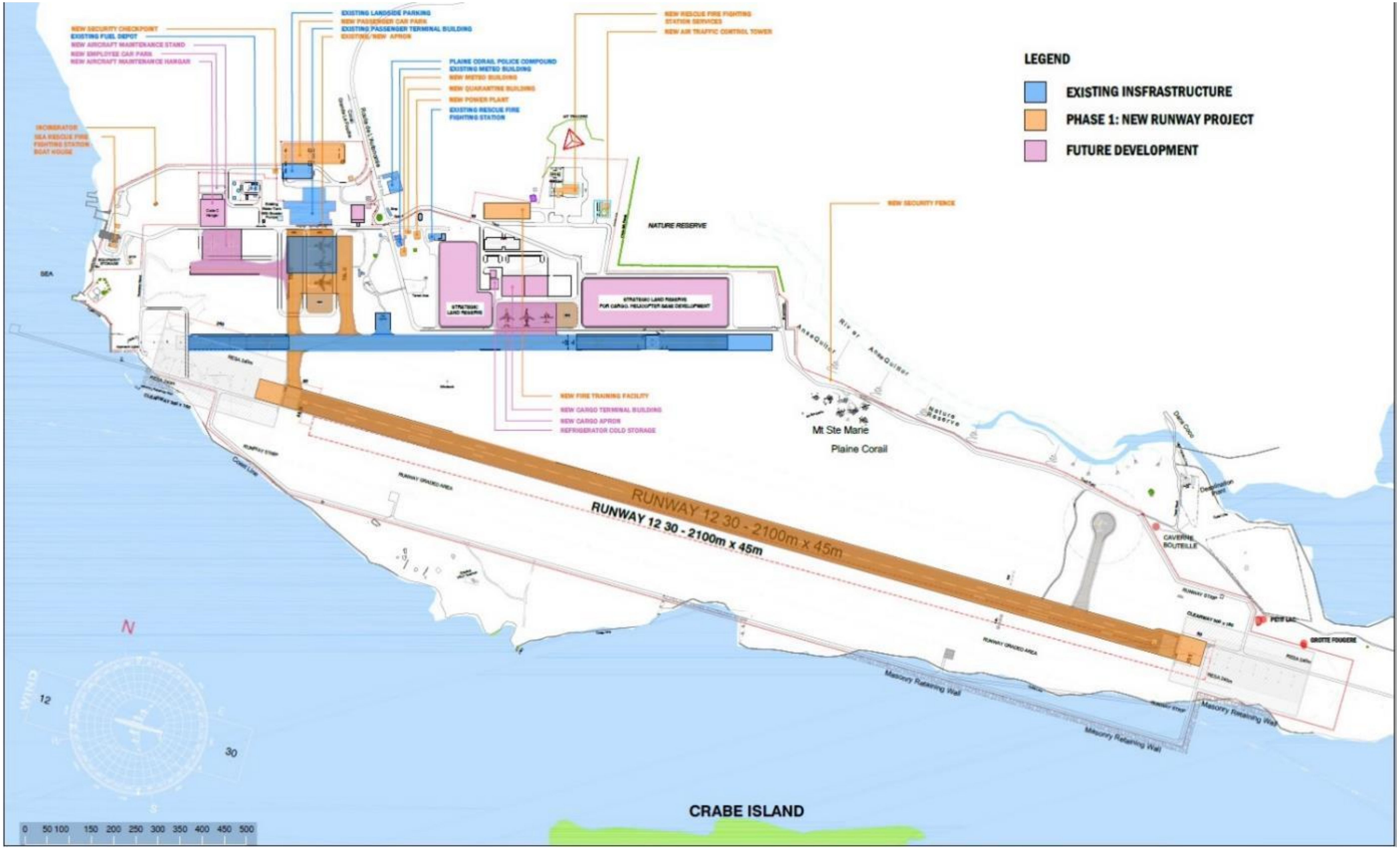
The project entails the resettlement of inhabitants and activities located within the airport expansion area. As such, inhabitants of Ste Marie have already been relocated.

1.2 PROJECTION DETAILS

1.2.1 GENERAL

The expansion of Rodrigues Airport will be phased, as shown in Figure 1-3 hereinafter.

Figure 1-3: Updated Master Plan (ARL, Nov. 2022)



The proposed expansion of Rodrigues airport will be conducted in two phases, of which only the activities under phase 1 are currently supported under this project.

The scope of works under phase 1, and for which the present Environment and Social Impact Assessment applies, is listed below:

Airport Infrastructure works

- New Runway 2100 m x 45 m wide with 2.5m shoulders both sides (Total width 50m)
- Earthworks, Land Reclamation and Rock Revetment Works associated with the new runway
- Existing Runway to be downgraded to Taxiway
- Taxiway (15m wide with 5m shoulders)
- Aprons to accommodate 3No. A321 Neo type aircraft
- Isolated Apron
- Lighting (Airfield Ground Lighting, Approach Lights, Flood Light Masts)
- Precision approach path indicators
- Communications, Navigation and Surveillance Systems for Air Traffic Management and Landing Procedures
- Landside Car Park

Airport Buildings

- Air Traffic Control Facility (relocated at Mont Travers)
- Rescue and Fire Fighting Services (relocated at Mont Travers)
- Ancillary facilities
- Power Centre
- Quarantine building
- Meteorological building
- Solid Waste Management Facility / Incinerator
- Airport Perimeter Road
- New Passenger Car Park

Ancillary Utilities and Services

- Surface Water Drainage
- Potable Water Supply
- Wastewater Treatment Plant
- Refrigerator cold storage

Facilities Associated with Construction

- Temporary workers camp, site establishment, yard, etc
- Desalination Plant - or atmospheric water generators - to supply fresh water for construction purposes, which can be handed over to ARL or RRA at the end of construction to top up the public network in this region
- Temporary Wastewater Treatment Plant
- Strengthening of existing perimeter track road to be used as haulage route

Quarry/borrow area

- Ste Marie Hill (to be cut for the airport expansion - located within airport perimeter)
- Mont Travers (to be cut for the airport expansion)

- Mont Topaze (was considered as an alternative – it is most probably not required any further)

Demolition of vacated existing building within the airport expansion footprint

Key infrastructure and services are further developed in sections below.

Phase 2 expansion of the airport shall be designed and assessed from an environmental and social point of view at a later stage. The activities under phase 2 are currently not supported under this project.

Strategic land, within the footprint of the existing airport, has already been earmarked and reserved for these future developments which include the following:

- Facilities to be located adjacent (north) of to the existing runway
- New cargo terminal building
- New cargo apron
- 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

1.2.2 NEW RUNWAY

1.2.2.1 Runway Design

The Preliminary Design entails the design a new runway with a length of 2,100m and a width of 45 m as per International Civil Aviation Organisation (ICAO) requirements, including Turn Pads for the A321 Neo type aircraft, and considering 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.

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 vertical profile of the runway has a continuous cross fall at 20% gradient and extent beyond the “Clear and Graded Areas” of the Runway Strip.

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 cut of the Sainte Marie Hill and surrounding area including the disused Bangelique reservoir which are located within the existing footprint of the airport.

It is now considered to cut also Mont Travers in order to 1) cater for the relocated Air Traffic Control (ATC) and Rescue and Fire Fighting Services from the reserve and 2) to provide suitable fill material for the project.

1.2.2.2 Earthworks, Land Reclamation and Rock Revetment Works

Earthworks: The preliminary cut and fill exercise has been undertaken (Drawing No. M184/CE/RG/LA/18)

- Total cut: 3,481,837m^3
- Total fill: 2,098,751m^3
- Net earthworks after pavement adjustment: 1,478,325m^3 (Potential estimated surplus)

Note: The Design Consultant GIBB Mauritius Ltd is currently running a 3D model of the earthworks to determine the appropriate balanced volume of materials and avoid any excess material. The previously determined excess volume was a rough estimate at Preliminary Design Stage. The aim is to minimize excess material. Any eventual excess material will be used within the project area anyway.

Latest data show that there is a total of 2.75 million m^3 of suitable fill material from Ste Marie Hill and Mont Travers and the iterative calculations for the balancing of cut and fill is being carried out with amendment of the longitudinal profile of the runway in order to have slight surplus rather than shortfall.

All unsuitable material for engineering fill would as far as possible be used for other purposes within the Project footprint and topsoil reused in the graded strips for grass planting. Surplus of material is not expected to be carted away from the Project area which itself is about 1.2 million m^2.

Land Reclamation: The new runway will encroach on the sea at two locations, as shown on Drawing No. M243/DD/CE/SK/06 attached, namely:

- Location A: total area 8,410.79m^2
- Location B: 22,085.48m^2

Rock revetment works: Rock revetment works are essential for the new runway where substantial fill is, and land reclamation are required (Drawing No. M184/CE/RG/LA/18).

1.2.2.3 Construction Methodology

Whilst the detailed construction methodology to be adopted to carry out the works will be defined by the contractor to be appointed for this project, an anticipated/probable construction methodology for the maritime works components has been provided by the Design Engineers and presented below. Likewise, the equipment that the contractor may deploy is also summarised hereunder.

Principal Works

The maritime works will comprise:

- Construction of rock revetment
- Construction of a quay related the boathouse
- Construction of a slipway to boathouse

Possible Construction Methodology

- General revetment works:
    - General site clearance
    - Setting out of revetment footprint
    - Placement of a silt screen along the length of the work area. The screen is to be maintained for the duration of the works
    - Access ramps to be created using existing rock fill at regular intervals to facilitate access to lorries and equipment
    - Laying, spreading and compaction of the approved fill material to create a working platform above sea level
    - Sequential laying of the rock armour to create the revetment
    - Lining the backend of the rock armour with an approved geotextile fabric
    - Backfilling to the landside face of the revetment with the approved fill materials to achieve formation level of infrastructure works or finish levels.
    - Greening and grassing

- Quay at boathouse:

The design adopted for the quay is for a vertical wall built of mass concrete blocks which is durable and require minimal maintenance. The design will be optimised pending results of the geotechnical investigations. The general sequence of works would be as follows:

- Setting out and construction of a bund, above mean high water spring level, along the length of the proposed berthing quay. This step is required should the Contractor opt for using a land-based excavator instead of an underwater excavator
- Underwater excavation to remove soft marine deposits under the quay wall, using an excavator positioned on the bund. The depth of excavation would be as specified by the geotechnical engineer
- Stockpiling of excavated material onshore to allow for drainage of excess water
- Boulder bottoming in trench to displace soft material
- Backfilling of trench with selected crushed rockfill to achieve a level base
- Laying of a blinding with diver assistance, if required
- Laying of base blocks to quay walls
- Laying of scour protection off the face of the quay wall
- Laying of intermediate blocks in the specific arrangement required
- Backfilling of quay walls in layers
- In-situ casting of capping beam to quay block wall to eliminate any unevenness
- Laying of sleeves for services
- Construction of concrete deck with provisions for movement joints
- Fixing of quay furniture

If the watermaster [Amphibious Multipurpose Dredger] equipment is used, the first two steps will be:

- Setting out of the alignment of the walls to the quay wall
- Using an amphibious excavator, e.g. watermaster class IV, soft marine deposits under the quay structure is to be excavated.

- Slipway at boathouse:
  - Setting out of the slipway geometry
  - Construction of a coffer dam, using sandbags, around the perimeter of the slipway to prevent ingress of seawater
  - Pumping of seawater out of the work area
  - Laying of rockfill and bedding layer to create the founding layer for the ramp
  - Laying of the precast units along the perimeter of the ramp
  - Setting out of the rail alignment
  - Casting of the slipway with the embedded rails
  - Removal of retention structure

Anticipated Plant Usage

- Anticipated Plant Usage:
  - Wheel excavator with backhoe for handling of material
  - Amphibious excavator (optional)
  - Track excavator with grabber for placing of rock
  - Bobcat for handling of material
  - Tipper lorry for transport of materials
  - Lorry fitted with 10t capacity crane for transport of precast elements
  - Concrete mixer
  - Water pump.

Excavation of Marine Deposits

To achieve a sound founding layer to receive the precast concrete quay block walls, excavation of the soft marine deposits along the length of walls is required. Depth of excavation to be confirmed by the geotechnical engineer. Due to the high organic content of the excavated material, the latter would not be suitable for re-use and will therefore be discarded to a dumping site.

However, due to the high-water content of the excavated material, it would be required to drain the excavated material to a water content of 70% prior to transportation to an onland dumping site as stipulated in the local Government (Dumping and Waste carriers) Regulations 2021. A trench/pit, lined with a suitable geotextile membrane, would be required to contain the excavated material during the drainage process. The location and dimensions of said pits would depend on the Contractor’s site arrangement.

1.2.2.4 All Airfield Ground Lighting, Navaids, and illuminated signage for the runway

All Airfield Ground Lighting (AGL), Navaids and illuminated signage provided for the runway will be compliant with the ICAO Annex 14.

The runway AGL includes:

- AGL;
- High intensity Precision Approach Path Indicators;
- Illuminated signs;
- Illuminated Windsocks;

- Runway Threshold Identification Lights 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.

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.

1.2.3 TAXIWAYS

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 taxi lane 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.

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.

1.2.4 APRON

1.2.4.1 Main Apron

The existing apron has two stands which can support an ATR72.

This apron will be extended to accommodate the operations of a minimum of three parking stands for the A321 (operating as nose-in and pushback) and two stands for the ATR72 (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.

1.2.4.2 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.

1.2.4.3 AGL, Navaids, and illuminated signage for the apron

As for the new runway, the apron airfield ground lighting (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;
- Visual Docking Guidance System;
- Constant Current Regulators (CCRs).

1.2.5 AIR TRAFFIC CONTROL FACILITY

The existing Air Traffic Control (ATC) facility is 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.

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.

It was recommended in the Environmental and Social Impact Assessment (ESIA) prepared in 2019 to relocate the ATC tower outside the Reserve.

The latest design received confirms the relocation of the ATC tower outside the environmental sensitive area.

The updated Architectural Drawings of the ATC are shown on Figure 1-4.

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 Obstacle Limitation Surfaces (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 breakout 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 either within the ATC tower or as a separate component building itself. Combinations could be:

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

Figure 1-4: Updated Architectural Drawings of the ATC (Preliminary Design)

1.2.6 Rescue and Fire Fighting Services

The Rescue and Fire Fighting Services (RFFS) consist of a Fire Station and a Sea Rescue Facility.

1.2.6.1 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 an observation 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 ensure adequate water supply during emergency situations. The capacity of the new water storage tanks will need to cater to the enhanced service requirements.

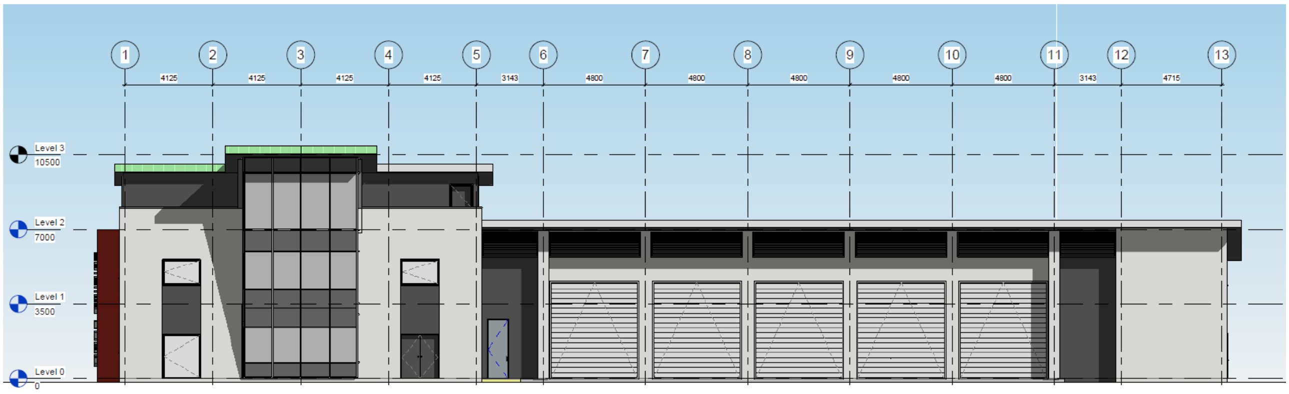
The Preliminary Design located the new RFFS together with the ATC east of the airport, close to the Anse Quitor River, i.e., within the limits of the critical habitat.

The ESIA prepared in 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.

The current architectural drawing received show a G+2 building

Figure 1-5: Rescue and Fire Fighting Services – South Elevation (updated 2022)



1.2.6.2 Fire Training Facility

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

According to information received, no fire training facility is planned as part of phase 1 airport expansion; there for its assessment is not undertaken in present ESIA.

Notwithstanding the above, should a fire training facility be provided at a later stage, it will need to be assessed in as much as air pollution (from burning) and ground/underground pollution (from runoff water/foam dispersion from firefighting) are concerned.

1.2.6.3 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, a boat house, platform and boat ramp will be provided for the National Coast Guards, as per available details:

- Boat House
- Platform 50m long by 15m wide; 1.7m above mean sea level (amsl) on the ground side and 1.2m amsl on the sea side
- Boat ramp 64m long by 15m wide directly connected to the boat house
- Ancillary facility: access road from airport 7m wide; car park

Figure 1-6: Sea Rescue Facility – extract from Drawing No 243/DD/CE/SK/09

1.2.7 Ancillary Facilities within the Scope of Phase 1 Airport Expansion

Refer to Figure 1-3 as updated for siting of the ancillary facilities.

1.2.7.1 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 using tankers. 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 upgrading of the fuel farm falls outside of the scope of activities supported by this project.

1.2.7.2 Power Centre

A new Power Centre consisting of a Ground Floor (GF) only, 272m^2 building is scheduled and will encompass amongst others the following rooms: metering, low voltage, Transformer and high voltage, Central Control Room, workshop, store, kitchen, mess, toilets, together with a generator room with 2 stand-by generators.

1.2.7.3 Quarantine Building

A quarantine consisting of GF only 454m^2 building is scheduled and will encompass amongst others the following rooms: consultation, nursing, donning, treatment, quarantine (high Risk), quarantine (low Risk), waiting, sanitary facilities, etc.

1.2.7.4 Meteorological Building

A new meteorological facility of GF+1 208m^2 building is scheduled and will encompass amongst others the following offices, dormitories, observation room at First Floor, sanitary facilities, etc

1.2.7.5 Incinerator

An oil-fired incinerator of capacity 75kg/hr shall be provided as part of the airport facility to handle only organic waste (kitchen wastes, all non-conforming consignments, detained plants/ dead animal). All non-organic waste will be handled under a solid waste management plan (refer section 1.2.8.4).

The incinerator will be operated by the National Plant Protection Office (NPPO).

ARL has confirmed the use of Directive 2000/76/EC [1]of the European Parliament and of the Council of 4 December 2000 on the incineration of waste.

Performance specifications will be drafted by the Consulting Engineers to meet the above directive.

- Location: as shown Drawing General Layout for ESIA Phase 1 Update (M243/DD/CE/SK/17)
- Chimney details - These are expected to range between the following values:
  - Height of chimney - 6 to 8 m.
  - Diameter of chimney - 300 to 500 mm.
  - Speed of exhaust gas - 12 to 15 m/s.
  - Temperature of exhaust gas - < 500 deg C.

[1] https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32000L0076

- The limits of the pollutants will be specified as per Directive 2000/76/EC which includes the following (daily average value):
  - Particulate matter - 10 mg/m^3
  - HCl -10 mg/m^3
  - SO_2 - 50 mg/m^3
  - NO_x - 400 mg/m^3

To achieve the above limits there will be a specific treatment of fumes to ensure compliance with the limits of pollutants in the air emissions, using either humid or dry treatment technology. This is because, humid treatment will have, in addition, impacts on wastewater management due to liquid effluents generated, compared to dry treatment which will generate solid wastes.

1.2.7.6 Airport Perimeter Road

The existing airport external perimeter road will be reused and extended where required.

On its eastern side, the existing perimeter road passes between the fencing of the Anse Quitor Nature Reserve and the airport.

Where this perimeter road will be used during construction as haulage route, it might require strengthening and widening/realignment of bends.

1.2.7.7 New Passenger Car Park

The existing passenger car park will be extended northwards and eastwards.

This extension entails the conversion of land which is currently under agricultural use.

1.2.8 Ancillary Utilities and Services

1.2.8.1 Surface Water Drainage

The general layout of the Surface Water Drainage is shown on Drawing No. M243/DD/CE/SK/16.

Two outlets are provided, namely:

- Outlet 1 which caters for surface water from the taxiway and apron and discharges into a low lying area within the airport perimeter (Figure 1-7), and
- Outlet 2 which discharges at sea (Figure 1-8).

Figure 1-7: Surface Water Drainage - Outlet 1 (discharge to land/underground)

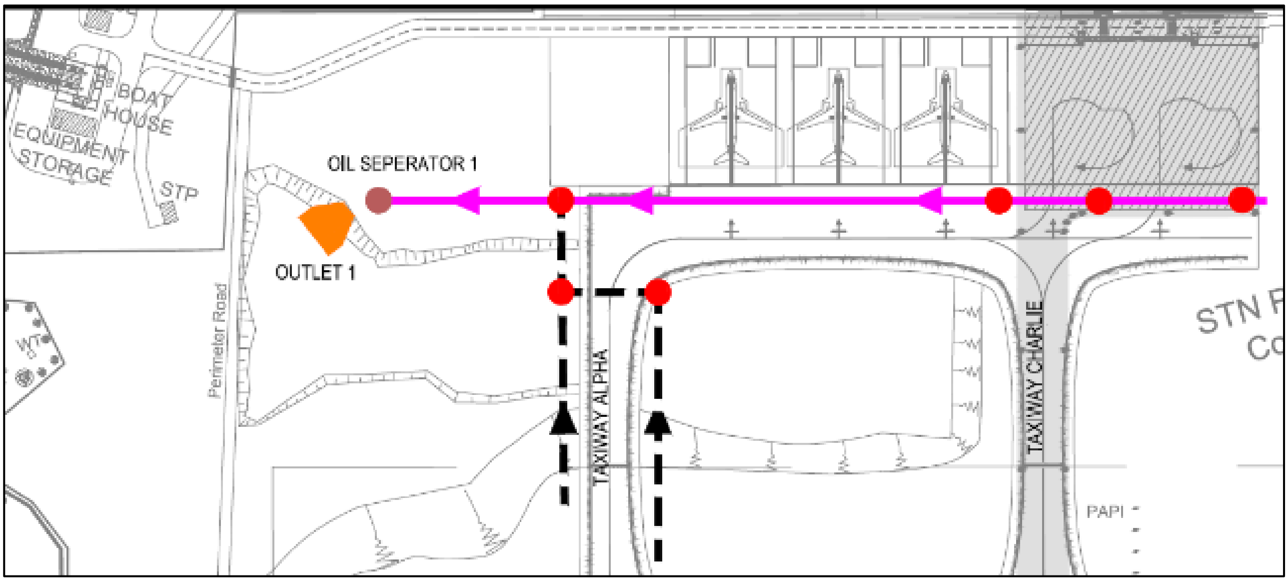
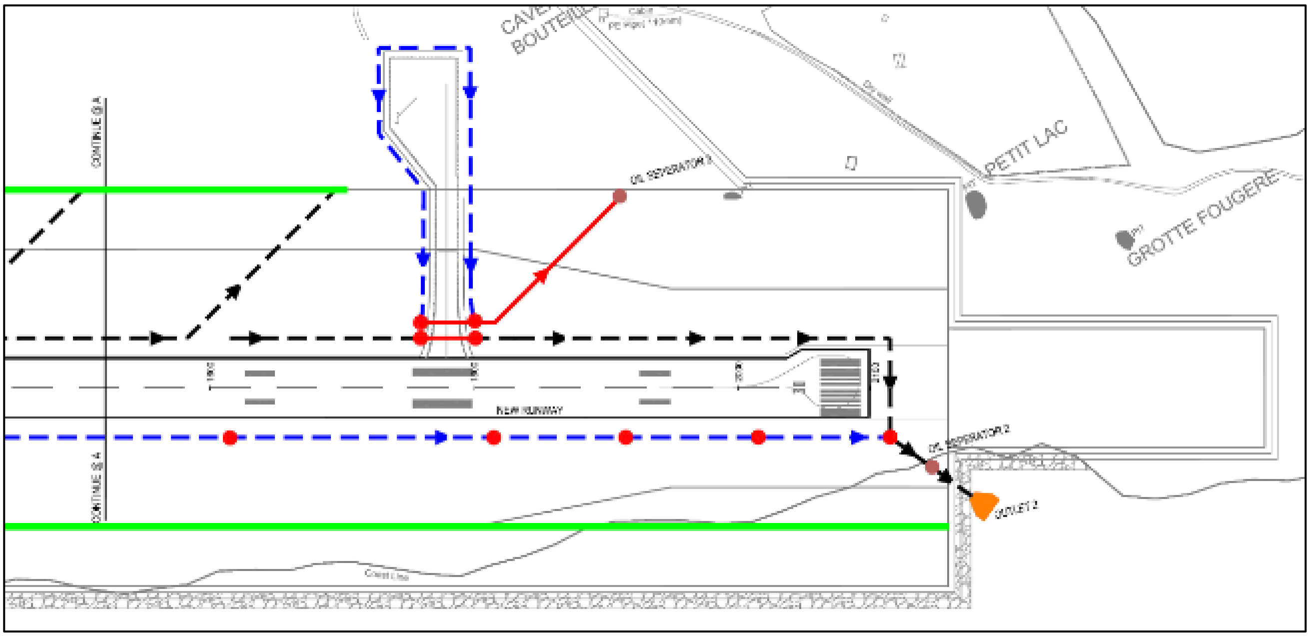


Figure 1-8: Surface Water Drainage - Outlet 2 (discharge at sea)



The surface water drainage discharge to land/underground would have to meet the Standards for discharge on land/underground set under the Environment Protection (Standards for effluent discharge) Regulations 2003 (refer chapter 3) at the minimum and the storm water management measures as set out in the World Bank Group Environmental, Health and Safety General Guidelines.

Likewise, the surface water drainage discharge at sea shall have to meet the Standards for discharge on land/underground into the ocean set under the Environment Protection (Standards for effluent discharge) Regulations 2003 (refer chapter 3) at the minimum or any other more stringent standards as set out by Good International Industry Practices for Airports operations.

1.2.8.2 Potable Water Supply

The airport currently relies on three main sources of water for both its daily operations and for firefighting storage:

- Supply from the potable water network managed by the Rodrigues Regional Assembly (RRA), Commission for Water Resources.
- Supply from rainwater harvested from the airport's roofs which is collected and stored in adequate reservoirs, and
- Supply by lorry from RRA facilities, obtained from a borehole located in Mourouk (south-east of Rodrigues) managed by the RRA.

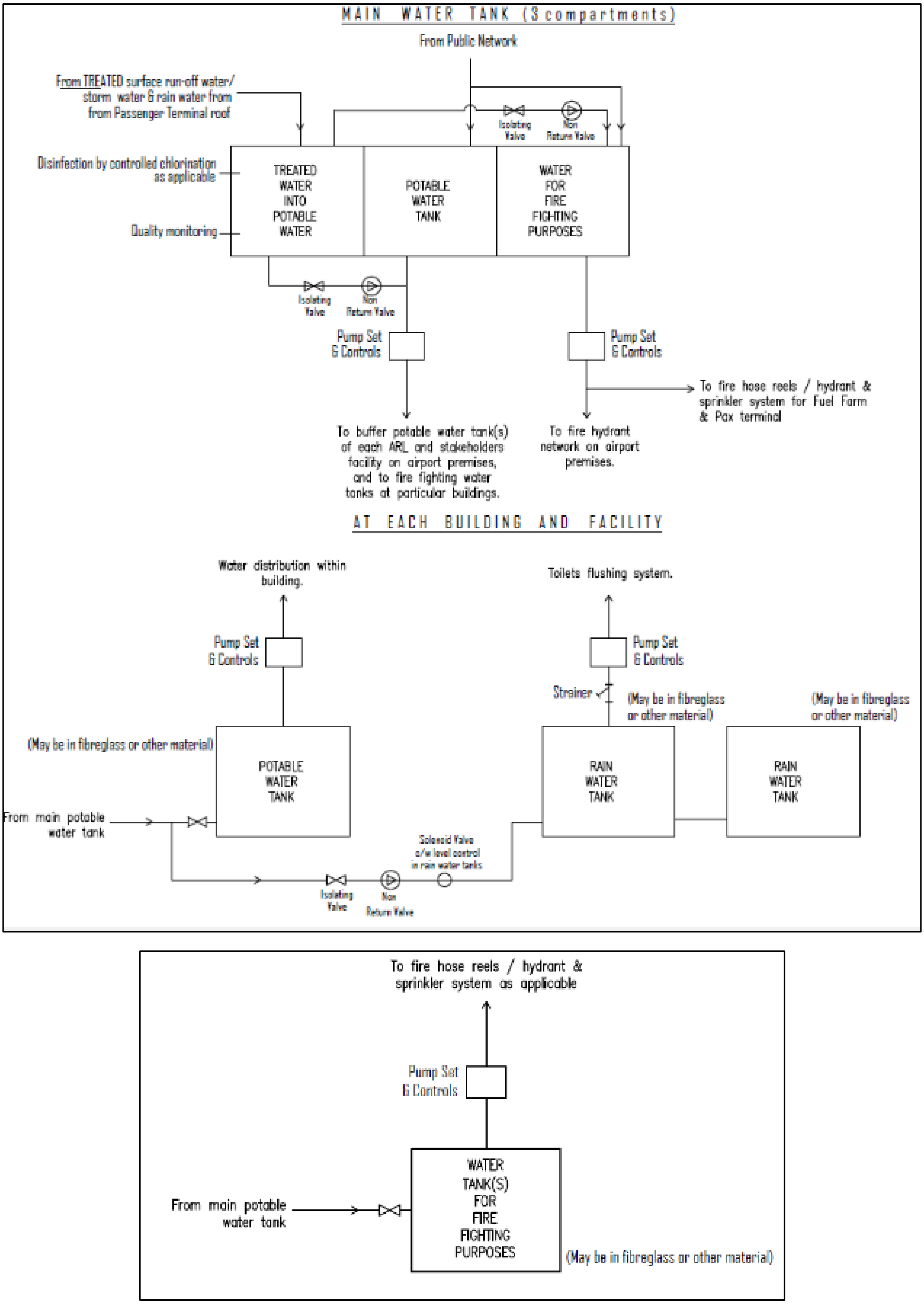
The current peak water demand is 11 m^3 per day which coincides with the peak period during the months of November, December, January and August. With the expansion of the airport, it is estimated that a water demand of 30 m^3 per day will be required.

Whereas the potable water supply strategy for the airport has not yet been finalized, the following streams are considered:

- Same three sources of water
- Supply from the potable water network
- Supply from rainwater harvesting
- Supply by lorry from RRA facilities
- Treated recycled water from "clean" surface runoffs (including green areas) and from the wastewater treatment, but for non-domestic uses only, namely irrigation, cleaning, firefighting backup (if necessary) and other industrial uses.

The diagram below illustrates the schematics of the water distribution network for the new airport. While provision will be made for the contractor to provide for a desalination plant to meet his daily water demand during construction phase, it is planned that the desalination plant will be handed over to ARL after the construction phase. The same shall be used during the operational phase.

Figure 1-9: schematics of the water distribution network for the new airport



1.2.8.3 Wastewater Treatment Plant

The airport currently relies on its own onsite Wastewater Treatment Plant (WTP) consisting of a septic tank and a leaching field; which corresponds roughly to a primary treatment. However, it is understood that, since the system does not work properly, the sewerage is being pumped from the septic tank at regular intervals and disposed of at municipal wastewater treatment plant located at Grenade.

A new full fledge WTP will be provided in the context of the expansion of the airport with a minimum design capacity of the 25-30 m^3 daily and with primary, secondary and tertiary treatment. The design of the plant shall be scalable to cater for future increase in passenger traffic.

The existing WTP will be dismantled once the new WTP is operational.

1.2.8.4 Solid Waste Management

There is no solid waste management plan currently in place at Plaine Corail Airport. All solid waste is disposed by RodClean company, a scavenging company which is responsible for the collection and management of solid waste in Rodrigues.

Following the RRA initiative to proceed with waste sorting in Rodrigues, it is now that ARL will embark to establish an onsite waste sorting aiming mainly at sorting and collecting PolyEthylene Terephthalate bottles for recycling.

A solid waste management plan shall be set up with a 3R initiative, i.e. "reduce”, “reuse" and "recycle”.

This plan shall be devised in consultation with the key stakeholders being the RRA and local companies involved in waste handling and management and taking into account the various possibilities in Rodrigues (reuse, recycling, dumping).

1.2.9 FACILITIES ASSOCIATED WITH CONSTRUCTION

1.2.9.1 Temporary workers camp, site establishment, yard, etc

Temporary facilities associated with the construction phase are shown on Drawing No M243/DD/CE/SK/07 and include the following areas for workers’ camp (area A), site establishment and offices (area B), yard/heavy equipment/garage/workshop (area C).

The northern perimeter track and the access for heavy equipment is also shown on the drawing.

Due consideration is being given to the clustering of the workers’ camp, site establishment and offices into a single larger area, to be located at area B widened.

1.2.9.2 Temporary Services

Key temporary services during construction include potable water supply, water for construction, electricity supply and waste management (solid and liquid).

Potable water supply: It shall be the Contractor’s responsibility to see to the provision of adequate potable water. The same sources as for operation are to be considered (Refer section 1.2.8.2. above); in addition, the provision of a desalination plant or provision of atmospheric water generators are to be investigated. Necessary approval and permits shall be sought by the contractor from the competent authorities and the client’s representative. As part of this ESIA, generic impacts associated with the installation of a desalination plant have been assessed to the extent possible, and generic mitigation measures provided.

Water for construction: Likewise, water will be required for construction. It shall be the Contractor's responsibility to identify sources of water. Necessary approval and permits shall be sought from the competent authorities and the client's representative.

Electricity supply: It shall be the Contractor's responsibility to estimate its electrical load required for construction and apply to temporary electricity supply during construction from the competent authorities. Any use of temporary generators shall be done after careful assessment and approval from the client's representative.

Solid waste management: It shall be the Contractor's responsibility to set up its solid waste management plan in consultation with the competent authorities and the client's representative.

Liquid Waste Management: domestic wastewater emanating from the temporary establishments including from the workers camp is to be treated in a WTP to tertiary level. Water shall be as far as practicable reused for construction. Any water to be discharged in the environment will be tested prior to being released.

1.2.9.3 Strengthening of existing perimeter track road to be used as haulage route

Refer section 1.2.7.6. above

1.2.10 QUARRY/BORROW AREA

The following quarry/borrow areas have been identified: primary options: Ste Marie Hill and Mont Travers, secondary (unlikely) option: Mont Topaze, all of which are shown on Drawing M243/DD/CE/SK/08.

1.2.10.1 Ste Marie Hill

Ste Marie Hill is located within the airport perimeter and shall have to be cut for the purpose of implementing the new runway. The cut will be undertaken hydraulically/mechanically; there shall be no blasting.

The outcome of the geotechnical interpretative report is positive and confirms that 95 % of the material under the St Marie Hill and surrounding areas is usable as fill material. This represents some 2.6 million m^3 of soil.

The haulage route is not an issue since Ste Marie Hill directly adjoins the area earmarked for the stockpiling of materials.

1.2.10.2 Mont Travers

Mont Travers is located north of the airport perimeter and shall have to be cut for the purpose of implementing the ATC and RFFS. The cut will be undertaken hydraulically/mechanically; there shall be no blasting.

The outcome of the geotechnical interpretative report is positive and confirms that apart from 250 mm of topsoil/unsuitable material, there is 175,000 m^3 of suitable material for fill under the Mont Travers area.

The haulage route from Mont Travers to the area earmarked for the stockpiling of materials will be through a temporary access track, that will need to be constructed from the borrow area along the existing airport perimeter road.

1.2.10.3 Mont Topaze

Mont Topaze was considered as an alternative should there be a lack of materials suitable for engineering fill from Ste Marie Hill and Mont Travers and should the material from Mont Topaze be suitable. There is currently a total of 2.75 million m^3 of suitable fill material with Ste Marie Hill and Mont Travers.

The required volume of fill calculated for Option 3 at the Preliminary Design Stage was 2.1 million m^3. Therefore, the possibility of using Mont Topaze as borrow area is very remote as the iterative calculations for the balancing of cut and fill is being carried out with amendment of the longitudinal profile of the runway in order to have a slight surplus rather than shortfall

The assessment of Mont Topaze is not within the scope of the present ESIA. Should there be a need to utilize Mont Topaze, an addendum to the present ESIA report will be undertaken as well as the ESMP.

1.2.11 DEMOLITION

Demolition of existing buildings being vacated houses, agricultural buildings and other ancillary buildings located in the airport expansion footprint will be undertaken hydraulically/mechanically.

It is understood that demolition waste is not suitable for engineering fill and hence it will have to be carted away. Demolition waste could either be reused for backfilling where possible or disposed of at Mont Plate, a quarry which is being used and then backfilled with inert construction waste.

1.2.12 SOURCING OF CONSTRUCTION MATERIALS

Based on the current design information, it is estimated that the following quantities of key construction materials will be required for the construction of the runway and ancillary facilities namely:

- 10,000 tons of bitumen
- 12,000 tons of cement
- 1,000 tons of re-enforcement bars.

It will be the responsibility of the contractor to source suppliers for the construction materials. Currently there are no known suppliers on the island from which materials can be sourced, therefore it is anticipated that the construction materials will need to be imported by sea from mainland Mauritius via Port Mathurin and transported by road to the construction site.

The main storage location has been earmarked as discussed previously; secondary storage areas and estimated quantities that will be imported and stored at a given time will depend on the contractor’s implementation schedule. Therefore, the impacts associated with the storage of material and production of asphalt will need to be assessed separately and mitigations provided in the contractor’s management plans once the details are known.

1.3 PROJECT TIMELINE

Project timeline and milestones have been updated by ARL/AML as follows:

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

1.4 COST AND INVESTMENT

The project's preliminary cost estimated as per Design of 2019 was MUR 3,923,013,815.

The updated cost estimated provided by the Consulting Engineers Gibb (Mauritius) Ltd stands at MUR 7,679,918,800.

Table 1-1: updated cost estimated 2023

Item No	Description	Amount (MUR)
1	Preliminary & General Items	1,167,341,881
2	Airside Infrastructure and Facilities	4,432,204,714
3	Building Works	482,844,562
4	Civil & Utility Works	250,129,982
5	Air Navigation Facilities	215,310,147
6	Dayworks	38,720,000
	Subtotal	**6,586,551,285**
	Contingency Sum - 10%	**658,655,130**
	Variation in Price - 6%	**434,712,385**
	Grand Total (Exc VAT)	**7,679,918,800**

1.5 PROJECTED TRAFFIC

1.5.1 PASSENGER TRAFFIC

The feasibility report prepared by the consultant 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 in table 1-2 below, and it can be seen that these have increased faster than expected.

Table 1-2: 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 Rodriguan 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 Rodriguan 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 in table 1-3 below and are compliant with the RRA tourism objectives.

Table 1-3: 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

Year	Actual Passenger Arrivals	Forecasted Arriving Passengers
2028		127572
2029		130812
2030		134135
2031		137542

1.5.2 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 in table 1-4 below:

Table 1-4: 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 in table 1-5 below:

Table 1-5: 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, example, December departures being three times those of February.

1.5.3 CARGO

An A321 aircraft can take about 4 tons of cargo on board.

Cargo projected traffic is not available yet.

For the time being, there is a plan to use the transport capacity of passenger aircraft and not to charter aircraft specifically for air freight. Table 1-6 shows the aircraft departures for 2021.

Table 1-6: 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	
Jan	9.40%	10,059	2271	13.64	14	62	15.77	16	71	14
Feb	5.05%	5,409	1352	8.12	8	32	9.39	9	36	8
Mar	6.08%	6,508	1469	8.83	9	40	10.20	10	44	9
Apr	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
Jun	5.28%	5,656	1320	7.93	8	34	9.16	9	39	8
Jul	8.98%	9,608	2169	13.03	13	58	15.07	15	66	13
Aug	9.11%	9,748	2201	13.22	13	58	15.29	15	66	13
Sept	5.82%	6,232	1454	8.73	9	39	10.10	11	47	9
Oct	8.12%	8,693	1963	11.79	12	53	13.63	14	62	12
Nov	10.58%	11,323	2642	15.87	16	69	18.35	18	77	16
Dec	15.66%	16,761	3785	22.73	23	102	26.28	26	115	24

* Mixed Fleet is 80% A321 neo + 20% B737-800

1.6 OVERVIEW OF THE PROJECT AREA OF INFLUENCE

The Project area of influence is 'the area likely to be affected by the project, including all its ancillary aspects, such as power transmission corridors, pipelines, canals, tunnels, relocation and access roads, borrow and disposal areas, and construction camps, as well as unplanned developments induced by the Project'*(World Bank).*

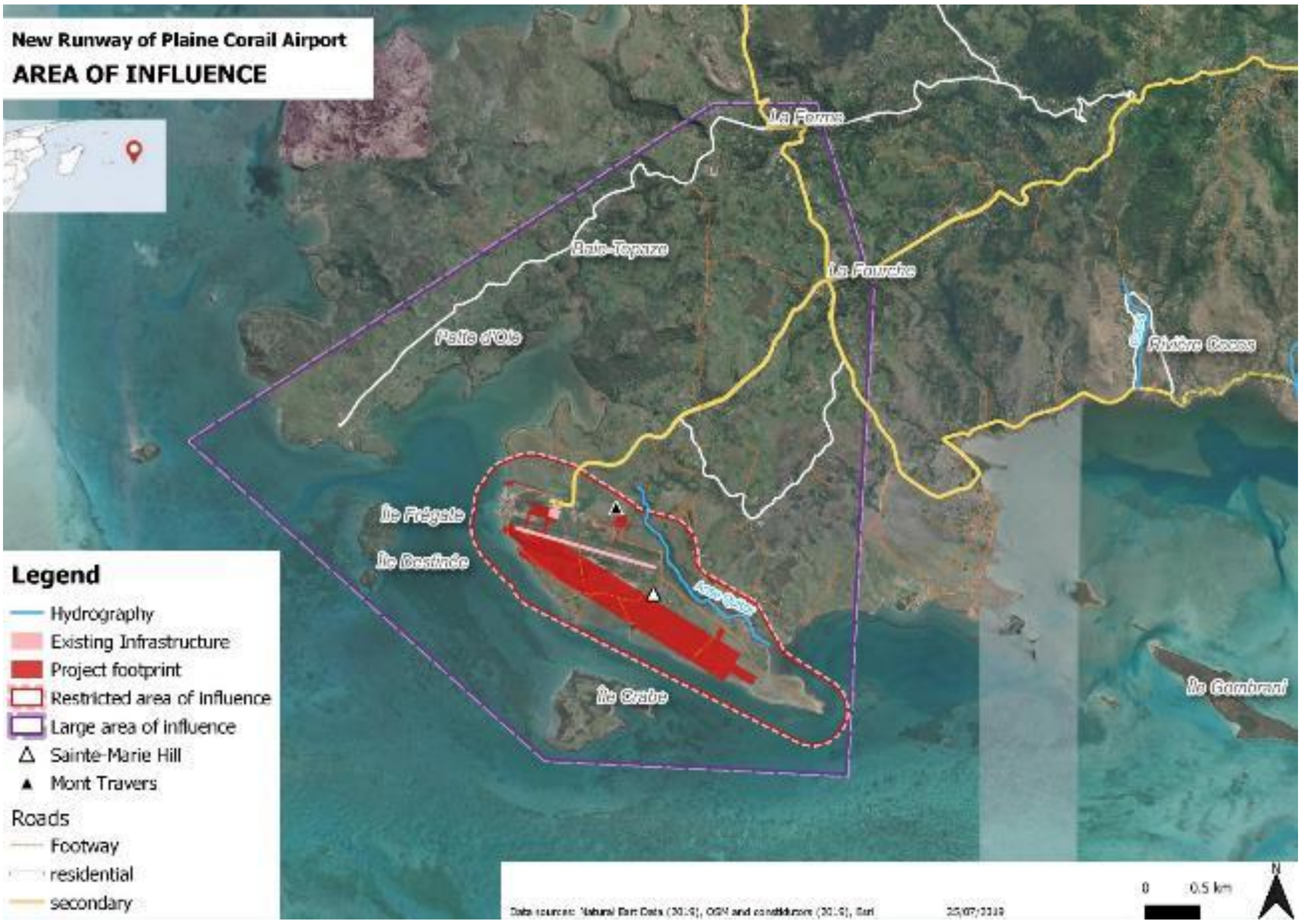
The ESIA has been prepared based on the definition of several specific areas of influence when considering the following components:

- Physical environment (climate, geology, coastal and marine environment, river, estuary, hydrology and hydrogeology)
- Biological environment (terrestrial and marine biodiversity)
- Traffic infrastructure and services
- Social environment including areas used for livelihood activities, for resettlement
- Airshed for air and noise
- Heritage and visual environment

Figure 1-10 below provides an overview of the project site and the areas that may be affected by the project's direct and indirect impacts.

Given the type of project and the size of the island, the area that may be affected by the project's cumulative impact can be as large as the island itself in as much as Traffic impacts, social impacts (both positive and negative) amongst others, are concerned.

Figure 1-10: Overview of the Area of Influence



1.7 Environmental and Social Standards and Plans Required

Through consideration of the details of the project presented above, the table 1-7 below indicates the need for the preparation of specific environmental and social instruments to be prepared to meet the requirements of the World Bank Environmental and Social Standards (ESS1 through ESS10).

Table 1-7: ESSs and Key Plans Required

Key Requirements of WBG Environmental and Social Standards	***Key Plans Required***
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	Environmental and Social Impact Assessment (ESIA) including cumulative impact assessment (this document) Environmental and Social Management Plan (ESMP) Environmental and Social Commitment Plan (ESCP) Construction ESMP (C-ESMP)
ESS2: Labour and Working Conditions	Labour Management Plan Occupational Health and Safety plan

Key Requirements of WBG Environmental and Social Standards	***Key Plans Required***
	Emergency Preparedness and Response plan Construction Occupational Health and Safety (OHS) plan
ESS3: Resource Efficiency and Pollution Prevention and Management	Water management and groundwater monitoring plan Stormwater management plan Waste management plan (construction and operations) Hazardous material management plan Quarry management and rehabilitation plan
ESS4: Community Health and Safety	Community OHS plan Emergency Preparedness and Response plan Construction Health and Safety (CHS) plan Traffic Management Plan Air quality and noise monitoring plan Sexual Exploitation and Abuse and sexual harassment (SEA/SH) action plan
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Resettlement Action Plan (RAP) Audit Resettlement Action Plan update in case future resettlement is identified Livelihood restoration plan
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Marine Biodiversity Management Dredging (if applicable) and Reclamation Management Plan Terrestrial Biodiversity Management Plan
ESS8: Cultural Heritage	Palaeontological management plan (if applicable) Chance finds Procedure as part of the ESMP
ESS10: Stakeholder Engagement and Information Disclosure	Stakeholder Engagement Plan (SEP)

1.8 DRAWINGS REFERRED TO IN THIS CHAPTER OF PROJECT DESCRIPTION

The following drawings referred to in this chapter, prepared by the Consulting Engineer GIBB are attached:

- Earthworks & Rock Revetment: Drawing No. M184/CE/RG/LA/18
- Land Reclamation: Drawing No. M243/DD/CE/SK/06
- Surface Water Drainage: Drawing No. M243/DD/CE/SK/16
- Temporary facilities associated with the construction phase: Drawing No M243/DD/CE/SK/07
- Quarry/borrow areas: Drawing M243/DD/CE/SK/08.

Figure 1-11: Earthworks & Rock Revetment: Drawing No. M184/CE/RG/LA/18

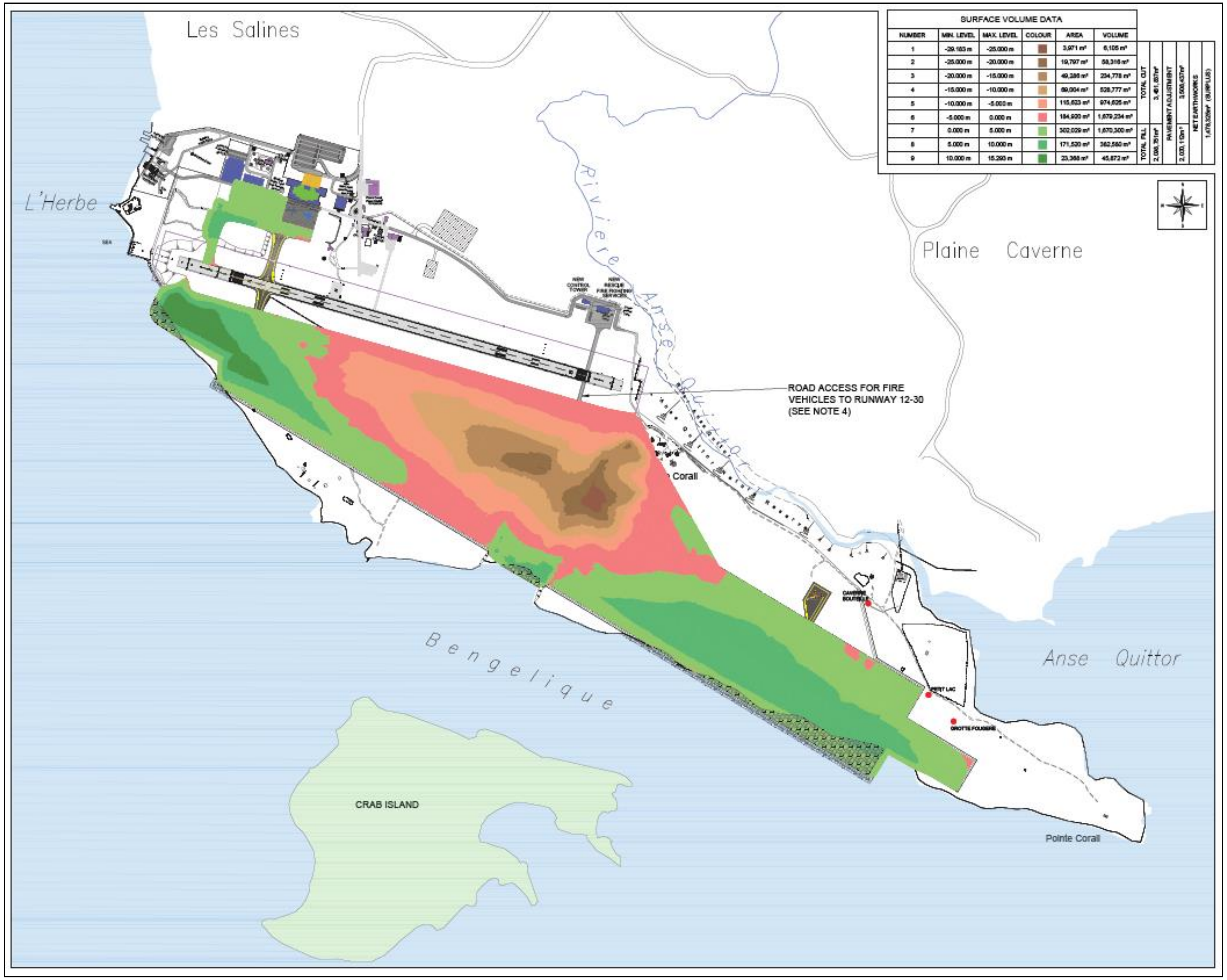


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Figure 1-12: Land Reclamation: Drawing No. M243/DD/CE/SK/06

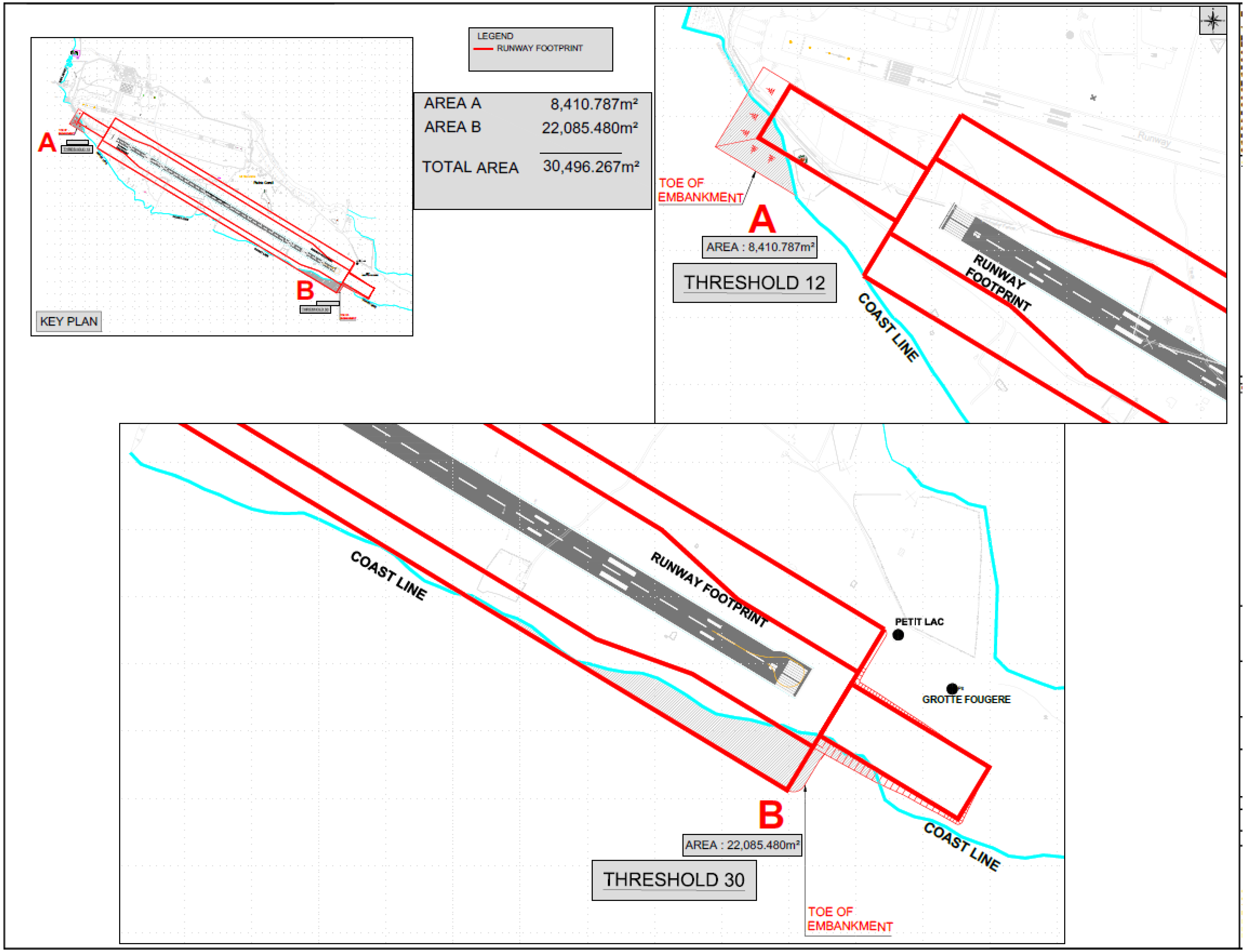


Figure 1-13: Surface Water Drainage: Drawing No. M243/DD/CE/SK/16

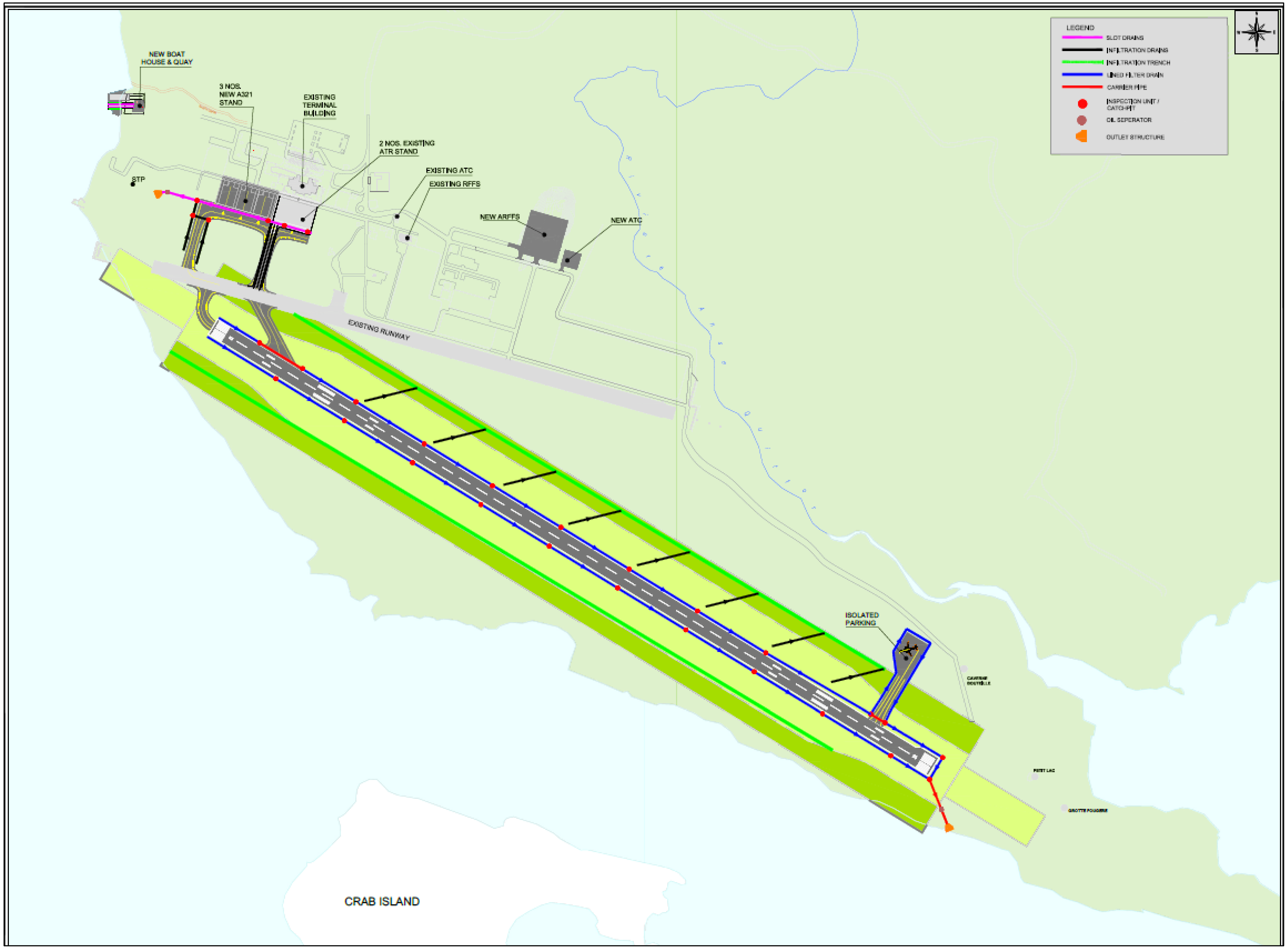
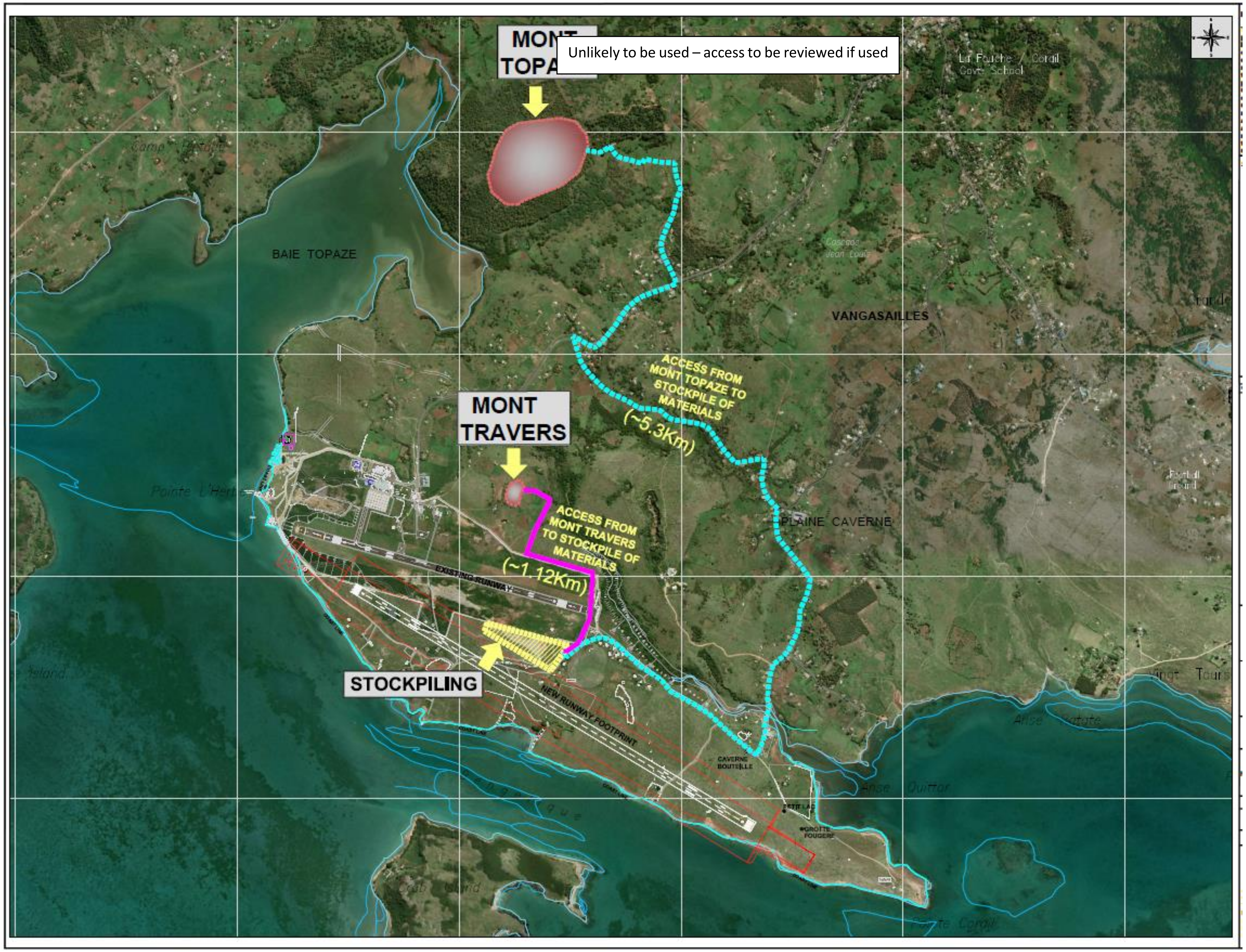


Figure 1-14: Temporary facilities associated with the construction phase: Drawing No M243/DD/CE/SK/07

Figure 1-15: Quarry/borrow areas: Drawing M243/DD/CE/SK/08



2 BASELINE DATA

2.1 SCOPING AND METHODOLOGY

2.1.1 SCOPING

The ESIA was conducted in compliance with both the Mauritius Environmental Protection Act 2002 and the requirements outlined in the World Bank Environmental and Social Framework.

The objective of the ESIA is to identify potential environmental aspects that could be directly or indirectly affected by the project. To pinpoint the main topics to be studied, experts were consulted, and this methodology was utilized to ensure that the study focused on the actual potential impacts of the airport project and to determine the extent of investigations that should be conducted for each subject.

The following tasks have been undertaken:

- Desk review of available data,
- Site investigations,
- Consultations with interested parties,
- Consultations with specialists.

Specialist studies are appended to and form part of this report; this chapter is a summary of key findings.

The project refers to the expansion of an existing airport, thus the project area is already an airport site. The environment is open, very sparsely populated, and essentially used for extensive agriculture and fishing. There are no forests or 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 aspects were the subject of campaigns in 2019 to assess the existing system:

- Terrestrial natural environment (field investigation carried out in April 2019)
- Marine natural environment (field investigation carried out in May-June 2019)
- Hydro-sedimentary context (field investigation carried out in May-June 2019)
- Hydrology and water management (field surveys carried out in May 2019)
- Socio-economic context (field survey carried out in April 2019)

To supplement the information gathered during the 2019 surveys, several additional studies were undertaken in 2023 as part of the ESIA update.

As geotechnical investigations were undertaken recently, no complementary field investigations were carried out this year.

2.1.2 BASELINE ASSESSMENT METHODOLOGY (RECEPTOR SENSITIVITY)

The first step is a presentation of the general state of the project area. This global presentation aims to define the current state (baseline), before the implementation of the project. It is a description that takes into account several aspects (physical context elements, natural context elements...).

The objective is to identify all the "receptors" which could be potentially affected, directly or indirectly, by the implementation of the project.

For each of these receptors, the 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 baseline, the issues are listed and their sensitivity is assessed and rated using the following rating: 1 "low", 2 "medium", 3 "high" or 4 "major". In addition, a gradient of blue is associated with each score to emphasize each rating. Thus, the higher the importance of the issue, the more intense the shade of blue.

Table 2-1: Receptor sensitivity

Receptor sensitivity	Low	Medium	High	Major

2.2 AREA OF INFLUENCE

Several Areas of Influence have been defined to establish the baseline of the project 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.

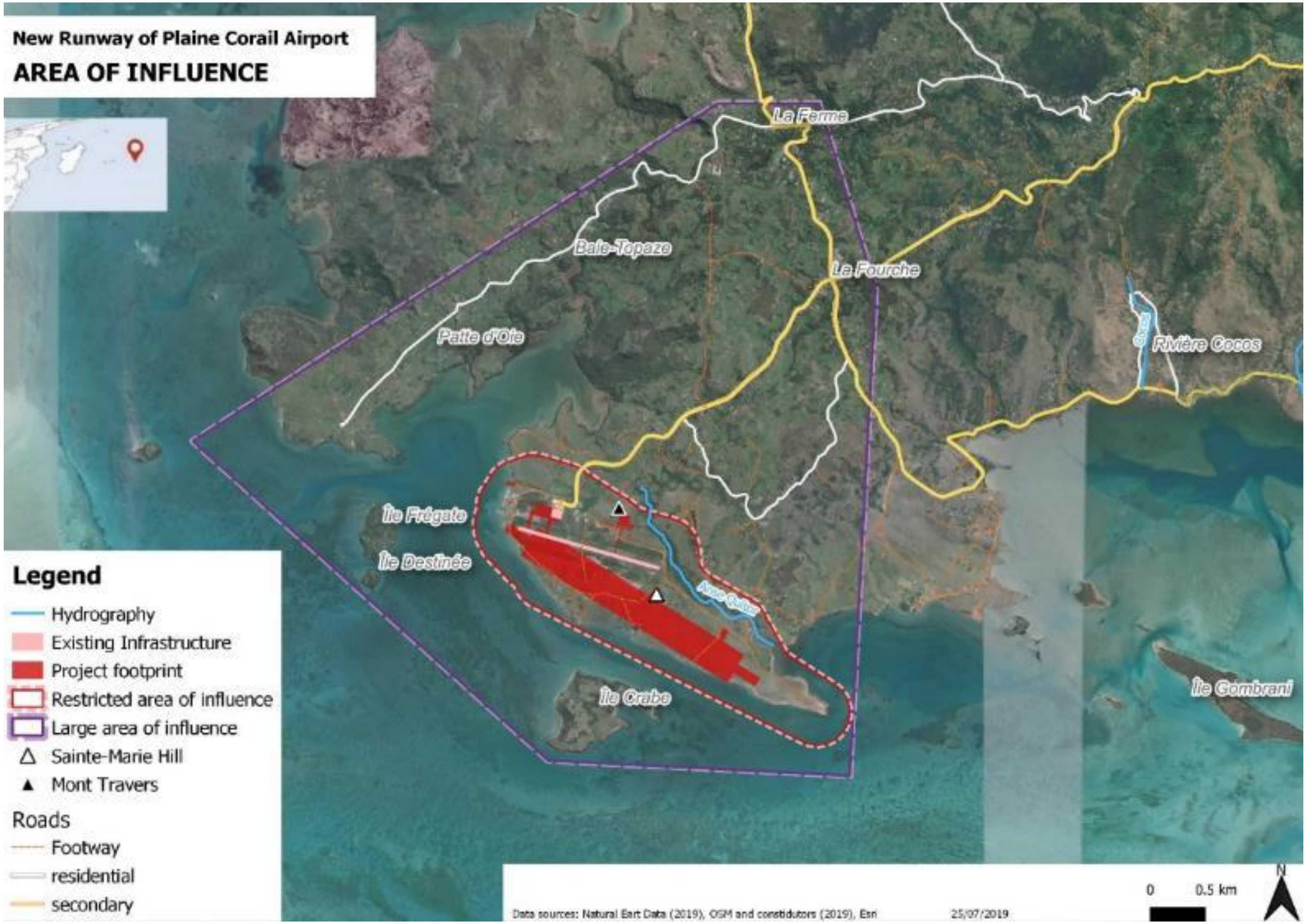
The project's footprint is included in the restricted area.

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.

The area of influence applied is specified at the beginning of each section.

Figure 2-1: Area of influence – General Overview



2.3 PHYSICAL ENVIRONMENT

2.3.1 AREA OF INFLUENCE

The area of influence for the physical context is shown in figure 2-1. The terms large and restricted areas of influence discussed previously are used.

2.3.2 GEOGRAPHICAL OVERVIEW

Rodrigues, like Mauritius or Réunion islands, 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 side of the island from Plaine Corail to the northeast.

Rodrigues Island strikes East-West. Although of modest elevation (the highest peak, Mount Limon, rises to 398 meters), 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, situated between 50 meters and 8 kilometres from the coastline. This vast lagoon is generally shallow and is punctuated with several islets that emerge from its waters.

Figure 2-2: Geographical overview of Rodrigues Island

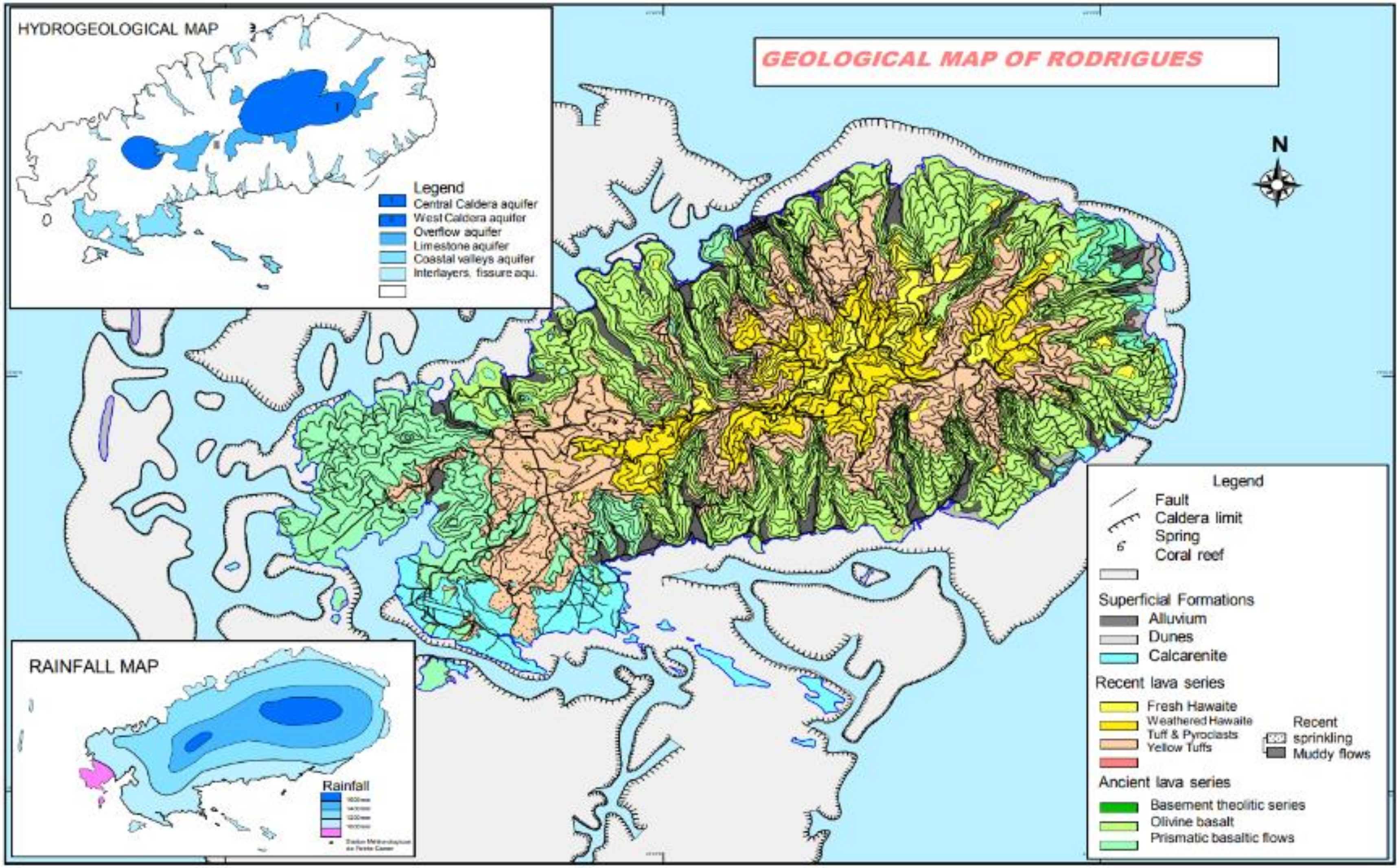
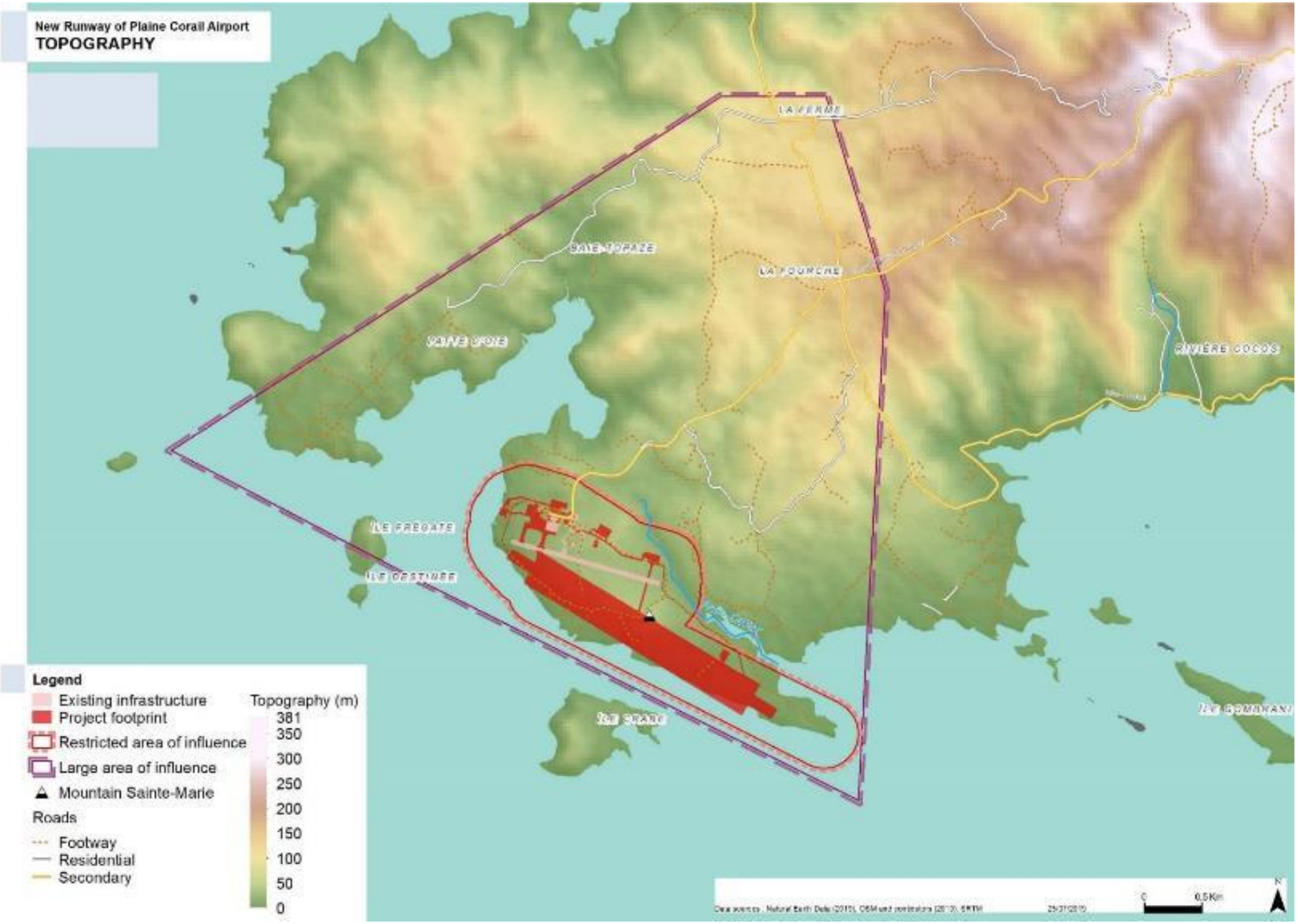


Figure 2-3: Topography of the area of influence



2.3.3 CLIMATE AND MARINE AND TERRESTRIAL METEOROLOGICAL CONDITIONS

The purpose of this section is to present the specific climatic and meteorological conditions of Rodrigues Island, which are influenced by its geographical location, wind, currents, swells, waves, and water level conditions.

This chapter will also examine extreme weather events that may occur on the island. The significance of analyzing these conditions is essential because the proposed project involves significant earthworks and modifications to the coastline. These modifications may have an impact on marine currents and sedimentation, which could affect the marine life of the reef and the balance of erosion. This inventory of conditions is a prerequisite for the hydro-sedimentological modeling planned for the impact analysis.

Furthermore, it is important to analyze the potential risks associated with the arrival of large aircrafts on the island, particularly during extreme weather conditions. To this end, a coupled numerical wave-current-sediment transport model (two-dimensional horizontal approach, 2DH) was constructed and operated to simulate flows, waves, sediment transport, winds, and their mutual interaction with the reef. These simulations were synthesis performed based on the current state of the island, considered as the baseline conditions.

Please refer to the 'Maritime Impacts Factual Report' for the complete description.

2.3.3.1 Numerical hydrodynamic modelling

Hydrodynamic 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.

Simulations carried out

To assess the impact of the structures, three types of simulations are carried out:

The reference simulation: This is the current situation with no extension of the runway into the ocean.

The construction phase simulation: The runway is under construction hence the modified topography; turbid plumes are propagated during the construction work.

The final phase of construction: The runway is built, resulting in modified topography; potential new water discharges (brine or wastewater) are made.

2.3.3.2 General geographical and climatic considerations

Rodrigues, one of the three islands of the Mascarene Islands, is located near the limit of the southern tropical belt and is free from the influence of large land masses or continents. The island's climatological regime is characterized by a mild maritime tropical climate that is divided into two seasons: winter (May to October) and summer (November to April).

Summer is the rainiest and hottest season, during which tropical cyclones occur. Winter is cooler and relatively drier. October is the driest month, and February is the wettest.

The average annual rainfall on Rodrigues is 1348 mm, which is equivalent to about 150 Mm^3/year for the whole island.

Rainfall ranges from 800 mm on the coast to more than 1600 mm on the peaks.

The most frequent natural disasters that Rodrigues is confronted with are cyclones and high-intensity rainfall over short periods of time that lead to flash floods or water accumulations.

2.3.3.3 **Winds and Cyclones**

The study area is characterized by a mild tropical maritime climate and is year-round influenced by two persistent wind systems: south-easterly trade winds and Austral westerly winds, which are subject to seasonal variations. The geographical location of the island, near the Inter-Tropical Convergence Zone (ITCZ), is the reason for this wind pattern.

During the summer season, the subtropical anticyclones weaken and move towards the pole, resulting in weaker trade winds. Conversely, in winter, when strong anticyclones pass to the South and move close to the Mascarene Islands, the trades are stronger and more persistent. This is because they are migrating equatorward and then moving eastwards along the southern high latitudes.

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.

As it is located in the cyclone belt, Rodrigues can be affected by cyclones from the east from November to April. On average, ten named tropical depressions are tracked in the South-West Indian Ocean with three of them reaching tropical cyclone intensity.

2.3.3.4 **Sea Currents**

Deep water offshore current

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. 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.

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 the ebb and flow tide currents. They are tide generated, the wave height inside the lagoon is very small. During light wind and strong tide coefficient, the current can briefly reverse. Baie Topaze is away from the main North-Western current and relatively current free.

Current inside the lagoon

The hydrodynamics of the reef lagoon are complex due to exposure to various physical events such as tides, waves, winds, river discharge, rainfall, and evaporation. Density-driven currents have been observed between the lagoon and ocean. The circulation patterns within a lagoon are primarily influenced by the spatiotemporal variations of hydrodynamic parameters such as waves, winds, and tides.

The coral reef that surrounds Rodrigues serves as a natural barrier, protecting adjacent shorelines from offshore coastal hazards such as tropical cyclones approaching from the northeast, southern hemisphere swells, and locally generated waves.

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 2-4: Pass 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 outside the coral reef. Bathymetry varies from 20 cm depth to 26.40 m and connects Anse Grand Var to the Ocean.

Another pass is located in the western part of the reef and participates, to a smaller extent, in the flushing of the lagoon.

Current between Baie Topaze and Anse Quitor

The channels between Crab Island and Plaine Corail, Fregate Island and Destinee Island, Fregate Island and the mainland are a bottleneck for current: the magnitude increases in this area.

North-western currents split when they reach Crab Island, its western front constitutes a calm sheltered area.

2.3.3.5 Waves

General information

Deep sea waves affecting Rodrigues’s shores can be generated by the following three meteorological phenomena:

- 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 kilometers across the ocean with little loss of energy. The swells typically approach Rodrigues from the south-west;
- 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. 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.

Inside the lagoon

The coral reef that surrounds Rodrigues serves as a natural barrier, protecting adjacent shorelines from offshore coastal hazards such as storm surges and waves. As waves approach Rodrigues, a significant amount of energy is dissipated when the waves break on the reef due to the abrupt change in bathymetry. 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 area of the reef boundaries. The wave-induced velocity is less than 0.1m/s in areas further from the reef.

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 between Baie Topaze and Anse Quitor.

As most of the swell has broken on the reef or has been transformed during the propagation through 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.

2.3.3.6 **Water level**

Port Mathurin tide gauge

A tide gauge is located at Port Mathurin since 1987. The tide gauge information for Rodrigues is listed in table 2-2 below.

Table 2-2: 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 shown in table 2-3 below:

Table 2-3: 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

Rodrigues is one of the islands being impacted by global climate change. From 1986 to 2003, the 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.

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.

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).

2.3.3.7 **Tropical cyclones**

As it is located in the cyclone belt, Rodrigues can be affected by cyclones from the east from November to April.

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.

Since the early 60's, 74 tropical disturbances have occurred in the vicinity of Rodrigues representing an 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.

The tropical disturbance events in the vicinity of Rodrigues Island [1962 - 2019] and the Sea level at Port Mathurin for the major cyclones impacting Rodrigues are presented in the Specialist Report for Maritime Impacts.

2.3.3.8 **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.

2.3.4 CLIMATE CHANGE PROJECTIONS

2.3.4.1 Sea Level Rise

Sea levels have begun to rise due to the impact of climate change. The Intergovernmental Panel on Climate Change (IPCC) has estimated the increase in sea levels for different regions of the world. For the South Indian Ocean, the estimates are as follows compared to the period 1995-2014 according to 2 scenarii are shown in table 2-4 below:

Table 2-4: Sea Level Rise Scenarii

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

2.3.4.2 Tropical Cyclones

According to the document "Climate Change 2021: The Physical Science Basis" by the Intergovernmental Panel on Climate Change (IPCC), there is medium confidence in the evolution of tropical cyclones. Specifically for Madagascar (no projections for the Indian Ocean as a whole), there is medium confidence in a decrease in frequency and an increase in intensity of cyclones. This means that there may be fewer cyclones, but they could have more intense winds and rainfall. Additionally, the lower minimum pressure and stronger winds could lead to more significant storm 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)".*

2.3.5 MARINE AND SHORES GEOLOGY AND MARINE TURBIDITY

2.3.5.1 Description of Rodrigues and Plaine Corail shorelines and reef

The coastal zone is surrounded by a shallow lagoon composed of silty sand and deeper channels.

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 seamount 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.

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.

2.3.5.2 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. 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 Baie Topaze where current is weaker or almost non-existent. There, the portion of silt and clays is significant[2] (AFD, 2016).

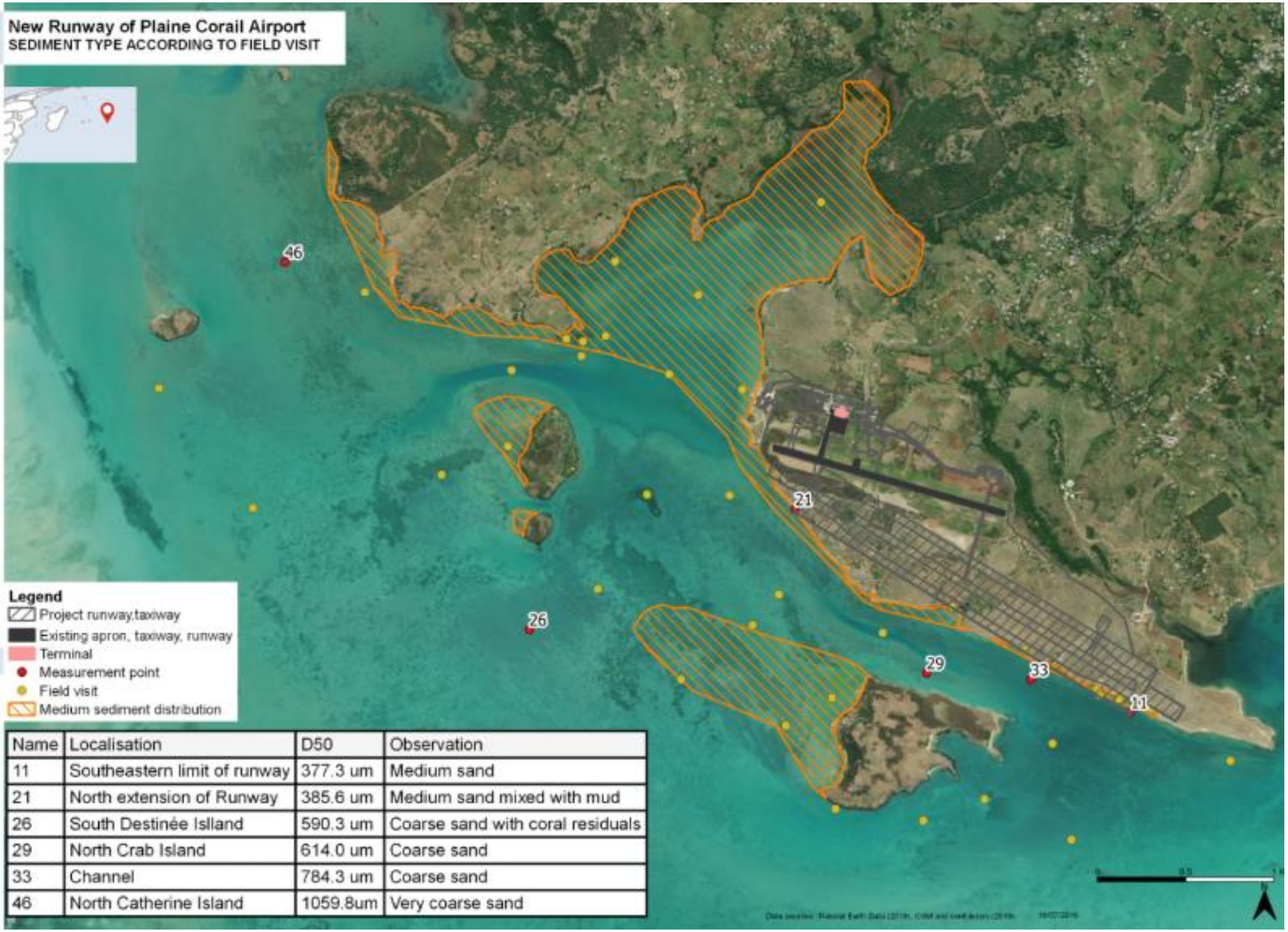
The Northern part of the bay is composed of mud due to the very weak current and the important water runoff during heavy rains.

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.

Marine sediment field measurements and grain size distribution are presented and detailed in the Specialist Report for Maritime Impacts. Below the synthesis of these measurements:

[2] 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

Figure 2-5: Marine sediment field measurement and grain size distribution.



Name	Localisation	D50	Observation
11	Southeastern limit of runway	377.3 um	Medium sand
21	North extension of Runway	385.6 um	Medium sand mixed with mud
26	South Destinée Islland	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

2.3.5.3 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 2-6: Natural turbid plume in Baie Topaze (Google Earth, 25-05-2017)

2.3.5.4 Marine environment issues

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 Crab Island and Rodrigues, it will 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.

Table 2-5: 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

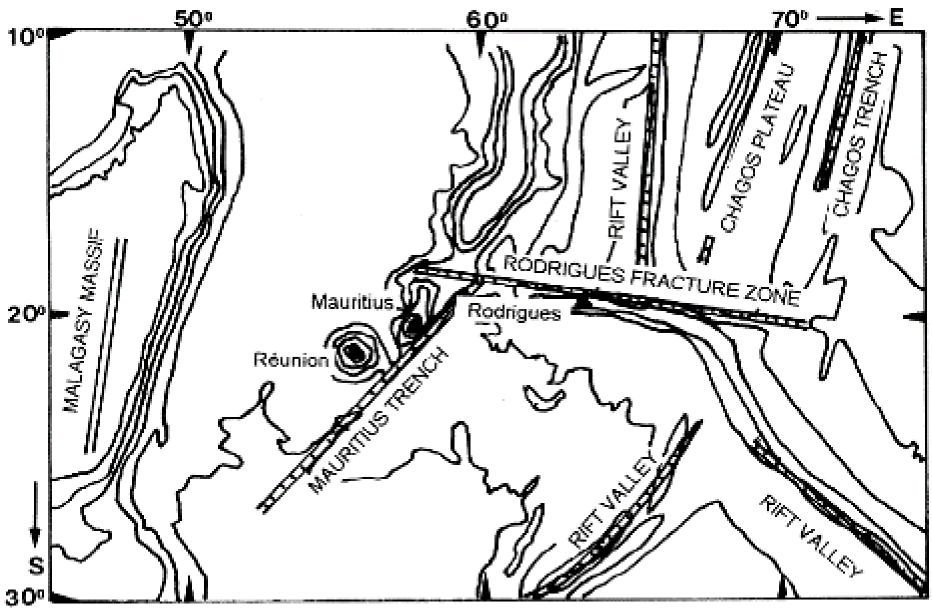
2.3.6 TERRESTRIAL GEOLOGY AND GEOTECHNICS

2.3.6.1 Geodynamical and geological settings of Rodrigues Island

Geodynamics of Rodrigues

Rodrigues Island is located on the eastern part of a roughly E-W trending fracture zone (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 2-7 below).

Figure 2-7: Geodynamic sketch map of the Mauritius-Rodrigues region



Hot Spot Volcanic Setting

The geological history of Rodrigues Island is characterized by three distinct periods of volcanic activity. The first period resulted in the formation of a basaltic basement, which was followed by a period of inactivity. The second period began with the formation of a central cone composed of both aerial and subaerial lava, slags, and cinders. Hydrothermal activity subsequently occurred at the centre of the cone, which was then followed by an explosive episode. A volcanic plug made up of hawaiites and basalts filled the depression. The area of influence of Plaine Corail is restricted and is composed of this weathered basaltic and hawaiite basement.

Geology of Plaine Corail

Plaine Corail area is located on the southwestern side of Rodrigues Island.

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) as shown in figure 2-8 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 2-8: Geological map of Rodrigues

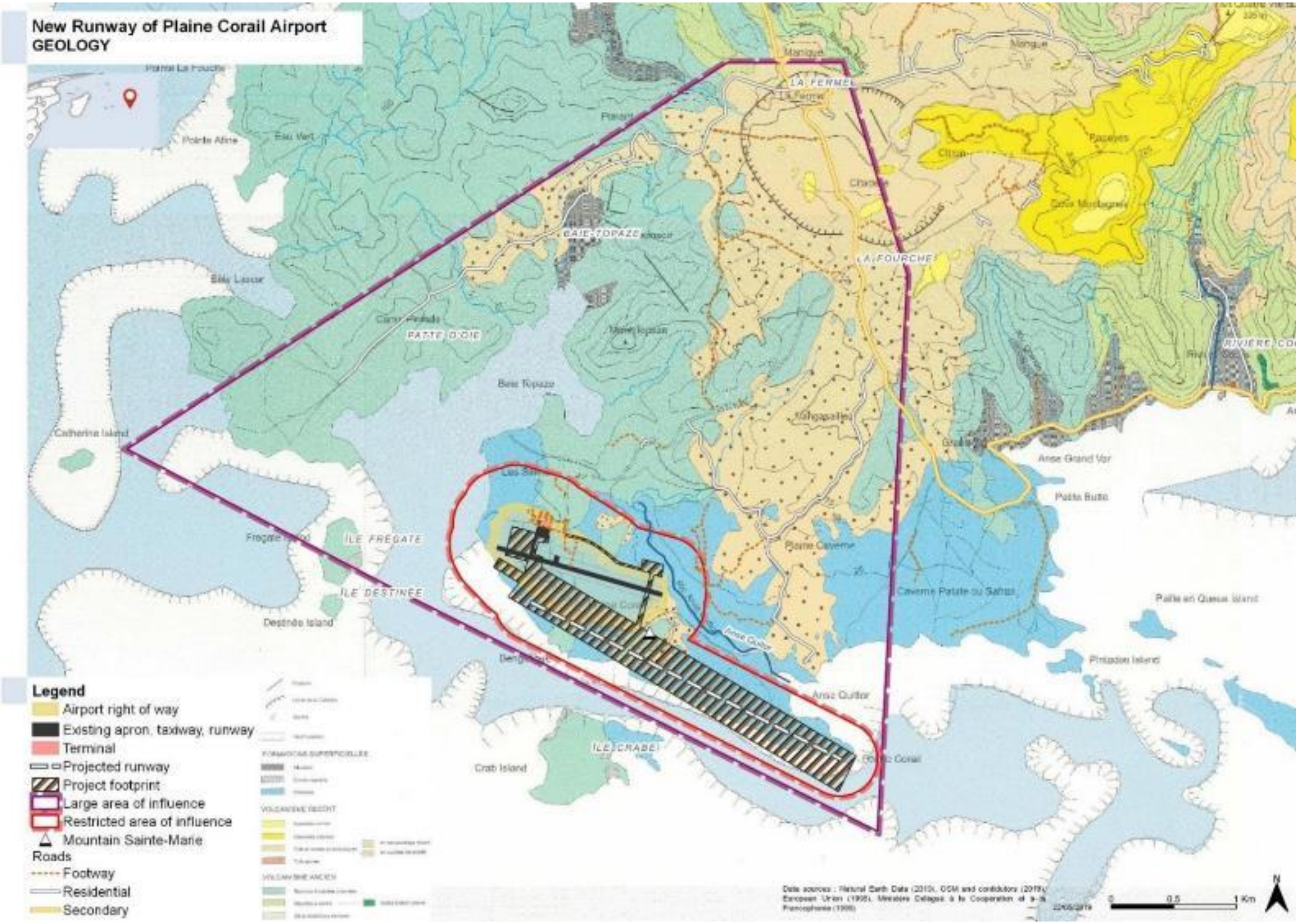


Figure 2-9: Geology and soils in the area of influence (legend next page)

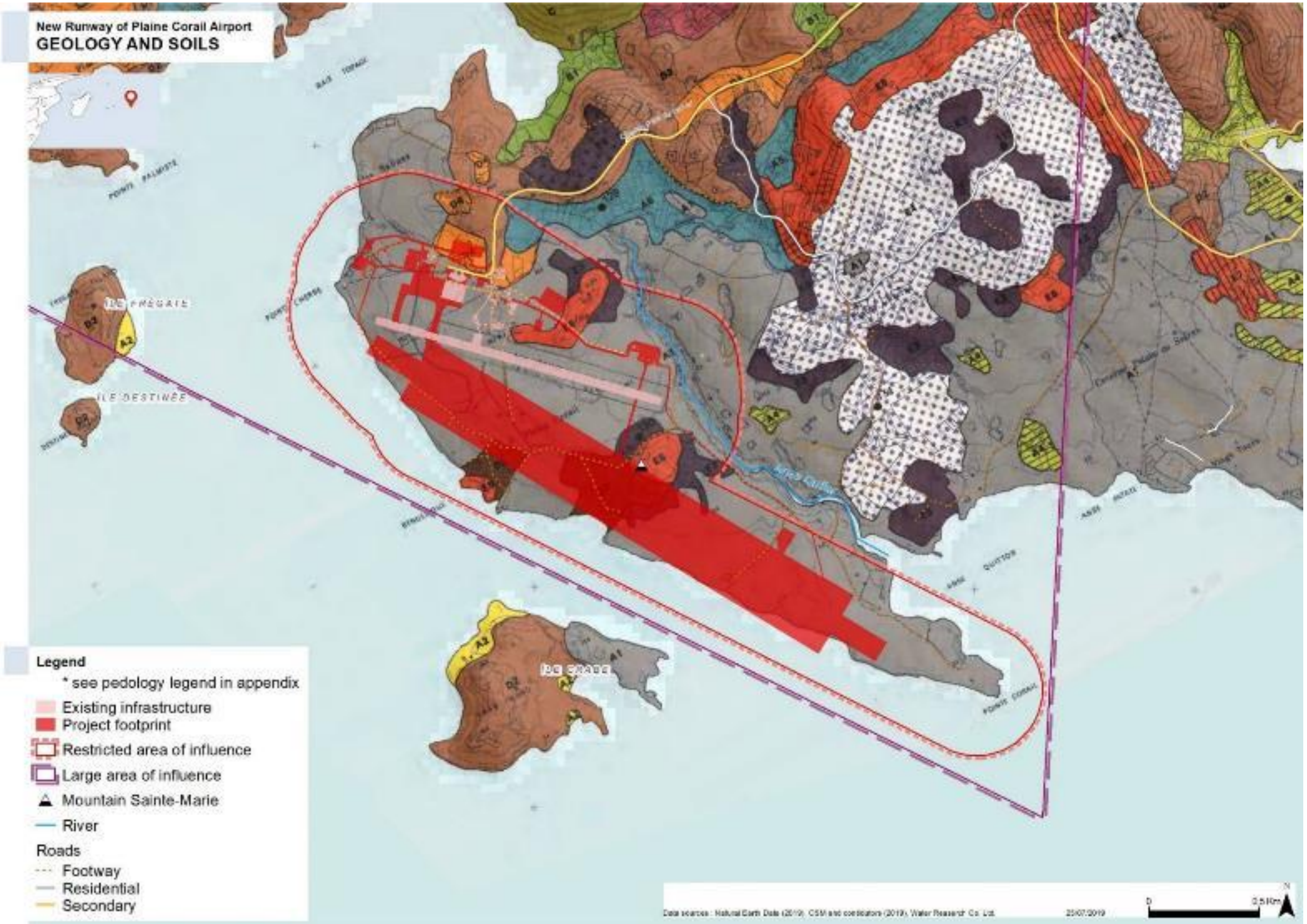
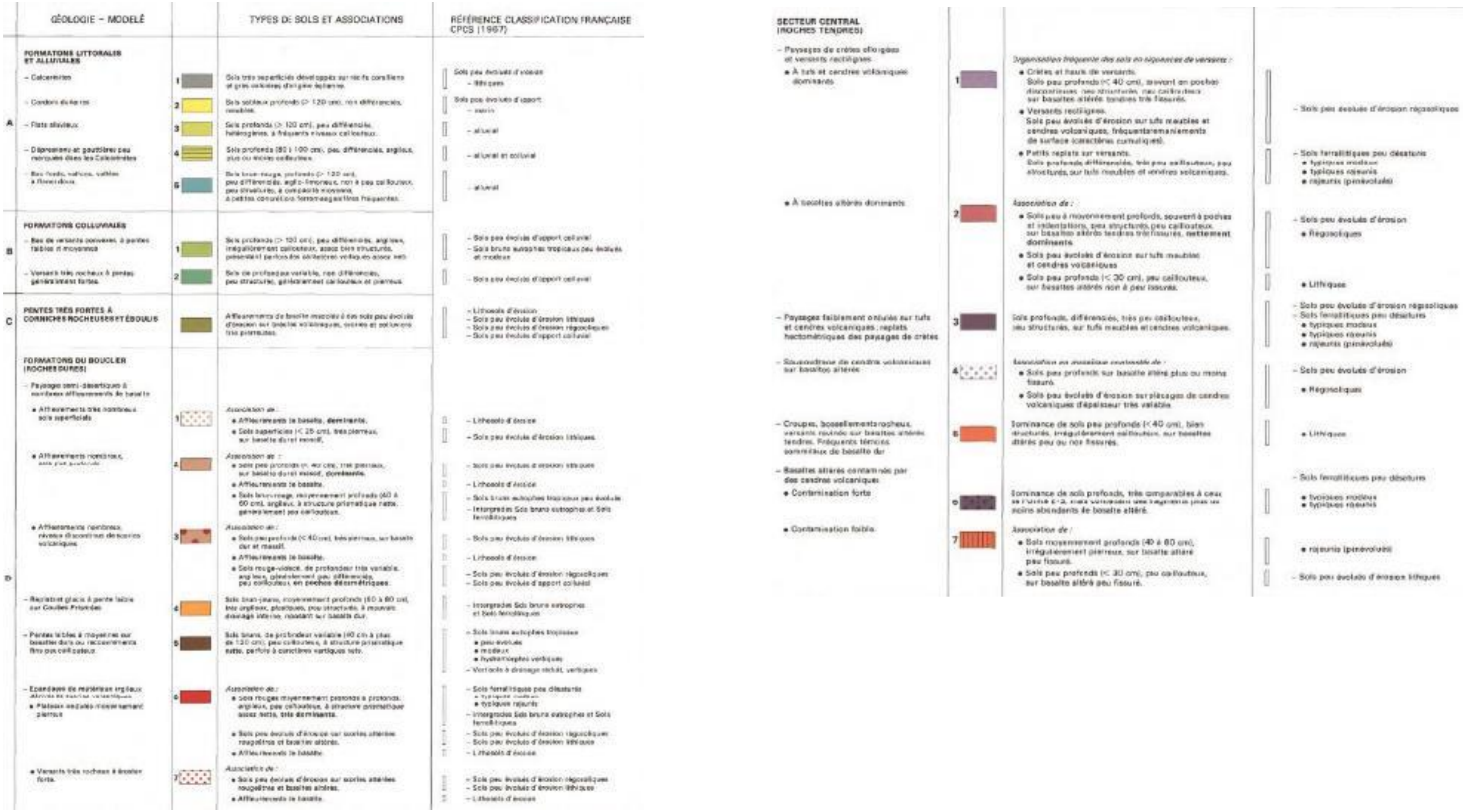


Figure 2-10: Legend of the geology and soils map of southern part of Rodrigues Island, near Plaine Corail and in the area of influence



Geology of the restricted area of influence

Ground investigations carried out

Different ground investigations were led by the Design Consultant GIBB, 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.

During the Phase B geotechnical campaign, 64 rotary core boreholes were drilled from September to November 2017. In addition, during the Phase C geotechnical campaign from May to August 2018, an additional 47 rotary core boreholes were drilled, along with 9 trial pits located in the north western part of the Rodrigues Airport area, near the northern end of the existing runway. (refer to Figure 2-11).

Figure 2-11: 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) – Boreholes

Figure 2-12: 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)

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. A groundwater quality baseline and monitoring plan will be prepared during project implementation, prior to construction.

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.

Based on the ground investigations conducted, it was found that the majority of voids in the area are situated between 10 and 20 meters below the surface. However, the impact of karstic dissolution on the formation of these voids was not investigated due to the absence of groundwater 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 2-12).

Available laboratory test results collected from samples extracted from both Phase B and Phase C have been summarized in Table 2-6.

It 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.

Three more 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 2-14 and focus on the northern, centre and southern parts of the new projected area (Figure 2-15, Figure 2-16).

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 2-17 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 colour bar has been applied to all ground investigations to show the thickness of each geological unit.

Table 2-6: Summary of In situ and Laboratory Data of Calcarenites, Breccias and Basalts Formations

Parameters	**Geological Formation**			**Calcarenites**	**Breccias**	**Basalts**
Classification	***Bulk density (Mg/m^3)***			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 2-13: Voids and cavities identified in the restricted area of influence at Plaine Corail

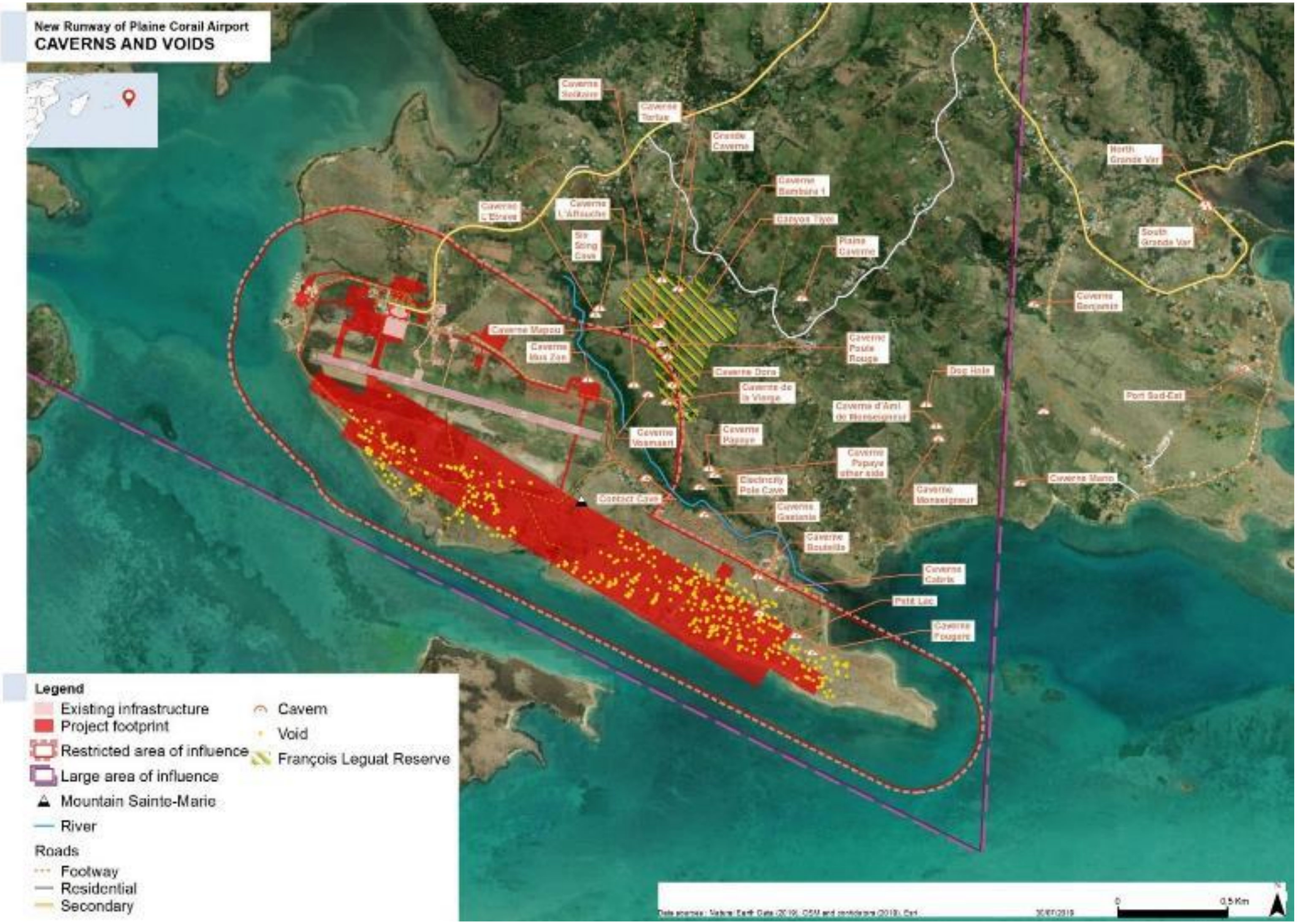


Figure 2-14: Geological long sections through the restricted area of influence at Plaine Corail

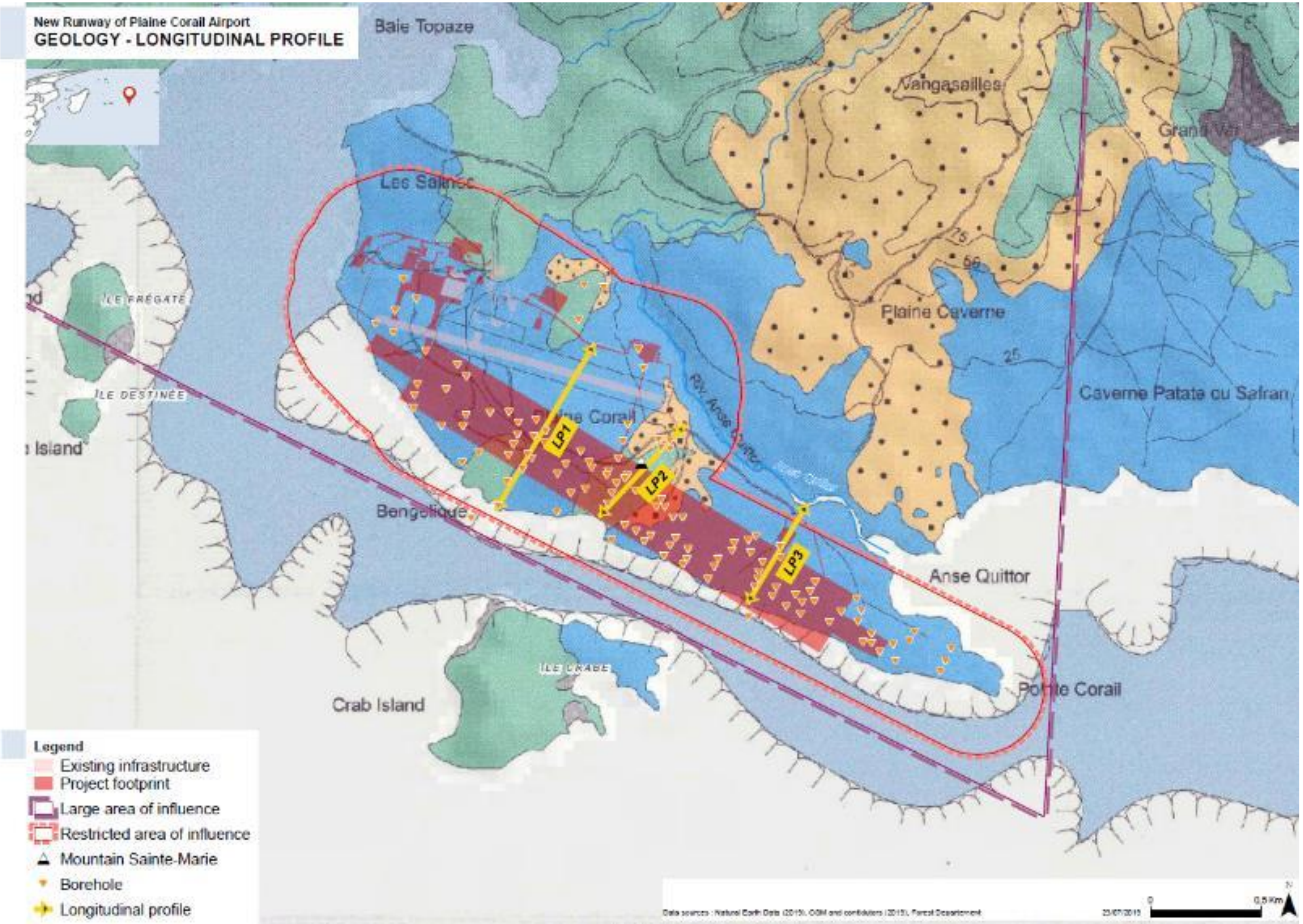


Figure 2-15: Geological long sections LP1 to LP2

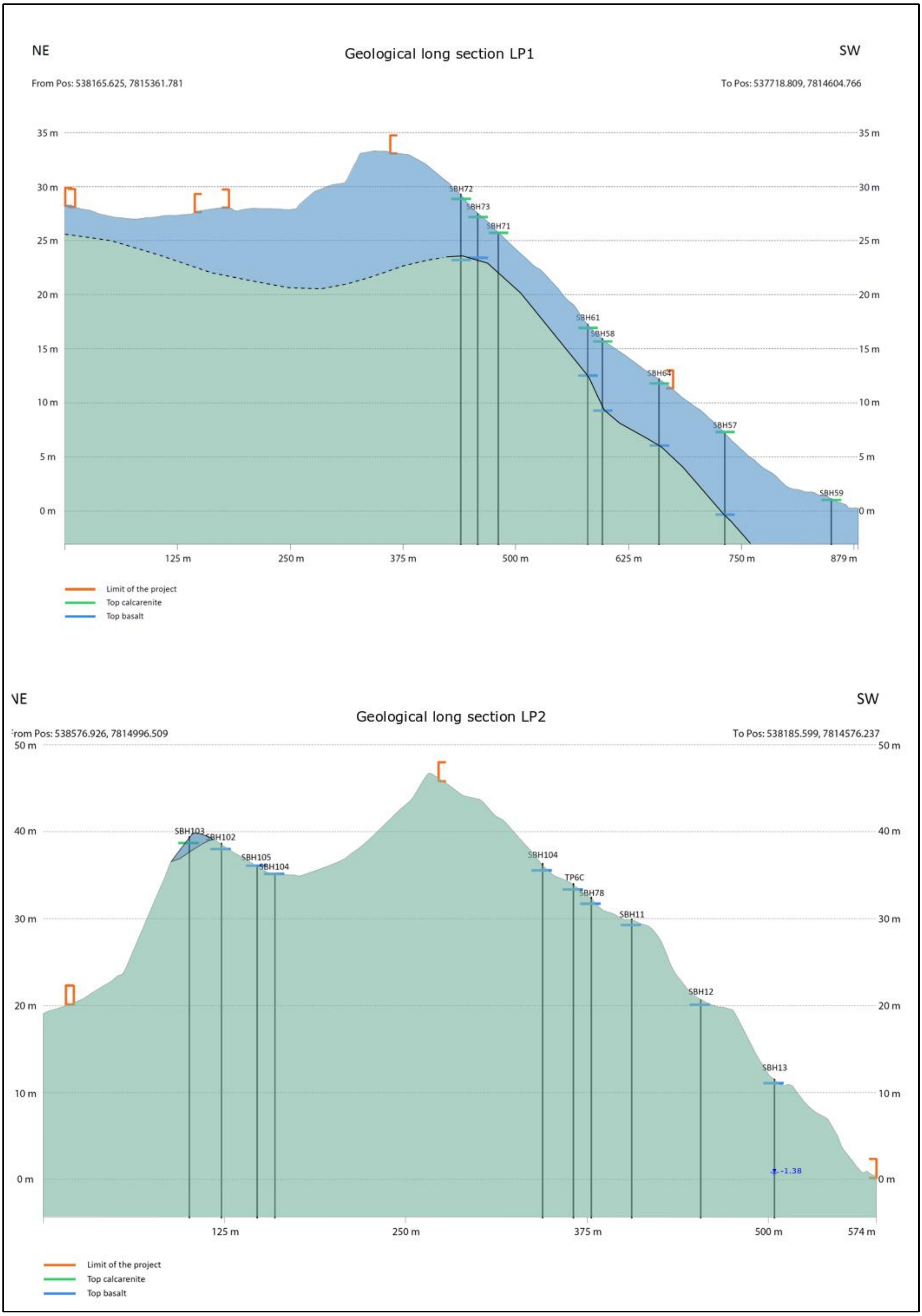


Figure 2-16: Geological long sections LP3

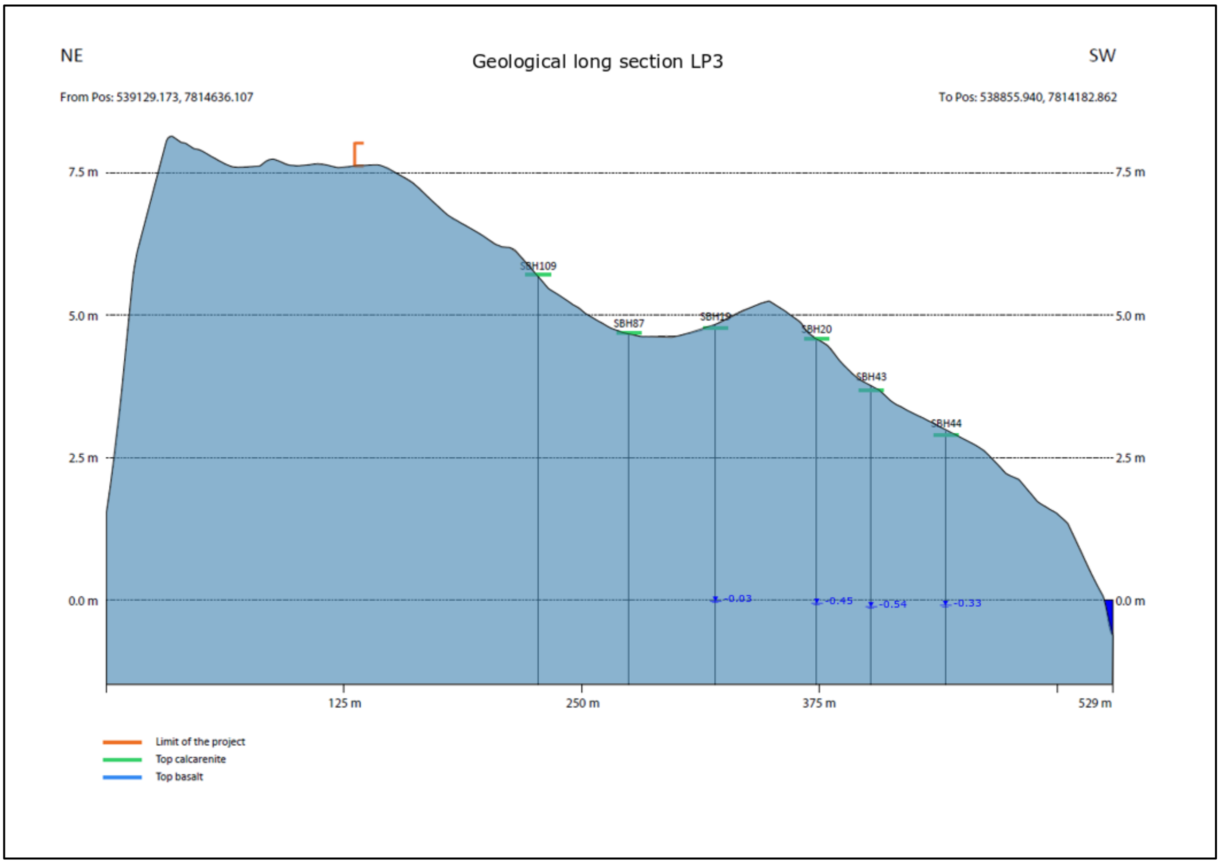
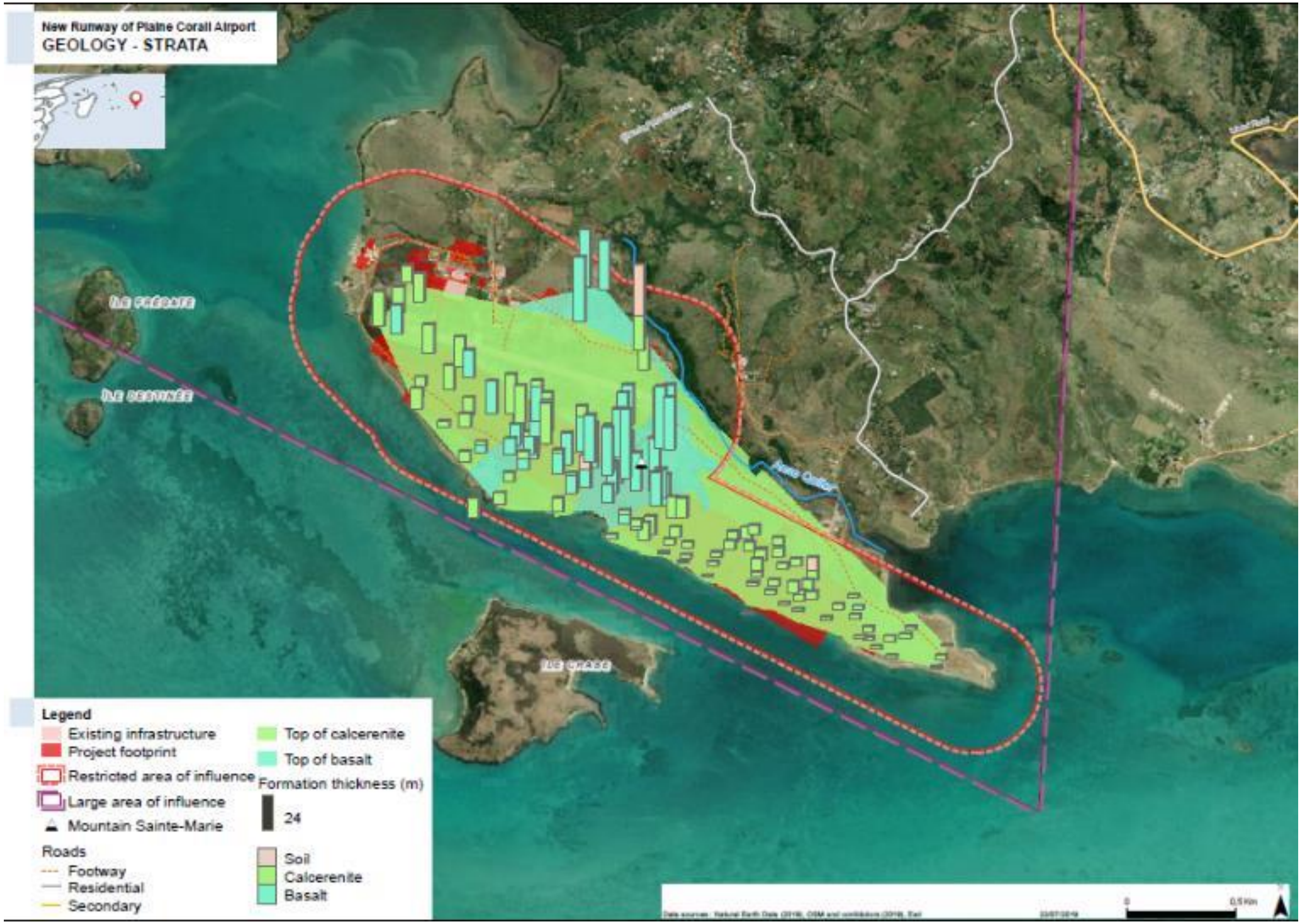


Figure 2-17: Spatial distribution and thickness of the main geological formations based on the geological formations encountered in bore holes ground investigations



Synthesis and uncertainties

Additional geophysical ground investigations were performed in the area of the present-day Plaine Corail Airport since Phase B ground investigations campaign as shown in red on the figure below.

Figure 2-18 - Extent of geophysical survey in the vicinity of Petit Lac and Grotte Fougère

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 have been carried out 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.

However, for the moment, the objective was only to confirm or not the feasibility of the 75m shift of the runway to the East. But it has been decided not to retain this shift option.

The geotechnical investigations carried out in the vicinity of Petit Lac area to identify the presence of subsurface voids has been carried out using the GPR technique.

The findings, classified in 3 sections include the following:

- Northern Section: Voids were detected at a depth of 4.0 m with a lateral distribution which extends and increase in size with depth. The cluster of voids was noted as from a depth of 14.0 m and is in a North-East to South West direction. The depth appears to start from 6.0 m down to 30 m.
- Central Region: Presence of voids was detected at a depth of 6.0 m depth below existing ground level down to 30.0 m below ground.
- Southern Region: Voids detected at a level of 6.0 m below ground level to a depth of 30.0 m. The lateral distribution of the voids is likely to increase from 18 m depth.

Effect of depth of cavity on behaviour of embankment fill

Following the ground penetrating radar (GPR) surveys in the area concerned, it was noted that most of the cavities were located at about 6.0 m depth. However, as per previous findings in 2018 and those of 2023 report, there are some locations where cavities were encountered between 1.0 m and 6.0 m. In order to assess the impact of these cavities on the ground behaviour following the construction of the embankment, an analysis was carried out using a sample of cavities encountered during the GPR surveys.

The proposed engineering solutions, for the identified voids/cavities at a depth less than 2.0 m, from the surface, include inter-alias the following methods:

- In case of a well-defined void at the surface after removal of topsoil – to excavate and expose the voids and then fill up with engineering backfill or high slump mass concrete.
- In the event that voids are not well defined, to excavate to the required depth and fill voids using mass concrete until the ground level and reinforce with a geotextile membrane before construction of the embankment fill.
- At the subgrade level, any cavities/fissures encountered at excavated rock surface or slightly below rock surface shall be exposed, trimmed, cleaned and then filled with engineering fill materials to minimize the risk of fill material settlement.

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.

2.3.6.2 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 (Sustainable Integrated Development Plan Report (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.

2.3.7 HYDROLOGY

This chapter describes 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.

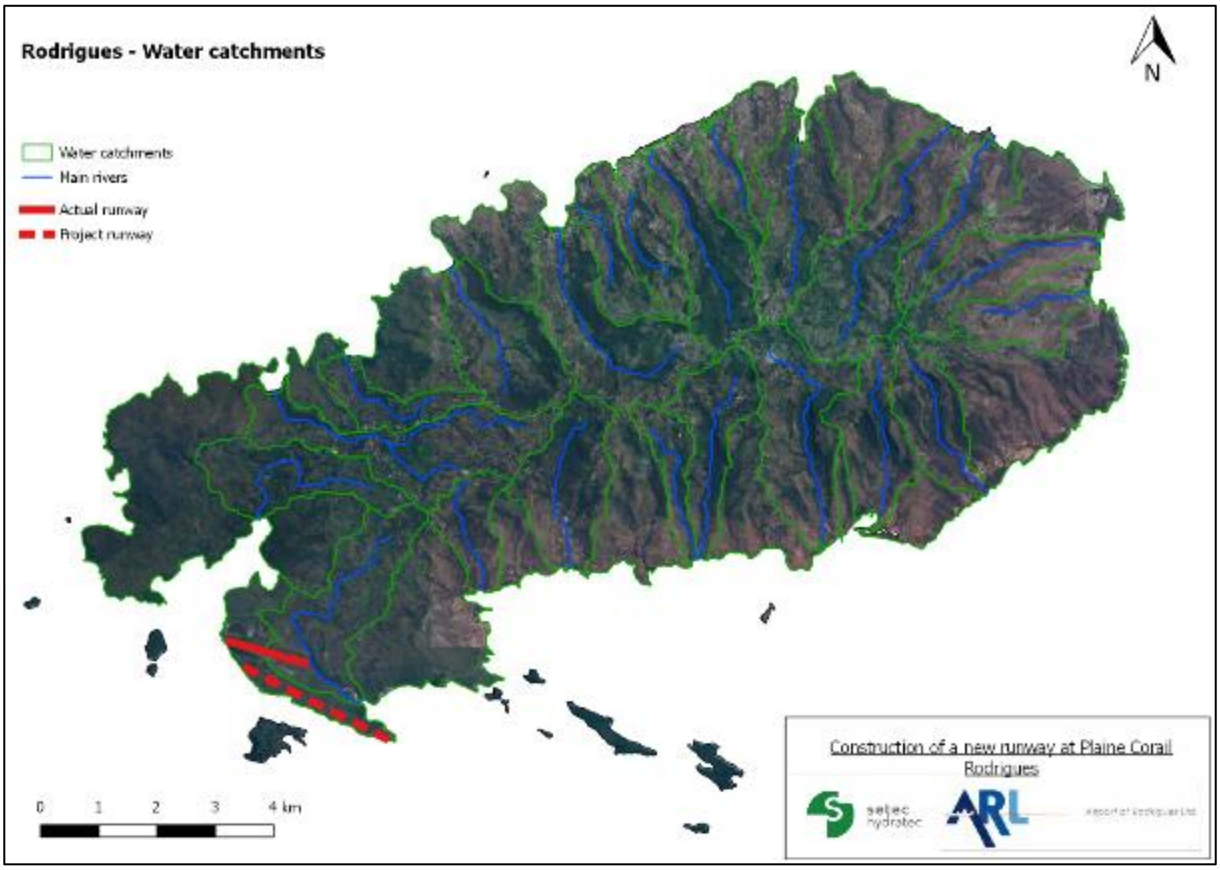
It also provides input data on which the conception stormwater management system of the project is based.

Please refer to the 'Water Management Factual Report' for the complete description.

2.3.7.1 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 2-19: 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.

2.3.7.2 Rainfall analysis

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).

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.

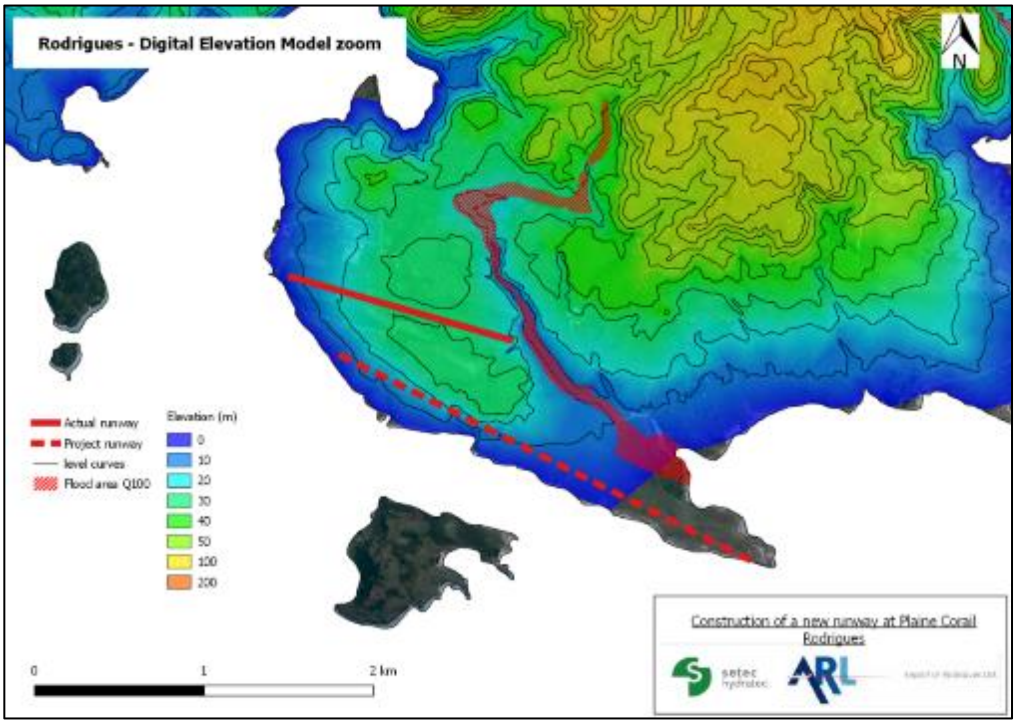
<u>Note</u>: Rainfall data specific to the Rodrigues Airport platform does not exist. Therefore, as in the Preliminary Design, the rainfall data to be considered is the one used for Mauritius and based on the same IDF curves as Mauritius.

2.3.7.3 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 a zoomed-in view of the digital elevation model (DEM) on the project area with level curves and flood areas for a 100-year return period.

Figure 2-20: 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 in figure 2-21.
- Natural low points of runoff concentration; however, no ditches are marked.

Figure 2-21: 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.

An uncertainty remains on the accuracy of the flood zone observed on the previous map, particularly at the mouth of the Anse Quitor River.

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 area will be filled in above the original ground level and therefore it is not foreseen that flooding of run-off would be a concern.

The position on a watershed with no other built-up issues also limits the risks associated with stormwater run-off.

Thus, considering the above, it can be deduced 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.

2.3.7.4 Hydrology issues

Table 2-7: Hydrology Issues and Sensitivity

Receptor	Description	Sensitivity
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 aircraft landing and take-off. Furthermore, its proper pre-treatment, with respect to oil, grease and suspended solids, is also important before its discharge in the environment or at sea.	Major
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.	Low
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 firefighting operation on the runway.	Major
Transfer of sediments to the lagoon	Stormwater management, including buffering storage and other works that facilitate infiltration and reduce soil erosion, can help address climate change adaptation and disaster risk reduction. By reducing peak flows, runoff, and soil erosion, this management approach can decrease sedimentation of water bodies, such as lagoons, and thus protect biodiversity, corals, and white sandy beaches. Furthermore, the buffering storage offers a means of confining any pollution generated by potential firefighting operations on the runway.	Major

2.3.8 WATER RESOURCE AND WASTEWATER MANAGEMENT

This section presents the water sector in Rodrigues, being the potable water supply scheme, the wastewater management and the stormwater management. It also presents the issues associated thereto.

Please refer to the 'Water Management Factual Report' for the complete description.

2.3.8.1 Water supply in Rodrigues

Current water supply

As Rodrigues is a small island, fresh water is a scarce resource. It comes from desalination plants and dams built on rivers as well as 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 m^3/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 freshwater production is provided by surface water harvesting, boreholes, and desalination of marine water.

Two desalination plants are already operational in Rodrigues. The capacity of extraction of salty water is about 3 200 m^3/day.

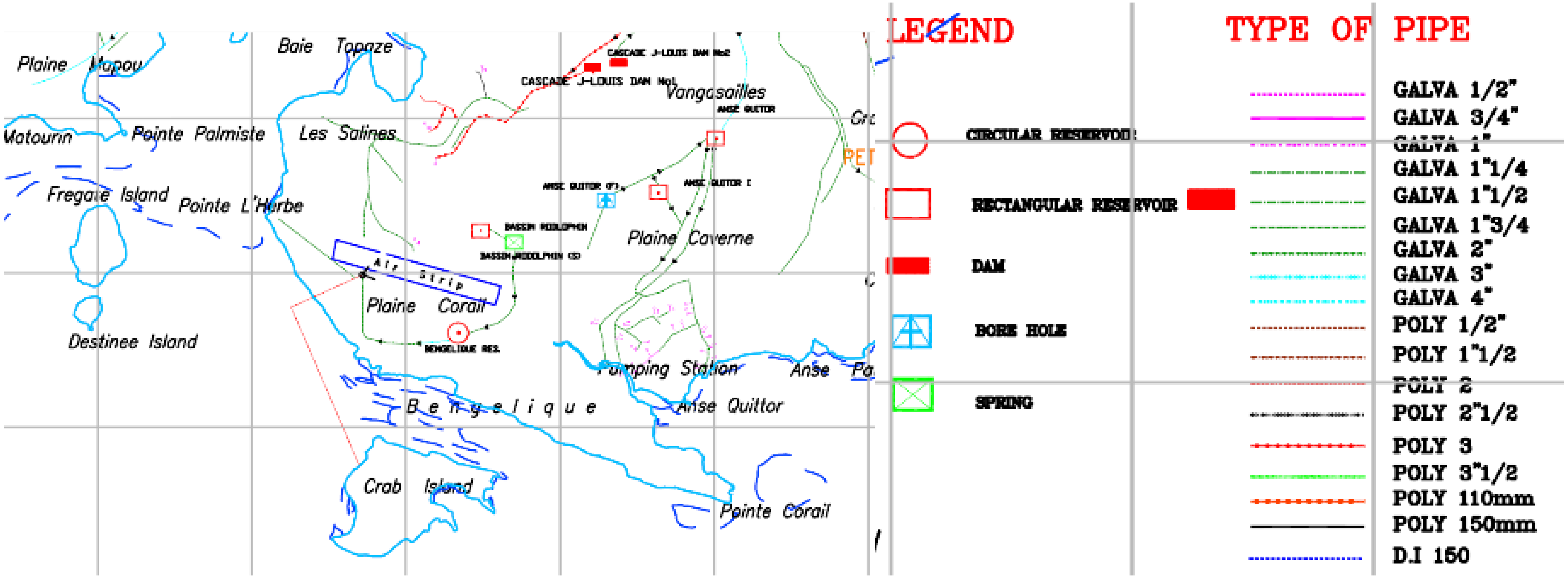
Water distribution is managed by the water resources, water is collected from dams, boreholes and desalination plants, pumped uphill for storage into reservoirs prior to distribution by gravity on the network.

Water is treated prior to distribution on the network, the water from boreholes is not necessarily treated prior to storage into distribution reservoirs.

Figure 2-22 below shows the water network in Rodrigues.

The Bangelique reservoir located in the project area, has been decommissioned and will be demolished. A spring used for fresh water supply is located north of the project area, very close to the restricted area.

Figure 2-22: Water network in Plain Corail and the restricted area



Project for increasing water production

Two new desalination plants are to be commissioned by the Rodrigues Regional Assembly (RRA):

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.

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.

The table 2-8 below shows the water consumption of the airport for the year 2017:

Table 2-8: 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

Source: ARL

2.3.8.2 Wastewater management

Wastewater management in Rodrigues Island

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).

Wastewater 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 septic 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. As part of the project, a new wastewater treatment facility will be implemented to meet the updated needs in the context of the expansion of the airport with a minimum design capacity of the 25/30 m^3 daily. The design of the treatment shall be scalable to cater for future increase in passenger traffic. The existing WTP will be dismantled once the new WTP is operational.

The aircraft lavatory wastewater is currently not unloaded from the plane and is taken to Mauritius for disposal. No facilities are currently available in Rodrigues to handle it. The new facilities will allow the handling of such effluents for the increased number of planes.

There are currently no onsite heavy maintenance/repair activities (of planes and airport equipment). 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.

2.3.8.3 Stormwater

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.

2.3.8.4 Water Resources and Wastewater issues

Table 2-9: Water Resources and Wastewater issues

Receptor	Description	Sensitivity
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 of wastewater is therefore important before discharge in the environment or at sea	High
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	High

2.3.9 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.

Please refer to the 'Hydrological Impacts Factual Report' for the complete description.

2.3.9.1 Hydrogeological setting

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 in section 2.3.6 for more details.

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 calcarenites represent very complex aquifers since they combine three types of porosities that contribute to groundwater flow: the matrix, fracture and karst network porosities.

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).

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.

Local considerations

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 Cavern 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 but there is no evidence of this connectivity.

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.

2.3.9.2 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.

Natural groundwater flow generally follows the topography, but the presence of saturated karst features may disrupt local flow patterns. Currently, the available information about groundwater level mapping only allows for interpretation above the influence of tidal fluctuations. The groundwater level, which ranges between 3 and 13 meters above mean sea level (AMSL), generally corresponds to the local topography in the area.

At the present time, no monitoring program of the groundwater level has been implemented yet.

Two drilling campaigns were carried out. Information about these campaigns is in the Specialist Report for Hydrogeological Impacts.

In a conventional porous medium, groundwater naturally flows from high land elevation to the sea, following the landform. However, in a karstic medium, flow paths are likely to be significantly altered by saturated or partially saturated karstic networks, resulting in flow directions that are not dependent on the landform. Springs are observed in the lower topographic portion of the airport area, likely due to the groundwater elevation being close to sea level. However, there is currently insufficient information to identify local groundwater patterns associated with all of the caves that have been identified in the airport area.

2.3.9.3 Hydrogeological receptors identification

The three receiving environments identified in the project area that are related to the hydrogeological context are as follows:

1. Receptor #1: Carbonate Karstic aquifer
2. Receptor #2: Basaltic aquifer
3. Receptor #3: Caves (in carbonate formation)

The detailed description of these three receiving environments is in the Specialist Report for Hydrogeological Impacts.

2.3.9.4 Water quality, vulnerability and contamination

Water quality

Currently, the only available data on water quality in the airport area comes from partial analyses of borehole water at the Cavern Bouteille catchment site. No further information is available on groundwater quality in the region. Water in caves near sea level is likely to be saline, at least in the tidal influence area. As of now, there are no documented instances of saltwater intrusion on land in Rodrigues. Stagnant freshwater ponds in caves are quickly colonized by biological elements and are not suitable for human consumption. Water inflow from storms can "flush" or dilute stagnant water in cave ponds, leading to a temporary improvement in water quality.

The water pumped from the Cavern Bouteille borehole is brackish and is probably a mixture of tide-influenced seawater and fresh water from the karst aquifer, but it is definitely close in quality to seawater. Table 2-10 below presents the results of laboratory analyses of water from the borehole intake.

Table 2-10: Cavern Bouteille Borehole intake quality

Parameters	Concentration (mg/L)	
Sample date	19 – 03 - 2018	15 - 07 - 2020
Chloride	10170	13162
Sulphate	1560	1974
Copper	<0.005	-
Chromium	<0.01	-
Potassium	136.64	285.40
Sodium	5128	7923
Nitrogen Nitrate	<0.01	<0.01
Nitrate as NO3-	<0.04	<0.04

The concentrations of sodium, chloride, sulphate, and potassium significantly increased between the 2018 and 2020 samplings. However, caution must be taken in interpreting the results since the two samples were not taken during the same period of the year and there is no information available about precipitation events during or before the sampling.

Vulnerability

Most of the material (raw water intake equipment) 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 Plaine Corail site would be highly vulnerable. However, the only known use of groundwater potentially connected with the karstic network of carbonate rocks of Plaine Corail is the Cavern Bouteille catchment.

Potential sources of contamination

Potential sources of groundwater contamination must be identified in the airport area.

The usual contaminant vectors in the airport during operation are:

- Fuel storage and operation (Kerosene, diesel and gas)
- Firefighting foam
- Industrial wastewater
- Sanitary wastewater
- Any chemical liquid or highly soluble material
- Contact rainwater, runoff water and infiltration

In addition, there are also those related to the construction, namely:

- Mobile generators (fuel leakage)
- Temporary fuel storage
- Storage of hazardous materials
- Accidental releases of hazardous substances into the environment
- Stormwater runoff in construction areas

To our knowledge, there is no groundwater monitoring history at Plaine Corail Airport.

Monitoring

As part of the ESMP, a groundwater monitoring will be undertaken, a baseline prior to works and regular monitoring thereafter.

2.3.9.5 Groundwater uses in the Island

In 2009, KMPG indicated that 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 as a groundwater use in the same way as inland drilling.

2.3.9.6 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.

The sensitivity of the Hydrogeological receptors is summarized in the table 2-11 and detailed in the Specialist Report for Hydrogeological Impacts:

Table 2-11: 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.

2.3.10 SUMMARY: PHYSICAL ENVIRONMENT SENSITIVITY

Table 2-12: 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

2.4 BIOLOGICAL ENVIRONMENT

2.4.1 TERRESTRIAL BIOLOGICAL CONTEXT

A terrestrial biodiversity survey was undertaken in 2019 and a complementary field survey was carried out in April 2023.

Please refer to the 'Terrestrial Biodiversity Factual Report' for the complete description.

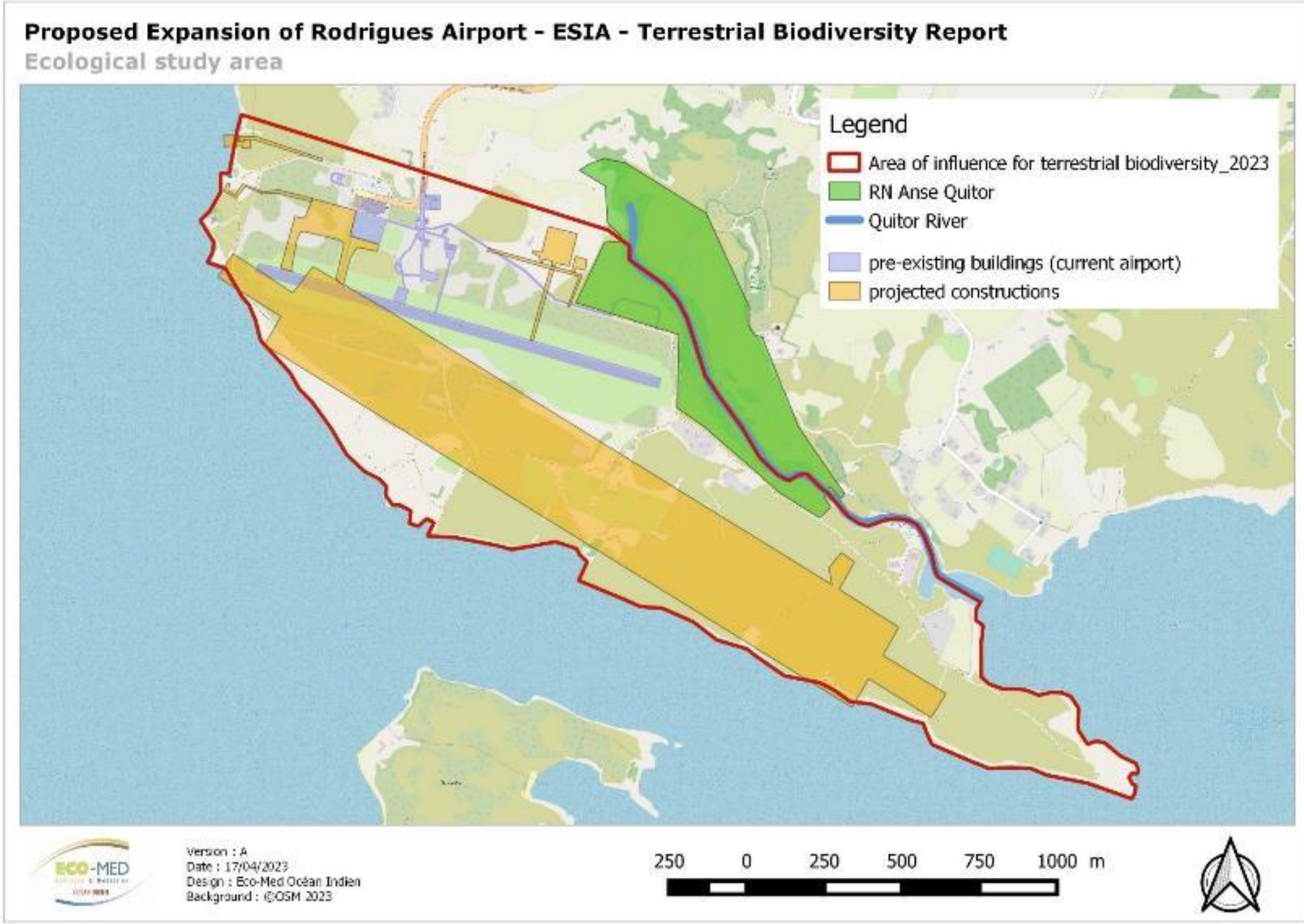
2.4.1.1 Area of influence

Figure 2-23 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 2-23: Area of influence – Terrestrial Biodoversity



2.4.1.2 Vegetation and flora

Ten terrestrial vegetation and habitat types are recorded in the area of influence (see Table 2-13 and Figure 2-24 below.

Table 2-13: Habitat types recorded in the area of influence

ID	Sensitivity	Name	Area (ha)	% of the total surface
HA1	**Natural habitats**	Grazing lands on basaltic resurgences	5.9	**2.5%**
	Natural habitats	Grazing lands on calcarenic substratum	67	**29%**
HA2	**Natural habitats**	Coastal vegetation dominated by Ipomoea pes caprae (shore-line community)	11	**4.7%**
HA3	**Modified habitats**	Anthropized areas	73	**31%**
HA4	**Critical habitat**	Dry forest	17	**7.1%**
HA5	**Natural habitats**	Riparian vegetation	1.1	**0.5%**
HA6	**Natural habitats**	Estuarine habitat	8.2	**3.5%**
HA7	**Natural habitats**	Calcarenic dry lawns of anthropogenic origin	2.2	**0.9%**
HA8	**Modified habitats**	Coastal grasslands dominated by secondarized thickets (*Lantana camara*)	25	**11%**
HA9	**Modified habitats**	Secondarized thickets (*Leucaena leucocephala*)	24	**10%**

Anse Quitor Nature Reserve (AQNR), classified as a dry forest is defined as a 'critical habitat' as per ESS6 in as much as it meets the definition of such habitat.

Native flora recorded in the area of influence and sensitivity assessment are listed in Table 2-14 and shown in Figure 2-25. 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, 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, Mathurina penduliflora, Pleurostylia putamen.*

Table 2-14: 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	*Foetidia rodriguesiana* - CR	4	**Major**
		Hyophorbe verschaffeltii - CR	43	
		Latania verschaffeltii - CR	10	
		Polyscias rodriguesiana - CR	7	
Flora	Plant species of high sensitivity	*Zanthoxylum paniculatum* – CR	1	**High**
		Antirhea bifurcate – CR	1	
		Clerodendrum laciniatum – EN	3	
		Diospyros diversifolia – EN	2	
		Fernelia buxifolia – EN	2	
		Mathurina penduliflora – EN	5	
		Pleurostylia putamen – EN	16	
		Terminalia bentzoe subsp. Rodriguesensis – VU	28	
		Pandanus heterocarpus – NT	69	
		Sarcanthemum coronopus – NT	37	
		Adiantum rhizophorum – LC	-	
Flora	Plant species of medium sensitivity	Phyllanthus dumentosus, Camptocarpus sphenophyllus, Secamone rodriguesiana, Nephrolepis biserrata, Phymatosorus scolopendria	-	**Medium**
Flora	Plant species of low sensitivity	Dodonaea viscosa, Dracaena reflexa, Elaeodendron orientale, Ficus reflexa, Ficus rubra, Premna serratifolia, Thespesia populnea, Cynanchum viminale	-	**Low**

Figure 2-24: Vegetation and habitat types mapping

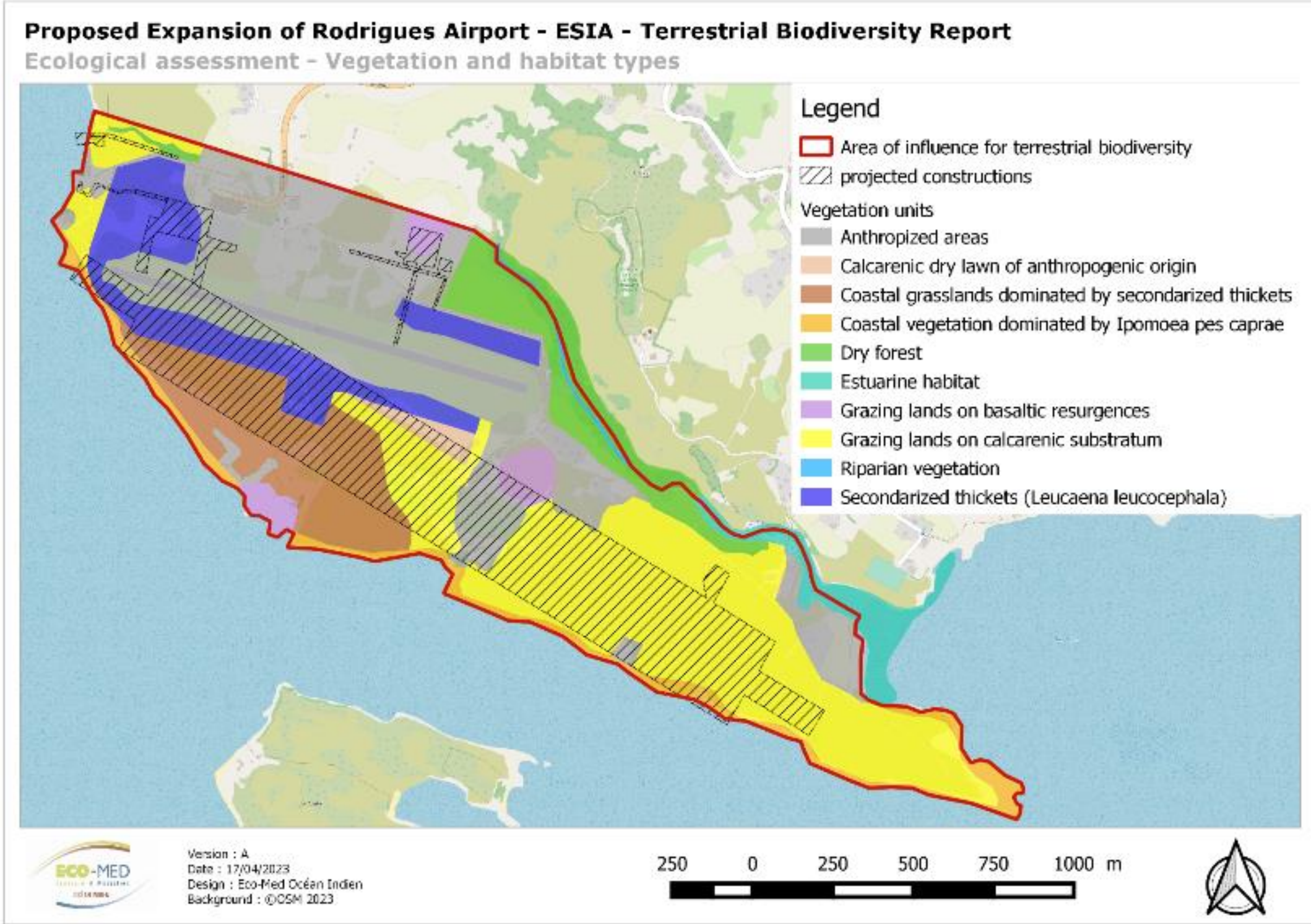


Figure 2-25: Endangered and threatened plant species map

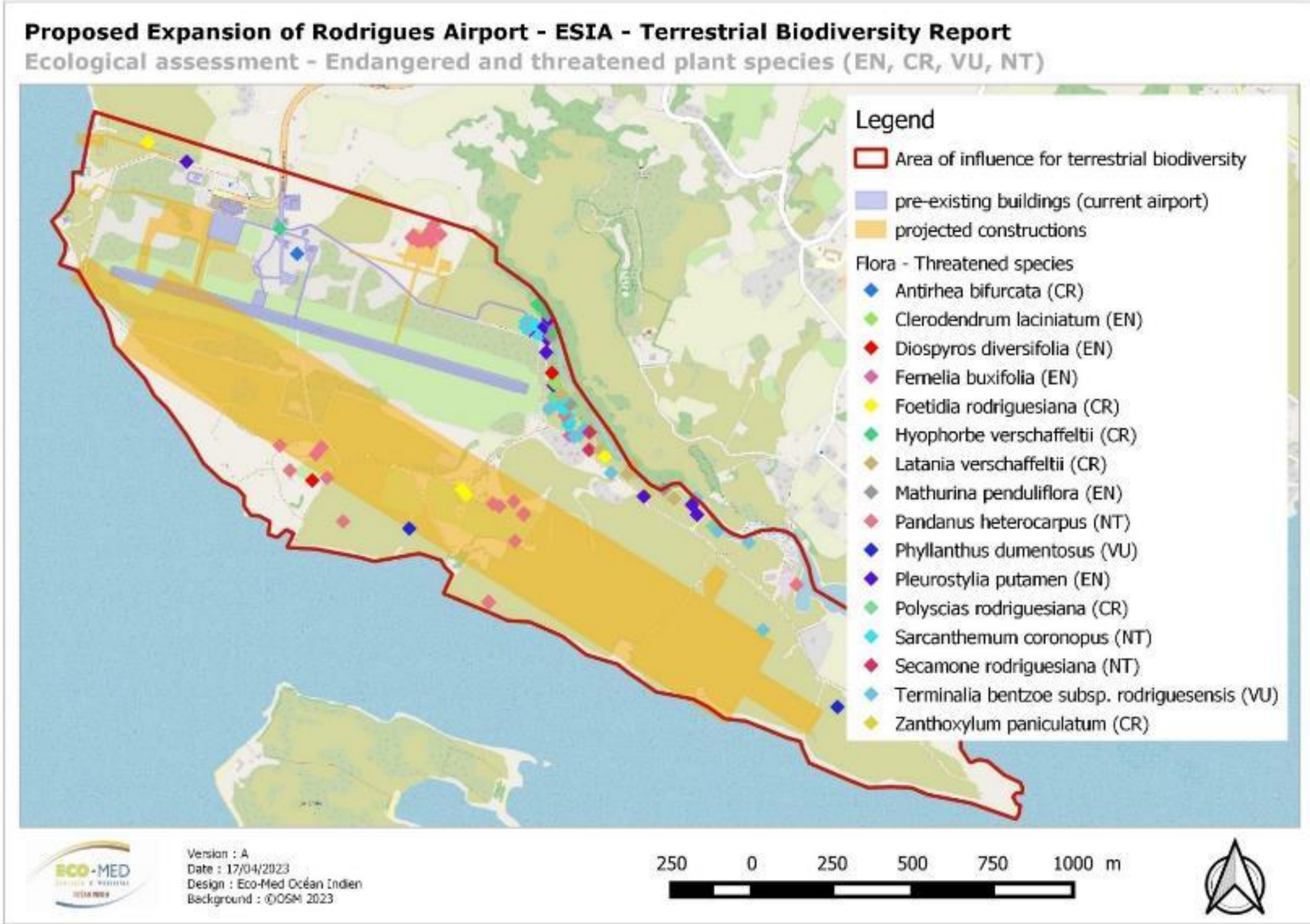


Table 2-15: List of plant species recorded on site (purple background: species recorded inside the project footprint) and sensitivity assessment for native species

Scientific name	French name	Family	Status	IUCN (status retained)	Sensitivity	Protection Forestry Services	Protection Forestry Act 1983
Foetidia rodriguesiana F. Friedmann	Bois puant	Lecythidaceae	Endemic	CR	Major	yes	
Hyophorbe verschaffeltii H. Wendl.	Palmiste marron	Arecaceae	Endemic	CR	Major	yes	
Latania verschaffeltii Lem.	Latanier jaune	Arecaceae	Endemic	CR	Major	yes	
Polyscias rodriguesiana (Marais) Lowry & G.M. Plunkett	Bois blanc	Araliaceae	Endemic	CR	Major	yes	
Zanthoxylum paniculatum Balf. f.	Bois pasner	Rutaceae	Endemic	CR	High		
Antirhea bifurcata (Desr.) Hook.f.	Bois goudron	Rubiaceae	Sub-endemic	CR	High	yes	
Clerodendrum laciniatum Balf.f.	Bois cabri	Lamiaceae	Endemic	EN	High	yes	
Diospyros diversifolia Hiern	Bois d'ébène / Ebénier	Ebenaceae	Endemic	EN	High	yes	
Fernelia buxifolia Lam.	Bois bouteille	Rubiaceae	Sub-endemic	EN	High	yes	
Mathurina penduliflora Balf. f.	Bois gandine	Passifloraceae	Endemic	EN	High	yes	
Pleurostylia putamen Marais	Bois d'olive blanc	Celastraceae	Endemic	EN	High	yes	
Terminalia bentzoe (L.) G.Forst.. subsp. rodriguesensis Wickens	Bois benjoin	Combretaceae	Endemic	VU	High	yes	
Pandanus heterocarpus Balf. f.	Vacoa parasol	Pandanaceae	Endemic	NT	High	yes	
Sarcanthemum coronopus Cass.		Asteraceae	Endemic	NT	High	yes	
Adiantum rhizophorum Sw.		Pteridaceae	Sub-endemic	LC	High		yes
Phyllanthus dumentosus Poir.		Phyllanthaceae	Indigenous	VU	Medium	yes	
Camptocarpus sphenophyllus (Balf. F.)		Asclepiadaceae	Endemic	NT	Medium		
Secamone rodriguesiana F.Friedmann		Apocynaceae	Endemic	NT	Medium		
Nephrolepis biserrata (Sw.) Schott	Fougère rivière	Nephrolepidaceae	Indigenous	LC	Medium		yes
Phymatosorus scolopendria (Burm. f.) Pic. Serm.	Patte de lézard	Polypodiaceae	Indigenous	LC	Medium		yes
Dodonaea viscosa Jacq.	Bois d'arnette	Sapindaceae	Indigenous	LC	Low	yes	
Dracaena reflexa Lam.	Bois de chandelle	Asparagaceae	Indigenous	LC	Low	yes	

Scientific name	French name	Family	Status	IUCN (status retained)	Sensitivity	Protection Forestry Services	Protection Forestry Act 1983
Elaeodendron orientale Jacq.	Bois rouge	Celastraceae	Sub-endemic	LC	**Low**	yes	
Ficus reflexa Thunb.	Ti l'affouche	Moraceae	Indigenous	LC	**Low**	yes	
Ficus rubra Vahl	Affouche rouge	Moraceae	Indigenous	LC	**Low**	yes	
Premna serratifolia L.	Bois sureau	Lamiaceae	Sub-endemic	LC	**Low**	yes	
Thespesia populnea (L.) Sol. ex Corrêa	Sainte Marie	Malvaceae	Indigenous	LC	**Low**	yes	
Cynanchum viminale (L.) L.	Liane calé	Apocynaceae	Indigenous	VU	**Low**		
Achyranthes aspera L.	Herbe d'Eugène	Amaranthaceae	Indigenous	LC	**Negligible**		
Alternanthera sessilis (L.) DC.	Brède emballage	Amaranthaceae	Indigenous	LC	**Negligible**		
Alysicarpus vaginalis (L.) DC.		Fabaceae	Indigenous	LC	**Negligible**		
Boerhavia coccinea Mill.	Bécabar batard	Nyctaginaceae	Indigenous	LC	**Negligible**		
Bothriochloa pertusa (L.) A. Camus		Poaceae	Indigenous	LC	**Negligible**		
Caesalpinia bonduc (L.) Roxb.	Cadoque	Fabaceae	Indigenous	LC	**Negligible**		
Cynodon dactylon (L.) Pers.	Petit-chiendent	Poaceae	Indigenous	LC	**Negligible**		
Cyperus dubius Rottb.		Cyperaceae	Indigenous	LC	**Negligible**		
Cyperus iria L.		Cyperaceae	Indigenous	LC	**Negligible**		
Cyperus rubicundus Vahl		Cyperaceae	Indigenous	LC	**Negligible**		
Dactyloctenium ctenioides (Steud.) Lorch ex Bosser		Poaceae	Indigenous	LC	**Negligible**		
Eragrostis tenella		Poaceae	Indigenous	LC	**Negligible**		
Euphorbia thymifolia L.	Rougette	Euphorbiaceae	Indigenous	LC	**Negligible**		
Fimbristylis cymosa R. Br.		Cyperaceae	Indigenous	LC	**Negligible**		
Fimbristylis dichotoma (L.) Vahl		Cyperaceae	Indigenous	LC	**Negligible**		
Heteropogon contortus (L.) P. Beauv. ex Roem. et Schult.	Herbe polisson	Poaceae	Indigenous	LC	**Negligible**		

Scientific name	French name	Family	Status	IUCN (status retained)	Sensitivity	Protection Forestry Services	Protection Forestry Act 1983
Ipomoea pes-caprae (L.) R. Br.	Liane batatran	Convolvulaceae	Indigenous	LC	**Negligible**		
Ludwigia octovalvis (Jacq.) Raven	Herbe à bourrique	Onagraceae	Indigenous	LC	**Negligible**		
Paspalidium geminatum (Forssk.) Stapf.		Poaceae	Indigenous	LC	**Negligible**		
Portulaca oleracea L.	Pourpier rouge	Portulacaceae	Indigenous	LC	**Negligible**		
Rhizophora mucronata	Palétuvier rouge	Rhizophoraceae	?	LC	**Negligible**		
Striga asiatica (L.) Kuntze	Goutte de sang	Orobanchaceae	Indigenous	LC	**Negligible**		
Tournefortia argentea L.f.	Veloutier argenté	Boraginaceae	Indigenous	LC	**Negligible**		

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

2.4.1.3 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*.

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. Closest (~3km) would be at La Ferme, Grand Var or Riviere coco. Originally the main roost was a Cascade Pigeon, now 8-9 roots across the island in areas where feed is available, e.g. *Ficus*.

Note that this species is not known to roost in caves, but only on high trees.

The population inventory has been completed with the April 2023 field survey. The observations confirm the conclusions already advanced.

Several bats are observed at the end of the day (Several tens in April 2019 and up to 12 individuals in April 2023), but only some individuals were seen punctually flying over the area of influence. They frequent Anse Quitor to eat there, but they have not been seen flying over the airport area. There is no major resting or feeding site beyond the Anse Quitor reserve when they arrive from the North.

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 they also frequent other forest habitats or private gardens (fruit trees).

According to the local experts, *Pteropus rodricensis* is not rare and its numbers are increasing. MWF has been conducting monitoring for about 50 years. The population has grown from less than 100 in 1974 to around 20,000 today (S. Kirsakye, 2022). Falls in numbers are observed occasionally after intense cyclonic episodes.

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).

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. 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.

Birds

The bird populations observed are mainly exotic. *Acridotheres tristis, Geopelia striata, Passer domesticus, Estrilda astrild* are the most common.

Four indigenous (or migratory) species frequent the site for their food: *Butorides striata*, *Arenaria interpres, Numenius phaeopus, Pluvialis squatarola*. 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. *Pluvialis squatarola, 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). 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.*

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, mainly empty (subfossil) shells were found. The *Tropidophora articulata* populations inventory has been completed with the April 2023 field survey. The area of influence has been investigated in depth (on the ground, in the litter, under the rocks, on the trunks, during the day, at night, with rainy weather). No living individuals of this species were found, confirming past findings of consulted experts. Subfossil shells have been identified in numbers. This species is known to be extremly abundant in a subfossil state (Owen L. Griffiths and Vincent F. B. Florens. 2006). It still survives in very low numbers over most of the island, especially in patches of degraded forest such as at Grande Montagne an Mt. Malartic.The only station where we found him alive is Anse Quitor (in 2019 only).

Tropidophora desmazuresi is also present on the site. It was considered by IUCN to be "Extinct" (Griffiths, 1996). Griffiths mentions him as CR in his 2006 book. The only locality presenting it as alive was Anse Mourouk, which we confirmed in 2023 by going there. Anse Quitor is therefore a second confirmed station.

Crustaceans

Five taxa are observed on the site. No terrestrial crustacean species with an unfavourable conservation status is known to Rodrigues, namely *Coenobita rugosus, Cardisoma caniflex, Ocypode ceratophtalmus, Neosarmatium meinerti and Isopoda (Gen. Sp.)*

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 first inventory period, one week after the passage of the cyclone Joaninha (26 March 2019), was not favourable to a representative vision of the usual diversity for this site. Therefore, as part of the updated ESIA study, a rapid assessment was conducted during April 2023 survey.

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.

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.

Myriapods

The three species of myriapods, which were commonly observed on the site, are not of significant interest.

2.4.1.4 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 2-16: 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 2-17: 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
Gastropoda	Littorinimorpha	Pomatiidae	*Tropidophora desmazuresi*	**Endemic**	**x**	**CR** *(EX)*	3	1	4	8	**Major**
Mammalia	Chiroptera	Pteropodidae	*Pteropus rodricensis*	**Endemic**	**x**	**EN**	3	1	3	7	**High**
Gastropoda	Littorinimorpha	Pomatiidae	*Tropidophora articulata*	**Sub-endémique**	**x**	**EN**	2	1	3	6	**High**
Gastropoda	Stylommatophora	Assimineidae	*Omphalotropis littorinula*	**Endemic**	**x**	**LC**	3	1	1	5	**medium**
Arachnida	Araneae	Araneidae	*Cyrtophora citricola*	**Native**	**x**	NA	1	1	0	2	**low**
Arachnida	Araneae	Araneidae	*Neoscona moreli*	**Native**	**x**	NA	1	1	0	2	**low**
Arachnida	Araneae	Nephilidae	*Trichonephila inaurata*	**Native**	**x**	LC	1	1	0	2	**low**
Arachnida	Araneae	Pholcidae	*Smeringopus pallidus*	**Native**	**x**	NA	1	1	0	2	**low**
Arachnida	Araneae	Salticidae	*Hasarius adansoni*	**Native**	**x**	LC	1	1	0	2	**low**
Arachnida	Araneae	Sparassidae	*Heteropoda venatoria*	**Native**	**x**	NA	1	1	0	2	**low**
Arachnida	Araneae	Sparassidae	*Olios lamarcki*	**Native**	**x**	NA	1	1	0	2	**low**
Arachnida	Araneae	Tetragnathidae	*Leucauge*	**Native**	**x**	NA	1	1	0	2	**low**
Aves	Charadriiformes	Charadriidae	*Pluvialis squatarola*	**Native**	**x**	LC	1	1	0	2	**low**
Aves	Charadriiformes	Scolopacidae	*Arenaria interpres*	**Native**	**x**	LC	1	1	0	2	**low**
Aves	Charadriiformes	Scolopacidae	*Numenius phaeopus*	**Native**	**x**	LC	1	1	0	2	**low**
Aves	Pelecaniformes	Ardeidae	*Butorides striata*	**Native**	**x**	LC	1	1	0	2	**low**
Aves	Phaethontiformes	Phaethontidae	*Phaethon lepturus*	**Native**	**x**	LC	1	1	0	2	**low**
Chilopoda	Scolopendromorpha	Scolopendridae	*Scolopendra subspinipes*	**Native**	**x**	NA	1	1	0	2	**low**
Gastropoda	Caenogastropoda	Thiaridae	*Melanoides tuberculata*	**Native**	**x**	LC	1	1	0	2	**low**
Hexapoda	Blattodea	Blaberidae	*Pycnoscelus surinamensis*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Hemiptera	Pyrrhocoridae	*Dysdercus fasciatus*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Hymenoptera	Vespidae	*Polistes olivaceus*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Crambidae	*Spoladea recurvalis*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Erebidae	*Hydrillodes uliginosalis*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Erebidae	*Remigia conveniens*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Erebidae	*Trigonodes hyppasia*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Hesperiidae	*Borbo borbonica*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Lycaenidae	*Leptotes pirithous*	**Native**	**x**	NA	1	1	0	2	**low**

Class	Order	Family	Taxa	Status	Local protection	IUCN	note statut	note protection	note IUCN	note total	Receptor sensitivity
Hexapoda	Lepidoptera	Lycaenidae	*Zizeeria knysna*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Lycaenidae	*Zizina antanossa*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Nolidae	*Earias biplaga*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Nymphalidae	*Danaus chrysippus*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Nymphalidae	*Hypolimnas misippus*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Nymphalidae	*Junonia rhadama*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Nymphalidae	*Melanitis leda*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Nymphalidae	*Phalanta phalantha*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Pieridae	*Catopsilia florella*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Lepidoptera	Sphingidae	*Agrius convolvuli*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Odonata	Coenagrionidae	*Ischnura senegalensis*	**Native**	**x**	LC	1	1	0	2	**low**
Hexapoda	Odonata	Libellulidae	*Pantala flavescens*	**Native**	**x**	LC	1	1	0	2	**low**
Hexapoda	Orthoptera	Acrididae	*Locusta migratoria*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Orthoptera	Gryllidae	*Gryllodes sigillatus*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Orthoptera	Tettigoniidae	*Conocephalus iris*	**Native**	**x**	NA	1	1	0	2	**low**
Hexapoda	Orthoptera	Trigonidiidae	*Trigonidium cicindeloides*	**Native**	**x**	NA	1	1	0	2	**low**
Malacostraca	Decapoda	Coenobitidae	*Coenobita rugosus*	**Native**	**x**	NA	1	1	0	2	**low**
Malacostraca	Decapoda	Gecarcinidae	*Cardisoma carnifex*	**Native**	**x**	NA	1	1	0	2	**low**
Malacostraca	Decapoda	Ocypodidae	*Ocypode ceratophthalmus*	**Native**	**x**	NA	1	1	0	2	**low**
Malacostraca	Decapoda	Sesarmidae	*Neosarmatium meinerti*	**Native**	**x**	NA	1	1	0	2	**low**
Reptilia	Squamata	Gekkonidae	*Lepidodactylus lugubris*	**Native**	**x**	LC	1	1	0	2	**low**

Table 2-18: 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 major / high sensitivity	*Tropidophora articulata & T. desmazuresi (Gastropoda)*	**Major / High**	Few alive populations inside Anse Quitor Reserve only
FA02	**Fauna**	Fauna species of high sensitivity	*Pteropus rodricensis (Chiroptera)*	**high**	>10
FA03	**Fauna**	Fauna species of medium sensitivity	*Omphalotropis littorinula (Gastropoda)*	**Medium**	Few alive populations inside Anse Quitor Reserve only
FA04	**Fauna**	Fauna species of low sensitivity	*All other native species*	**Low**	Unknown

2.4.1.5 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.

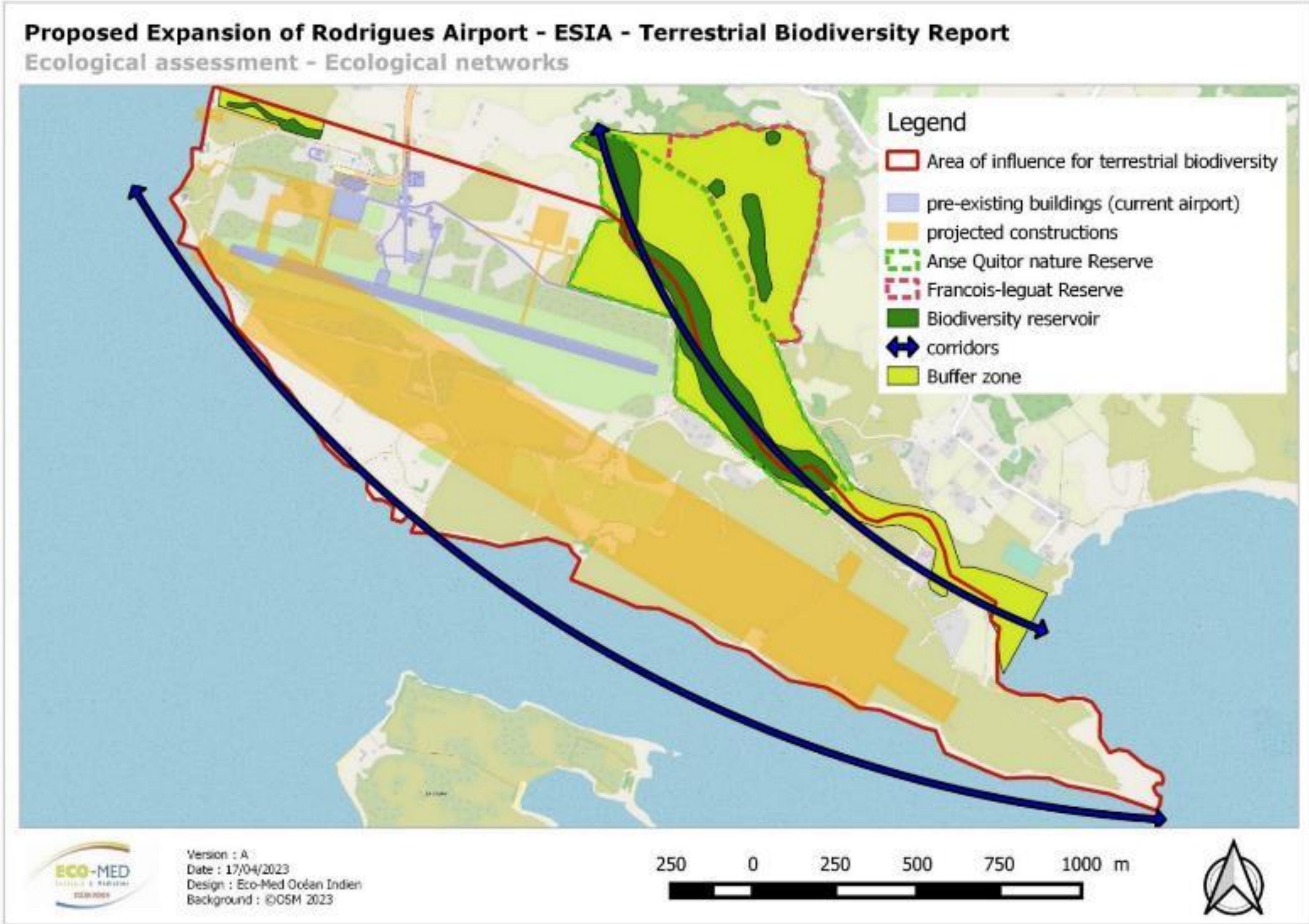
The restoration parcels and plantations bordering it form a buffer zone (including the official delimitation of the Anse Quitor nature reserve, the François Leguat Reserve and the downstream portion of the river).

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 2-19.

Table 2-19: 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 (*Lygodactylus 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*) Endemic molluscs (*Tropidophora ssp, Omphalotropis littorinula*)
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, etc*)
Grazing lands		

Figure 2-26: Ecological network mapping



2.4.1.6 Terrestrial biological environment issues

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 Figure 2-26 above, 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.

Protected species

Forestry Act 1983 :

The Forestry Act 1983 prohibits the destruction of plants in forest land and reserves. 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 tables 2-17, 2-18 and 2-19.

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:

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 in the Specialist Report for Terrestrial Biodiversity.

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 congregator species;
(d) Highly threatened or unique ecosystems
(e) 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 rescue and firefighting station (RFFSD) have been relocated outside the critical habitat, hence reducing the impact rating.

2.4.2 MARINE BIOLOGICAL CONTEXT

A marine biodiversity survey was undertaken in 2019 and a complementary field survey was carried out in April 2023.

Please refer to the 'Marine Biodiversity Factual Report' for the complete description.

2.4.2.1 Area of influence

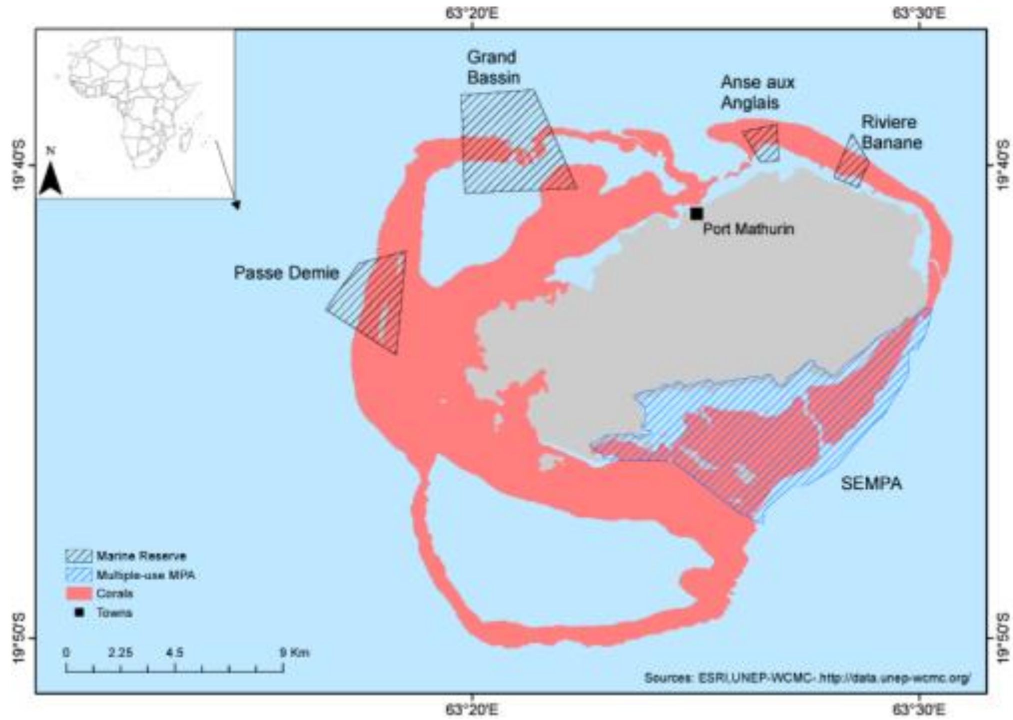
The area of influence for marine biodiversity, as shown in the Figure hereafter, extends from Baie Topaze to the north, Désirée and Frégate Islands, Crab Island to the south and Anse Patate to the east.

Figure 2-27: Area of influence for Marine biodiversity

2.4.2.2 Management responses and marine protected area

The marine environment of Rodrigues is protected by the Fisheries and Marine Resources Act signed in 2007. Ten Marine Protected Areas have been declared and proclaimed in Rodrigues Island, out of which five are classified as Fishing Reserves, four as Marine Reserves and one as a multiple-use MPA . (see figure 2-28 below)

Figure 2-28: Marine Areas under Protection, excluding the five Fishing Reserves (not currently geo-referenced)



The Marine Reserves were identified through a participatory process with the support of Shoals Rodrigues, a local marine non-governmental organization. Fishermen from 17 villages were consulted and asked to identify appropriate locations for the marine reserves with a view to promote sustainable fisheries and to improve conservation status of the marine environment.

The Marine Reserves are Riviere Banane, Anse aux Anglais, Grand Bassin and Passe Demie. The cumulative extent of the marine reserves is 24.3km2.

The South East Marine Protected Area (SEMPA) is a multiple-use MPA was proclaimed in 2009 and originally identified in consultation with the local communities from ten villages bordering it. SEMPA is not only the largest MPA of Rodrigues but also that of the Republic of Mauritius covering a marine area of 43km2. It stretches from the shoreline to the 20m isobath and is composed of a variety of habitats including the lagoon, off-lagoon waters, reef slopes, reef flats, channel reefs, back reef areas and seagrass beds.

The boundaries of the **Fishing Reserves** have been so far described using specific points on land and at sea, though their GPS coordinates have not been recorded and their areas not calculated. The extent is approximately 20km2.

Moreover, there is no formal management being undertaken in the Fishing Reserves except for sea patrolling by the Fisheries Protection Service. The five fishing reserves are Pointe la Gueule to Pointe Vénus; Pointe Manioc; Baie Topaze; Anse Quitor and Grande Passe.

The project is located between the Baie Topaze Fishing Reserve and the South East Marine Protected Area. It is not included in any marine protected area.

2.4.2.3 Marine ecological issues of Rodrigues Island

Rodrigues Island is surrounded by a fringing reef that encloses a shallow lagoon and extends up to 5 km offshore, it is described as the most developed reef in the Mascarene Islands (Klaus and al., 2016). However, the island is isolated and located upstream of other major reefs in the Western Indian Ocean, making the coral reefs of Rodrigues Island vulnerable to disturbance (Klaus and al., 2016).

According to Duvat (2015), the effects of climate change on the marine environment of the small islands of the southwest Indian Ocean are characterized by:

- An accentuation of beach erosion (retreat of the coastline).
- A silting up or a displacement of the mangroves.
- A reduction in phanerogam meadows.
- An increasing frequency and intensity of coral bleaching events.
- A decrease in the resilience of coral communities.
- A resurgence of pathogens

The results of the BRIO program (Building Resilience in the Indian Ocean - Météo France, 2022), show a warming that could reach 6°C locally by 2100 compared to the period 1981-2010; resulting in an alternation of longer and more severe droughts, with denser rainy episodes and a higher proportion of intense cyclones.

Rainfall data for the past 10 years, measured at the "Plaine Corail Airport" site by the Mauritius Meteorological Services (2023), provide results in line with BRIO program forecasts. Thus, despite very irregular rainfall from one year to the next, we globally observe:

- An increase in the number of days with more than 25 mm of precipitation (33 days during the period 2013-2017 Vs 54 days during 2018-2022, i.e. an increase of 64%).
- An increase in the number of months with more than 250 mm of precipitation (3 months during 2013-2017 Vs 6 months during 2018-2022, i.e. an increase of 100%).

During the same period, corals have been severely impacted by human activities and climate change.

The cumulative effect of all the pressures of anthropogenic origin identified on Rodrigues Island represents the highest risk of direct impact of human activity on coastal marine ecosystems. This effect has probably largely contributed to the gradual degradation of lagoon coral formations and acts chronically on ecosystems, gradually affecting their regulation and resilience mechanisms in the face of paroxysmal natural impacts (cyclones, heavy rains, coral bleaching, etc.). These weakened ecosystems then resist less well and regenerate more slowly than if they were not subjected to these chronic pressures. This degradation of coral populations (architect species) could eventually cause a lasting breakdown (phase shift) of coastal reef ecosystems towards environments with detrital spreading of low ecological interest, causing almost definitive chain reactions on all ecosystem services produced by the reef-lagoon system (fisheries resources, sanitation and public health, self-sanitation, CO2 sequestration, etc.).

2.4.2.4 Marine Biodiversity Survey 2023

Marine Biodiversity Inventory

The biodiversity inventories were carried out in immersion (snorkeling or diving) on all of the 86 stations sampled during the investigation campaign of April 2023 (MAREX, 2023). Refer to figure 2-29 sampling plan.

A total of 261 species were identified during this study, for an estimated total sampling time of 14 hours, carried out by 3 experts immersed simultaneously at 86 stations of which 78 (91%) were composed of soft substrates at more than 80% (sandy muddy to coarse detrital).

The species were distributed as follows within the different taxa:

- 149 species of fish (including 16 new records for Rodrigues)
- 50 species of hard corals (scleractinia and millepores)
- 34 species of macroinvertebrates (crustaceans, echinoderms, molluscs, flatworms)
- 26 species of macroalgae (>3 cm)
- 2 species of marine phanerogams.

However, despite this significant imbalance in the sampling of soft and hard substrates (only 8 stations with a majority of hard substrates), 79% of all species were observed on rocky substrates, or fixed on limestone blocks (dead corals), illustrating the issue of conservation of these minority habitats. However, it should be noted that all species of phanerogams, as well as 54% of algae species, 32% of macroinvertebrate and 18% of fish were observed on soft substrates.

Among all the species listed, only one species of fish and one species of coral have a protection status in local regulations:

- *Stegastes limbatus*: The Fisheries and Marine Resources Act, 2007
- *Acropora muricata* (formerly *Acropora Formosa*): The Fisheries and Marine Resources Act, 2007 and The environment protection Act, 2002

In addition, 15 species of coral, 2 species of fish (*Carcharhinus amblyrhynchos* and *Taeniura meyeni*) and 1 species of sea cucumber (*Holothuria nobilis*) are classified NT, VU or EN on the IUCN Red list. All species of corals, *Holothuria nobilis* and *Tridacna maxima* are also listed in Appendix II of CITES.

Concerning the uses by humans, 39 species of fish have an ancillary interest for fishing (subsistence exploitation) and 35 have a major interest (marketing). These are mainly groupers, spinefoots, red mullets, parrots and snappers. These species were observed in very low abundance and generally in juvenile stages, with the exception of the Passe Butte aux Sable station (ROD56) where the individuals observed were abundant and large.

Among the macro invertebrates, apart from ourite (*Octopus cyanea*), whose fishing is regulated in Rodrigues (closure of fishing from August 13 to October 12), lobster (*Panulirus versicolor*) and kono-kono (*Pleuroploca trapezium*), still relatively abundant, only a few individuals of *Holothuria leucospilota* and *Holothuria nobilis*, whose fishing has also been regulated in Mauritius and Rodrigue since 2006 (but whose effective control in the field seems difficult), as well as a specimen of giant clam (*Tridacna maxima*), the international trade of which is regulated by CITES, have been observed.

Certain species of algae are also used as seafood and in pharmacopoeia, in particular because of their richness in antioxidants, mineral salts and their antibiotic and vermifuge action. These are in particular species of the genus *Caulerpa*, which are very abundant in the study area, and to a lesser extent *Turbinaria, Acanthophora* and *Digenea.*

Mapping of Marine Habitats

A total of 13 habitats have been identified based on image analysis and ground truthing from 2019 and 2023. Refer to figure 2-30 Marine Habitat mapping.

They can be grouped according to the following typology:

Soft substrate habitats:

- Bare soft substrate:
  - Muddy bay
  - Sandy-muddy channel
  - Sandy-muddy lagoon with rubble
  - Sandy lagoon with rubble
- Algae and seagrass beds:
  - Algae bed dominated by Rhodophyta assemblage
  - Algae bed dominated by Caulerpa spp.
  - Seagrass bed dominated by Halophila spp

Hard substrate habitats:

- Sublittoral rocks:
  - Sublittoral rock dominated by Ochrophyta assemblage
- Fringing coral reefs:
  - Fringing reef dominated by *Acropora muricata*
  - Detrital fringing reef dominated by Ochrophyta assemblage
- Barrier coral reefs:
  - Detrital reef flat with sparse corals and algae
  - Outer reef flat with sparse corals
  - Outer slope with corals, soft corals, gorgonians and crustose algae

Ecological sensitivity assessment

The “MERCI-Cor” assessment method (Method to Avoid, Reduce and Compensate for Impacts in Coral Environments), developed on behalf of IFRECOR (Pinault et al., 2017), offers a rapid approach to acquiring data from field, allowing a semi-quantitative evaluation of the main ecological indicators, adapted to each type of environment (coral reefs, seagrass beds, associated fauna), currently promoted by the International Coral Reef Initiative (ICRI).

On the same stations as the biodiversity inventories, 19 ecological indicators were measured in order to estimate ecological sensitivity according to three criteria:

- The richness and abundance of benthic populations of hard substrates (8 indicators),
- The richness and abundance of benthic populations of soft substrates (6 indicators),
- The richness and abundance of associated mobile fauna (fish and macro-invertebrates) (5 indicators).

Bare soft substrate habitats

Bare soft substrate habitats cover a large majority of the study area (64%), as evidenced by the artisanal exploitation of lagoon sand, whose landing stage is located on the project footprint. There is a very clear grain size gradient between: (1) the muddy bays, covered with a silty sediment mainly of terrigenous origin (black color), fluid and smooth, (2) the sandy-muddy channel, with less cohesive but still very fine sediments, (3) the sandy-muddy lagoon with rubble, mainly composed of fine to medium sand, and (4) the sandy lagoon with rubble composed of coarse sand and shell and coral debris

From a biological perspective, almost no fish were observed on these habitats. They are characterized by their populations of epigeal (living on the surface of the sediment) and endogeic (living buried in the sediment) macroinvertebrates. Epigeal macro-invertebrates, mainly composed of echinoderms, in particular black sea cucumber (Holothuria atra), extremely abundant throughout the study area, and some gastropod molluscs (Tonna perdix, Pleuroploca trapezium, etc.), were identified in situ and showed increasing abundance from muddy bays (3 individuals/100m2) to the sandy lagoon with rubble (86 individuals/100m2).

The relative abundance and diversity of endogeic fauna were estimated from the number of burrows and tumuli observed per square meter, and by the diversity of shells and debris of dead organisms present on the surface of the sediment. Thus, burrows and tumuli dug by decapod crustaceans (Alpheidae, Callianassidae) and lugworms were very abundant at the bottom of the bays (43 burrows/m2) and increasingly rare going seaward, with minimum values on the sandy lagoon with rubble (7 burrows/m2). Conversely, bivalve shells collected at the surface of the substrate (e.g. Gafrarium pectinatum, Quidnipagus palatam, Trachycardium angulatum) indicated greater abundance and diversity in the coarser sediments.

Despite an increasing gradient of biological richness from the muddy bays, very poor in biological settlements, towards the lagoonal coarser sediments, characterized by populations of moderately abundant and diversified macro-invertebrates, the bare soft substrates habitats can be considered as resistant to environmental disturbances, due in particular to the strong demographic flexibility and the food opportunism of their benthic communities. They are considered in this study of **very low sensitivity**

	FIXED BENTHIC FAUNA AND FLORA		MOBILE FAUNA	GLOBAL SENSITIVITY
	HARD SUBSTRATES	SOFT SUBSTRATES	POISS & MACRO-INV	GLOBAL
BARE SOFT SUBSTRATE HABITATS	NA	VERY LOW	VERY LOW	VERY LOW

Algae and seagrass beds

Algae and seagrass meadows represent 17% of the study site. They develop on a grain size gradient ranging from fine, slightly silted sand to coarse sand and debris.

Algae assemblages, dominated by Rhodophyta (Palisada perforata, Acanthophora spicifera, Hypnea cornuta), resistant to desiccation and environmental variations (Vasconcelos et al., 2021), develop very close to the shore, sometimes up to the intertidal zone.

Then follow the phanerogam meadows, composed of pioneer species adapted to sedimentation (Halophila ovalis, Halophila stipulacea). Finally, Caulerpa beds (Caulerpa brachypus, C. chemnitzia, C. cupressoides, C. racemosa, C. serrulata, C. taxifolia) appear further from the shore (about 1km) on coarse detrital substrates and extend in patches to the barrier reef.

Fish populations were virtually absent from these habitats. The associated fauna was also mainly composed of macroinvertebrate species, overall very similar to those described on bare soft substrates. A very high abundance of black sea cucumbers (Holothuria atra) was notably observed in the Caulerpa beds and individuals of kono-kono (Pleuroploca trapezium), isolated or in small groups, were frequently observed on the Halophila seagrass stations.

Although the ecological interest of *Caulerpa* beds is poorly documented, they seem to act on the associated fauna in a similar way to seagrass beds, by concentrating the associated mobile fauna (feeding, reproduction, concealment against predation), such as sea cucumbers and gastropod molluscs. On the other hand, their strong adaptability to environmental variations and the virtual absence of fish keep these habitats at a **low** level of sensitivity. Coastal algal beds, dominated by Rhodophyta assemblages, are classified as **very low sensitivity**.

	FIXED BENTHIC FAUNA AND FLORA		MOBILE FAUNA	GLOBAL SENSITIVITY
	HARD SUBSTRATES	SOFT SUBSTRATES	POISS & MACRO-INV	GLOBAL
ALGAE BED DOMINATED BY RHODOPHYTA ASSEMBLAGE	NA	VERY LOW	VERY LOW	VERY LOW

	FIXED BENTHIC FAUNA AND FLORA		MOBILE FAUNA	GLOBAL SENSITIVITY
	HARD SUBSTRATES	SOFT SUBSTRATES	POISS & MACRO-INV	GLOBAL
ALGAE BED DOMINATED BY CAULERPA SPP.	NA	LOW	LOW	LOW

	FIXED BENTHIC FAUNA AND FLORA		MOBILE FAUNA	GLOBAL SENSITIVITY
	HARD SUBSTRATES	SOFT SUBSTRATES	POISS & MACRO-INV	GLOBAL
SEAGRASS BED DOMINATED BY HALOPHILA SPP.	NA	MEDIUM	VERY LOW	LOW

Sublittoral rocks

In places (0,1% of the study site), the volcanic coastline of Pointe Corail continues into the lagoon as a rocky belt about 40m wide. This rocky incursion is then quickly silted up going seaward. It allows the installation of a brown algae assemblage (Phaeophyceae) characteristic of intertidal environments, beaten by the waves (Sargassum ilicifolium, Padina boergesenii, Canistrocarpus cervicornis, Turbinaria ornata).

However, this transitional ecosystem does not present any specific issue in terms of conservation due, on the one hand, to the very ubiquitous and pioneering nature of the algal assemblage and, on the other hand, to the very low diversity and abundance of the associated fauna, with the exception of the species *Modiolus auriculatus* present in dense patches. This habitat is classified as **very low sensitivity.**

	FIXED BENTHIC FAUNA AND FLORA		MOBILE FAUNA	GLOBAL SENSITIVITY
	HARD SUBSTRATES	SOFT SUBSTRATES	POISS & MACRO-INV	GLOBAL
SUBLITTORAL ROCKS DOMINATED BY OCHROPHYTA ASSEMBLAGE	VERY LOW	NA	LOW	VERY LOW

Fringing coral reefs

Small scattered fringing reefs (0,2% of the study area), already described by Chapman in 2000, were sampled near certain coasts of the study site in 2019 and 2023. These habitats, of heritage interest despite their small size, in particular thanks to the architect species Acropora muricata, however, showed significant signs of degradation. If some reefs are already completely dead, probably for many years, it is different for reefs that are still alive, the signs of degradation of which seem to have appeared more recently (10 to 15 years). Their location near the coast, at the exits of bays, could indicate a gradual deterioration in water quality over the past twenty years, amplified by the coral bleaching events of 2015 and 2016.

Fish populations were moderately diverse (20 to 30 species per station on branched Acropora reef and less than 15 species on dead reefs) and composed of fairly common non-specialist species, typical of shallow rocky bottoms, with few top predators of small sizes (Lutjanus fulviflamma, Lutjanus fulvus, Epinephelus merra). Species characteristic of coral reefs (Chaetodontidae, Sacridae, Holocentridae, Pomacentridae) were almost absent, in favour of opportunistic herbivorous with a broad food spectrum (Ctenochaetus striatus, Zebrasoma desjardinii, Acanthurus nigrofuscus, etc.).

The macroinvertebrate populations were composed of a mixture of reef species of heritage interest (Turbo argyrostomus, Cypraea tigris) and black sea cucumbers (Holothuria atra) present throughout the study area in variable densities. The colonies of Acropora muricata were invaded by algal turfs and ascidians and grapes of bivalves of the Pteria genus were inserted between the partially necrotic branches.

The presence of the protected species Acropora muricata and associated populations moderately abundant and diversified, although fairly common, justify the classification of branching Acropora reefs as medium sensitivity. On the other hand, dead reefs, whose extinct coral species have left only rubbles where common fauna still lives, are classified as **low sensitivity**.

	FIXED BENTHIC FAUNA AND FLORA		MOBILE FAUNA	GLOBAL SENSITIVITY
	HARD SUBSTRATES	SOFT SUBSTRATES	POISS & MACRO-INV	GLOBAL
FRINGING REEF DOMINATED BY ACROPORA MURICATA	MEDIUM	NA	MEDIUM	MEDIUM

	FIXED BENTHIC FAUNA AND FLORA		MOBILE FAUNA	GLOBAL SENSITIVITY
	HARD SUBSTRATES	SOFT SUBSTRATES	POISS & MACRO-INV	GLOBAL
DETRITAL FRINGING REEF DOMINATED BY OCHROPHYTA ASSEMBLAGE	LOW	NA	LOW	LOW

Barrier coral reefs

The barrier reef (19% of the study site), located offshore (2 to 4km from the coast) is both the richest environment and the furthest from the supposed effects of the airport project. From the lagoon out to sea, it is composed of: (1) an inner detrital reef flat on mixt substrates, characterized by a virtual absence of coral colonies, scattered and unoriginal fish populations and a high abundance of sea urchins (Echinometra mathaei), (2) a compact outer reef flat with coral populations slightly more developed than on the inner reef flat and very high densities of sea urchins (Echinometra mathaei, Echinothrix diadema, Stomopneustes variolaris), (3) an outer slope with spurs and grooves, marked by partly dead coral populations and composed of species adapted to siltation, but a remarkable population of fish, in particular composed of threatened species (Carcharhinus amblyrhynchos, Taeniura meyeni) and of high interest for fishing (Epinephelus coioides, Epinephelus tauvina, Plectropomus punctatus).

Apart from the populations of sea urchins, the macroinvertebrates encountered on the barrier reef habitats were scarce, but were of heritage interest, such as the giant clam (Tridacna maxima), the turban (Turbo argyrostomus), the black teatfish (Holothuria nobilis) or the eyed cowry (Arestorides argus).

These habitats located on a hydrodynamic gradient also present a gradient of ecological sensitivity decreasing from the sea towards the lagoon, with an outer slope of high sensitivity (remarkable fish population), followed by a compact outer reef flat then a detrital inner reef flat of **low sensitivity**.

	FIXED BENTHIC FAUNA AND FLORA		MOBILE FAUNA	GLOBAL SENSITIVITY
	HARD SUBSTRATES	SOFT SUBSTRATES	POISS & MACRO-INV	GLOBAL
DETRITAL REEF FLAT WITH SPARSE CORALS AND ALGAE	VERY LOW	NA	LOW	LOW

	FIXED BENTHIC FAUNA AND FLORA		MOBILE FAUNA	GLOBAL SENSITIVITY
	HARD SUBSTRATES	SOFT SUBSTRATES	POISS & MACRO-INV	GLOBAL
OUTER REEF FLAT WITH SPARSE CORALS	MEDIUM	NA	LOW	LOW

	FIXED BENTHIC FAUNA AND FLORA		MOBILE FAUNA	GLOBAL SENSITIVITY
	HARD SUBSTRATES	SOFT SUBSTRATES	POISS & MACRO-INV	GLOBAL
OUTER SLOPE WITH CORALS, SOFT CORALS, GORGONIANS AND CRUSTOSE ALGAE ASSEMBLAGE	MEDIUM	NA	HIGH	HIGH

Physicochemical analyses

The results of the physicochemical analyses show a strong gradient of increasing quality of the coastal waters from the bottom of Topaz Bay, towards the reef barrier. The water in the bay is characterized (1) by significantly higher temperature (27.9°C) and salinity (35.18) values (ocean values of 27.2°C and 34.75), indicators of a marked evaporation phenomenon, accompanied (2) by significantly lower dissolved oxygen (85.7%) and pH (7.88) values (ocean values of 101% and 8.14), indicators of highly confined waters, probably subject to a phenomenon of coastal eutrophication, and (3) very high turbidity values (8.44 NTU, for oceanic values of 0.45 NTU), also showing a chronic terrigenous influence on this highly sensitive water body.

These results are in line with the observations made previously on the tendency to progressive siltation of the coastal fringe, probably due to cumulative mechanisms of land destabilization (urbanization, unsuitable agricultural practices, deforestation) in a context of climate change (increase the number of days of heavy rain per year and the frequency and intensity of tropical depressions). This phenomenon is most likely the main cause of the signs of advanced degradation of lagoon coral reefs described in this study.

Table 2-20: Habitats dimension & Ecological Sensitivity

SUBSTRATES	HABITATS (1)	HABITATS (2)	SURFACE (HA)	SURFACE (%)	HARD SUBSTRATE BENTHOS	SOFT SUBSTRATE BENTHOS	FISH AND INVERTEBRATES	GLOBAL SENSITIVITY
SOFT SUBSTRATES	BARE SOFT SUBSTRATES	MUDDY BAY	269,20	5,3%	/	VERY LOW	VERY LOW	VERY LOW
		SANDY-MUDDY CHANNEL	39,46	0,8%	/	VERY LOW	VERY LOW	VERY LOW
		SANDY-MUDDY LAGOON WITH RUBBLE	439,84	8,6%	/	VERY LOW	VERY LOW	VERY LOW
		SANDY LAGOON WITH RUBBLE	2532,39	49,6%	/	VERY LOW	VERY LOW	VERY LOW
	ALGAE AND SEAGRASS BEDS	ALGAE BED DOMINATED BY RHODOPHYTA ASSEMBLAGE	285,98	5,6%	/	VERY LOW	VERY LOW	VERY LOW
		ALGAE BED DOMINATED BY CAULERPA SPP.	484,60	9,5%	/	LOW	LOW	LOW
		SEAGRASS BED DOMINATED BY HALOPHILA SPP.	80,55	1,6%	/	MEDIUM	VERY LOW	LOW
HARD SUBSTRATES	SUBLITTORAL ROCKS	SUBLITTORAL ROCKS DOMINATED BY OCHROPHYTA ASSEMBLAGE	5,17	0,1%	VERY LOW	/	LOW	VERY LOW
	FRINGING CORAL REEFS	FRINGING REEF DOMINATED BY ACROPORA MURICATA	4,97	0,1%	MEDIUM	/	MEDIUM	MEDIUM
		DETRITAL FRINGING REEF DOMINATED BY OCHROPHYTA ASSEMBLAGE	6,95	0,1%	LOW	/	LOW	LOW
	BARRIER CORAL REEFS	DETRITAL REEF FLAT WITH SPARSE CORALS AND ALGAE	539,42	10,6%	VERY LOW	/	LOW	LOW
		OUTER REEF FLAT WITH SPARSE CORALS	223,78	4,4%	MEDIUM	/	LOW	LOW
		OUTER SLOPE WITH CORALS, SOFT CORALS, GORGONIANS AND CRUSTOSE ALGAE ASSEMBLAGE	198,14	3,9%	MEDIUM	/	HIGH	HIGH

2.4.2.5 Bibliographic study of marine mammals and sea turtles of Rodrigues

Sea 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.

More recent studies have shown that both species still frequent the waters of Rodrigues. Individuals have been observed occasionally in the lagoon or on the reef slopes (Shoals Rodrigues pers. obs.). The beaches potentially favourable to marine turtles are mainly located in the eastern third of the island.

The data collected by Lartiges et al in 2003 have enabled us to highlight the presence of marine turtles in Rodrigues over the last few decades with:

- a good ten young turtles observed in January 2002 swimming along the shore of Crab island;
- an emergence observed in 1988 on Baladirou beach;
- a laying on Mourouk-Ouest beach about ten years ago;
- ascents on the beach of Saint François are observed every 2 or 3 years

However, the situation on the ground remains worrying, and visibly since the Lartiges et al. report (2003), things have hardly changed: very few marine turtles come to lay their eggs, and poaching of these protected species is still frequent on the island (Frétey et al., 2012).

The project area does not regularly host these remarkable and emblematic species. Sea turtles may be observed in Topaz Bay (Palmiste Pointe), but this should be considered an occasional occurrence (Shoals Rodrigues pers. obs.). No turtle was observed in the area of influence during the dives in July 2019.

The green turtle is classified as "endangered" and "critically endangered" for the hawksbill turtle on the IUCN Red List (www.iucnredlist.org).

For this reason, marine turtles are of a high sensitivity.

Marine mammals

Five main species are observed in the coastal waters of Rodrigues:

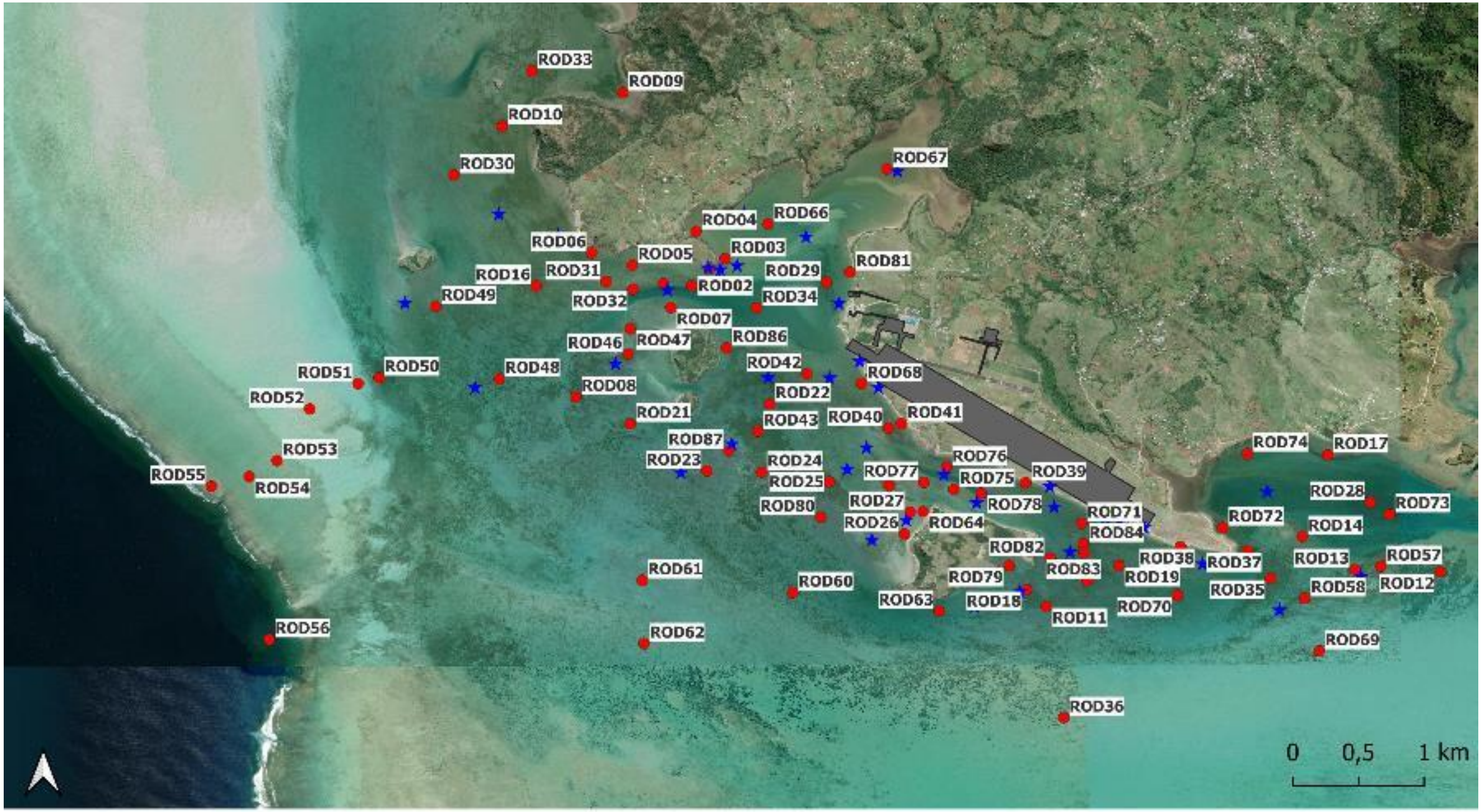
- The spinner dolphin (*Stenella longirostris*);
- The pantropical spotted dolphin (*Stenella attenuata*);
- The common bottlenose dolphin (*Tursiops truncatus*);
- The Indo-Pacific bottlenose dolphin (*Tursiops aduncus*);
- The humpback whale (*Megaptera novaeangliae*).

Humpback whales are present during the southern winter, between August and September. Bottlenose dolphins (Stenella sp.) are present mainly around the lagoon, in deeper waters. These two species can form populations of several hundred individuals. Concerning bottlenose dolphins (Tursiops sp.), the common bottlenose dolphin also remains more attached to deep waters, whereas the Indo-Pacific bottlenose dolphin seems to be more coastal. The latter may form very localised metapopulations as little is known about deep water movements for this species (Cockcroft et al., 2011 in Biotope, 2016).

In the project 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 60 m). 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.

For this reason, marine mammals are of a low sensitivity.

Figure 2-29: Marine Biodiversity - Sampling Plan 2019 & 2023



- Plan d'échantillonnage MAREX
- Plan d'échantillonnage SETEC
- Projet de piste

Figure 2-30: Marine Habitat Mapping

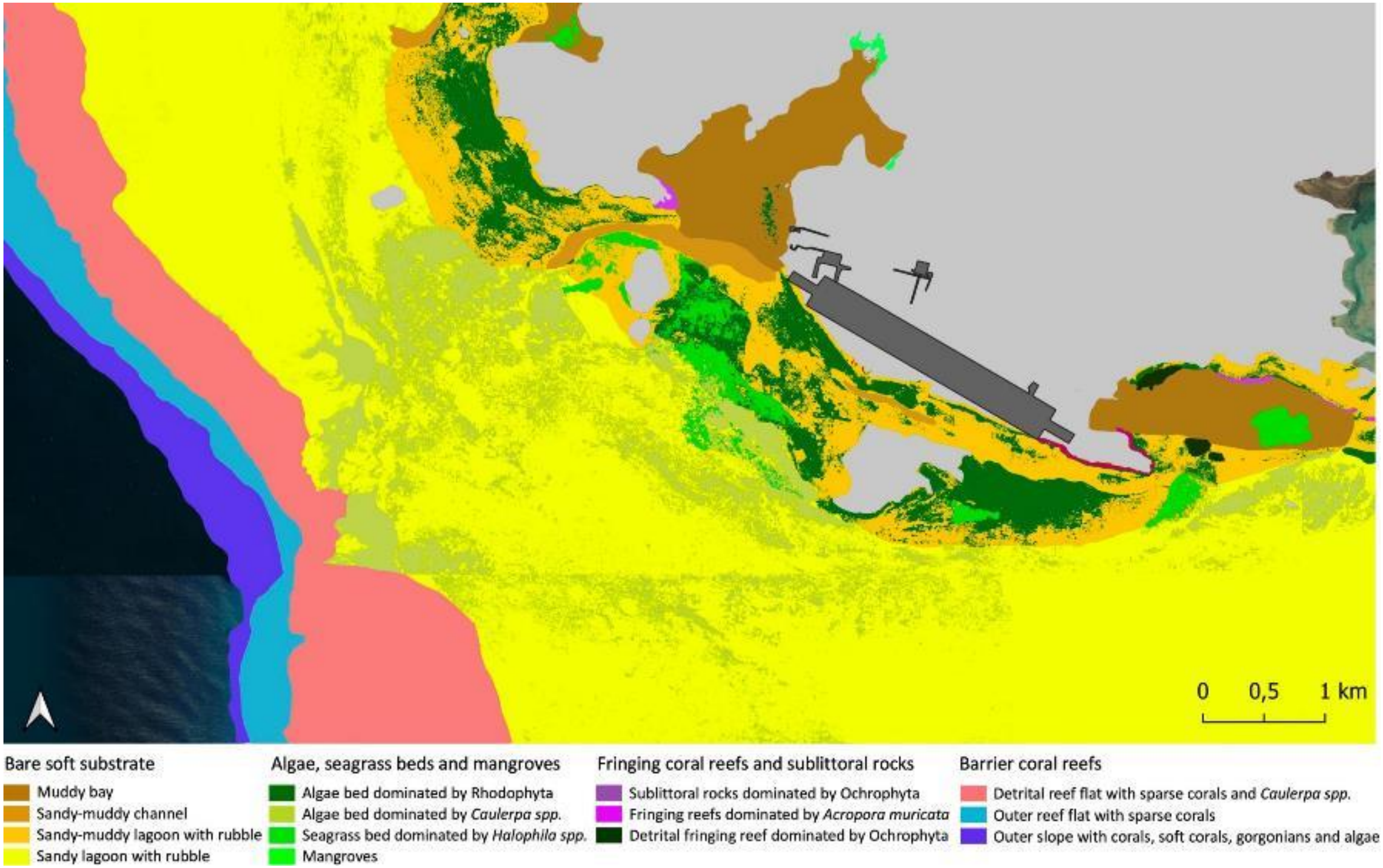


Figure 2-31: Habitats overall sensitivity – MERCI-Cor indicator (MAREX, 2023)

2.4.3 SUMMARY: BIOLOGICAL ENVIRONMENT SENSITIVITY

Table 2-21: 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	*Foetidia rodriguesiana, Hyophorbe verschaffeltii, Latania verschaffeltii, Polyscias rodriguesiana*	Major
		Zanthoxylum paniculatum, Antirhea bifurcata, Clerodendrum laciniatum, Diospyros diversifolia, Fernelia buxifolia, Mathurina penduliflora, Pandanus heterocarpus, Pleurostylia putamen, Terminalia bentzoe subsp. rodriguesensis, Adiantum rhizophorum, Sarcanthemum coronopus	High
		Phyllanthus dumentosus, Camptocarpus sphenophyllus, Secamone rodriguesiana, Nephrolepis biserrata, Phymatosorus scolopendria	Medium
		Dodonaea viscosa, Dracaena reflexa, Elaeodendron orientale, Ficus reflexa, Ficus rubra, Premna serratifolia, Thespesia populnea, Cynanchum viminale	Low
	Terrestrial fauna	*Tropidophora articulata & T. desmazuresi (Gastropoda)*	Major/High
		Pteropus rodricensis (Chiroptera)	High
		Omphalotropis littorinula (Gastropoda)	Medium
		All other native species	Low
	Marine habitats	Bare soft substrate habitats	(very) Low
		Algae bed dominated by Rhodophyta assemblage	(Very) Low
		Algae bed dominated by Caulerpa spp	Low
		Seagrass bed dominated by Halophila spp	Low
		Sublittoral rocks dominated by Ochrophyta assemblage	(very) Low
		Fringing reefs dominated by *Acropora muricata*	Medium
		Detrital fringing reef dominated par Ochrophyta assemblage	Low
		Detrital reef flat with sparse corals and algae	Low
		Outer reef flat with sparse corals	Low
		Outer slope with corals, soft corals, gorgonians and crustose algae assemblage	High
	Marine fauna	Marine turtles	High
		Marine mammals	Low

2.5 TRANSPORT NETWORK, ELECTRICITY SUPPLY AND WASTE MANAGEMENT

2.5.1 AREA OF INFLUENCE

Given the size of the island, infrastructure and services radiate from the capital city, Port Mathurin and surroundings, to the rest of the island. The main backbone is shown in Figure 2-32.

The area of influence can be taken as the island itself

2.5.2 TRANSPORT NETWORK

2.5.2.1 Road

A Traffic Baseline Study and Impact Assessment was undertaken in 2023. The following is an extract of the specialist study appended herewith.

The main mode of transportation around the island is the road network. The primary road is a paved road that runs along a northeast-southwest axis, starting from the coastal village of Pointe Coton in the northeast. It passes through the centre of the island at Mont Lubin before serving La Fourche Corail further to the west. Finally, the road connects to Plaine Corail airport from the north.

There are “secondary roads” and “residential roads” as shown on figure 2-32 below. 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 track-roads, asphalt and dirt roads. Finally, dirt roads serve small hamlets or more isolated dwellings.

Figure 2-32: Road Network in Rodrigues

Private transport network

The road network of Rodrigues Island is composed of several roads, classified into three categories as indicated in table 2-22 below:

Table 2-22: Road Classification in Rodrigues

	Road Capacity (vehicles/hour)	Average speed for Light vehicles (Km/h)	Average speed for Heavy Load vehicles (Km/h)
Primary	1 500	50 - 70	< 60
Secondary	1 000	40 - 50	-
Tertiary	500	< 40	-

During the construction phase, heavy trucks transporting different materials will mainly pass through the Autonomy Road linking the Port Mathurin port and the Plaine Corail airport (construction site).

The Autonomy Road is a primary road that passes through Mont Lubin. This mountain has an altitude of 393 meters above sea level, presenting a slope up to 14.7% preventing the articulated trucks from using this itinerary on their way to the airport.

Transport demand (Land Use)

Table 2-23: Travel demand rates of different TAZ

N°	Zone Name	*Population based on Land Use				Generation vectors (Veh/Peak hour)	
		*Permanent[3]	*Employment	*Transit/ visitors	TOTAL	Production	Attraction
1	Baladirou	214	20	38	**272**	**16**	**11**
2	Grand Baie	375	84	145	**604**	**29**	**30**
3	Anse aux Anglais	799	224	464	**1 487**	**64**	**85**
4	Port Mathurin	2 371	1 365	1 966	**5 702**	**218**	**359**
5	Baie aux Huitres	1 872	858	700	**3 430**	**154**	**186**
6	Baie Malgache	915	82	153	**1 150**	**65**	**45**
7	Baie du Nord	432	50	103	**585**	**32**	**25**
8	La Ferme	1 816	225	501	**2 542**	**136**	**109**
9	La Fouche Corail	1 592	327	1 237	**3 156**	**151**	**159**
10	Plaine Corail Airport	695	222	414	**1 331**	**60**	**71**
11	Riviere Coco	2 124	231	610	**2 965**	**163**	**122**
12	Quatre Vents	1 522	164	529	**2 215**	**121**	**92**
13	Petit Gabriel	1 175	180	240	**1 595**	**84**	**70**
14	Le Chou	1 080	323	334	**1 737**	**84**	**86**
15	Mon Lubin	2 455	242	506	**3 203**	**178**	**130**
16	Roseux	827	159	438	**1 424**	**68**	**72**
17	Grande Montagne	1 070	332	1 160	**2 562**	**115**	**139**
18	Riviere Banane	1 255	245	353	**1 853**	**91**	**90**
19	>> Est	1 337	214	281	**1 832**	**98**	**79**
20	>> Sud	2 335	343	759	**3 437**	**182**	**151**
Total		**26 261**	**5 890**	**10 931**	**43 082**	**2 110**	**2 110**

[3] * Based on collected data and Consultant assumptions

Traffic Simulation

The study was conducted for two horizons:

- 2023, the current situation (baseline scenario),
- 2025, with and without Construction works,
- 2026, with and without Project and,
- 2046, with and without Project.

The Consultant has adopted an annual traffic increase rate of 3%.

The outcome of the Traffic Impact Assessment both for construction and operation phase is provided below.

- the traffic volume generated by the Construction works phase has no significant impact on the traffic fluidity on Rodrigues Island.The main impact on users is the slowing down the traffic speed along the "Route de l'Autonomie", presenting a steep gradient due to the trucks that will travel at a low speed along this main road, linking the port to the Airport.
- the additional traffic generated during the operation phase represents only about 15 light vehicles and 4 heavy vehicles per day by 2046, which remains quite low.

2.5.2.2 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.

2.5.2.3 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.

2.5.2.4 Maritime routes

Rodrigues Island can be reached by sea via mixed cargo and passenger ships from Mauritius, with an almost weekly frequency. The journey takes 1 to 2 days by sea, and the port is located in the capital, Port Mathurin.

In addition to the regular shipping service, there are also many fishing boats and leisure boats, like catamarans, which can be used for hiking, diving, and other aquatic activities.

A boat service operates every fortnight by MV Mauritius Pride, connecting Rodrigues Island to Mauritius. The journey takes 24 hours, and the ship has a capacity of 250 passengers.

2.5.3 ELECTRICITY SUPPLY

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; 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).

The island's electricity demand of around 27.1 GWh is met entirely by the Central Electricity Board (CEB) using light and heavy oil. Despite good potential, solar water heating has low penetration. The CEB generates electricity by combusting oil at two power stations located in Port Mathurin and Pointe Monnier, with a total installed capacity of 10 MW and effective capacity of 9.4 MW. Port Mathurin has six 500 kW and three 1 MW units, making a total installed capacity of 6 MW. Pointe Monnier's first phase has 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.

2.5.4 SOLID WASTE MANAGEMENT

Rodrigues currently generates approximately 86 tons of solid waste per week. Since 1990, waste have been disposed of in an open dump located at Roche Bon Dieu. However, the site is almost full, and alternative waste management options need to be considered. The construction of a new landfill is currently underway with a completed 50 m x 50 m cell already receiving waste. However, the construction of a proper complete landfill depends on the availability of funds.

Waste segregation at household levels has started in 2022 and 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 and wheelie bins. During the implementation phase, a levelled and fenced platform of area 80 m x 100 m was 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 before exportation.

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

Green wastes are currently 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 artwork.

Construction wastes are disposed at Mt Plate which is a rock quarry site.

Legal measures are also being studied:

- Ban on use of plastic bags in Rodrigues
- Ban on use of polyethylene containers
- Regulation of waste disposal

2.5.5 SUMMARY: TRANSPORT, ELECTRICITY SUPPLY AND WASTE MANAGEMENT SENSITIVITY

Table 2-24: 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

2.6 SOCIAL ENVIRONMENT

2.6.1 METHODOLOGY AND AREA OF INFLUENCE OF THE SOCIO-ECONOMIC STUDY

2.6.1.1 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 km^2), 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, due to its small size, relies on an economy that remains fragile, and the island is heavily dependent on regular imports by sea. Imports by air take place in a very small proportion. Therefore, the Rodrigues Plaine Corail Airport is equipped with a relatively small landing strip of 1,280 m, which can only accommodate aircraft of type ATR 72. Operational and technical limitations related to the length of the runway prevent the airport from operating at full capacity. This situation inevitably leads to pressure on carriers during peak periods, higher rates 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.

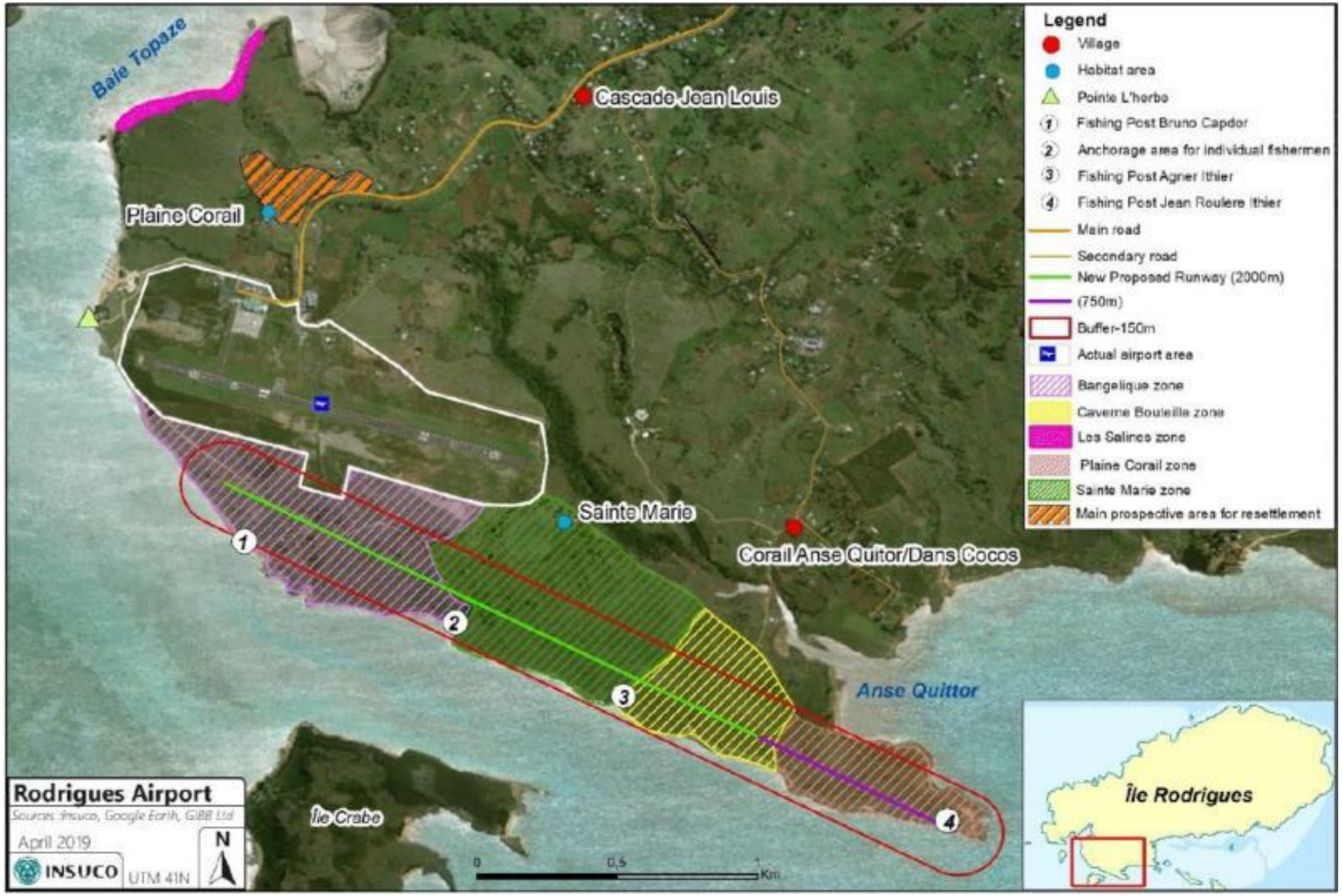
It should be noted that the project to equip Rodrigues with a new and longer airstrip comes from a political will shared by the Rodrigues Regional Assembly (RRA) and the Government of Mauritius to consolidate the economy of Rodrigues in order to better accompany the island in its socio-economic development, always with the aim of making Rodrigues an exemplary island in terms of sustainable and sustained management of its scarce resources.

2.6.1.2 Methodology

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 2-33: Social 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.

Direct Project Control Zone

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 2-34: Landscape of the project's direct control area

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. 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 2-35: 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.

Direct Impact Zone

Following the launch of the airport extension project, in 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 considered 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 considered to accommodate the relocation of fishing activities.

Population taken into account in the study

In conclusion, the basic social study considered:

- 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.

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.

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 the 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, questionnaires were sent to all households including some located 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 interview questions were sent to heads of households identified in an opportunistic manner by conducting door-to-door interviews with those who were available to answer questions.

Sample size

The size and final composition of the sample are shown in the table 2-25 below:

Table 2-25: 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%

Questionnaire

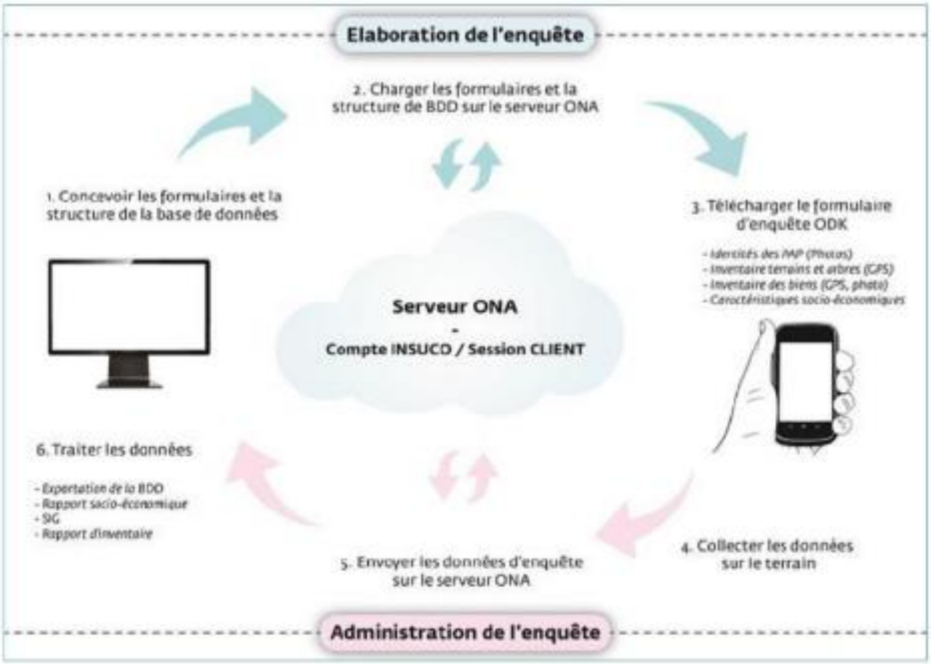
A questionnaire was developed to collect quantitative data from households. The questionnaire was designed after a first phase of field visits. This has made it possible to identify and formulate in the most appropriate manner the relevant issues for the survey and to propose significant indicators of the socio-economic situation of households, their trajectories and the parameters to consider in terms of vulnerability.

Figure 2-36: 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 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 2-37: Operational diagrams 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.

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.

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 2-38: 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 analyze 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).

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 considers 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. To understand these aspects with the micro companies that are the subject of the study, two particular aspects of land management were 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, 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 considered, but also the organization of access to pastures and fish mooring.

Focus on productive activities

A qualitative approach was 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 were taken into account. A thematic focus was 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 and non-residents operating in the area. Direct observations and informal conversations made it possible to complete the framework.

Figure 2-39: Individual interview with a fisherman in Sainte Marie village

2.6.2 ADMINISTRATION AND GOVERNANCE OF RODRIGUES ISLAND

Rodrigues Island' 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.

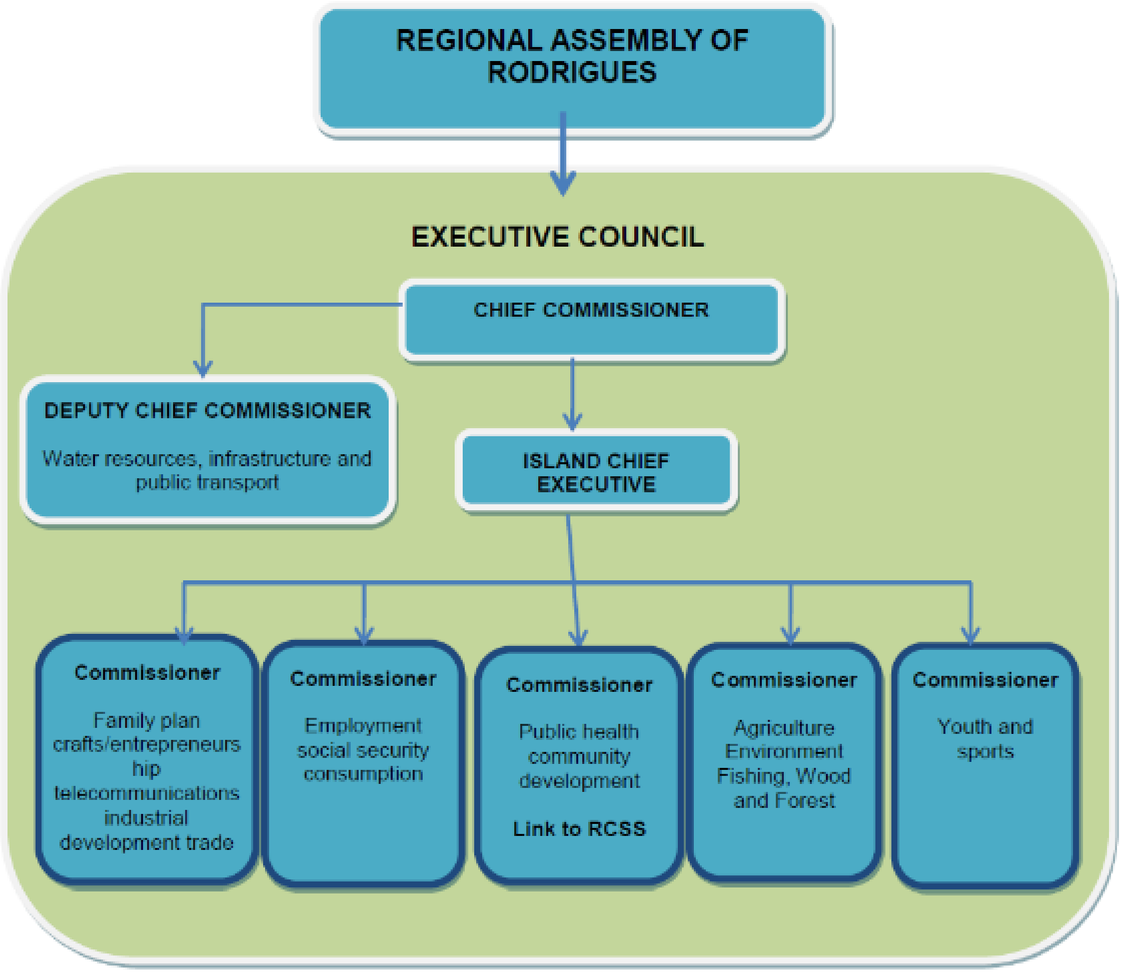
Figure 2-40: Rodrigues Island and project zone location

2.6.2.1 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 2-41: Rodrigues Regional Assembly (RRA) organizational chart



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.

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.

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.

The Commissioners

Five Commissioners each oversee a different committee, namely:

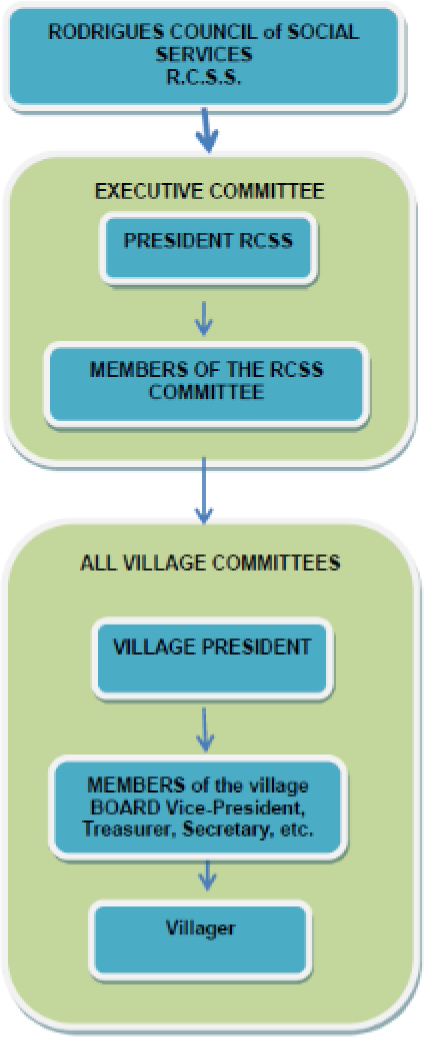
- The Commission on the development of children, women, family plans, prison and reform institutions, crafts, industrial development, cooperatives, technology and telecommunications, trade, etc.;
- The Social Security Commission, the Office of employment and consumer protection;
- The Commission on health 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.

Key non-governmental organization:

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 2-42: 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.

2.6.3 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.

2.6.3.1 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.

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.

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.

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.

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.

The second family of Sainte Marie

Two cousins were behind the installation of the second family in Sainte Marie.

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.

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.

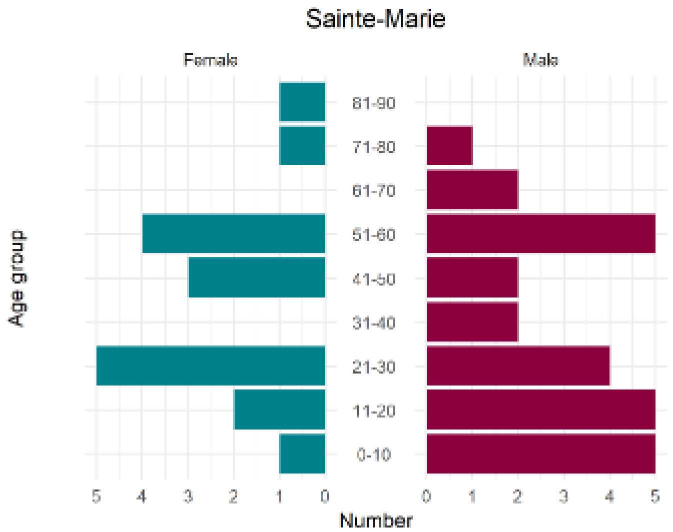
His cattle have suffered significant losses due to foot-and-mouth disease. He is the only operator of his father's former field.

His son built his own house nearby. These are the only two houses belonging to members of the second cousin’s descendants.

The demographic evolution of Sainte Marie

Quantitative household surveys have established the following demographic profiles for the village of Sainte Marie.

Figure 2-43: 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.

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.

2.6.3.2 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 2-44: Dwellings in Plaine Corail village

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.

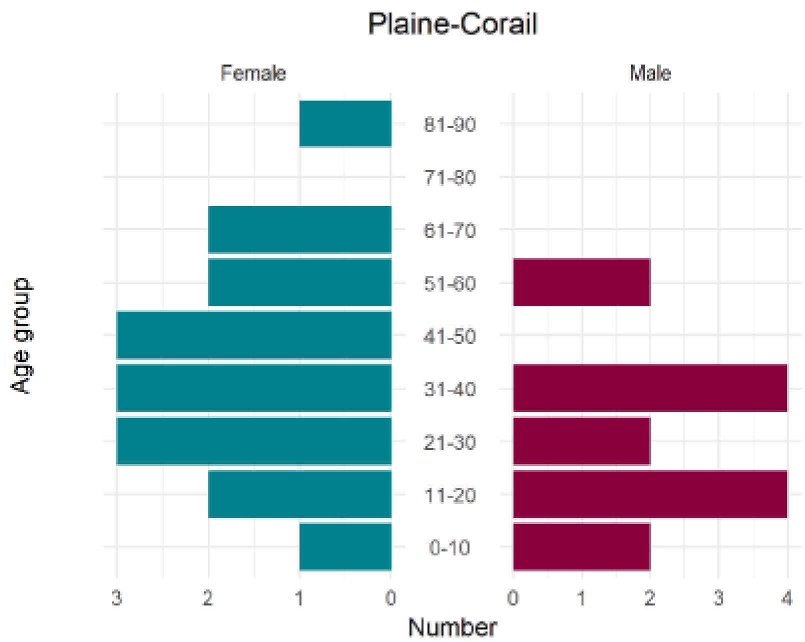
Distribution of dwellings

The inhabitants of Plaine Corail are distributed across eight dwellings.

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 2-45: 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.

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.

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.

2.6.3.3 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.

Intergenerational transmission of land rights

The case of Sainte Marie

The following principles govern land rights locally:

- As a 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.

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.

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.

2.6.3.4 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 service in Rodrigues has helped to reduce the possible gaps in the distribution of opportunities between men and women.

2.6.4 ACCESS TO BASIC PUBLIC SERVICES

2.6.4.1 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 2-46: Access to basic public services (health, education) in the project area

Figure 2-46 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.

2.6.4.2 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.

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.

Regarding 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.

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.

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.

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.

2.6.4.3 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.

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.

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.

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 in the specific appointments scheduled for that day).

The villagers visit the dispensaries for follow-ups related to chronic diseases.

2.6.5 THE LOCAL ECONOMY

2.6.5.1 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.

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.

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 2-47: 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 Bangelique, 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 2-48: Fishermen's dormitory and canteen

<u>Crew organization</u>

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 2-26 below illustrates the positioning of the crews:

Table 2-26: 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 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 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).

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 sharesused to support 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.

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.

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.

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.

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 remain 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.

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 does not have 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.

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 herds 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 2-49: 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.

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.

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).

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.

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.

Main food crops in Rodrigues

Food production remains very varied, but the largest and most widespread products are:

Table 2-27: 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.

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.

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 agroclimatic 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.

An inhabitant also reported that the younger generation is not interested in the work of the earth anymore.

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.

2.6.5.2 Household economic activities

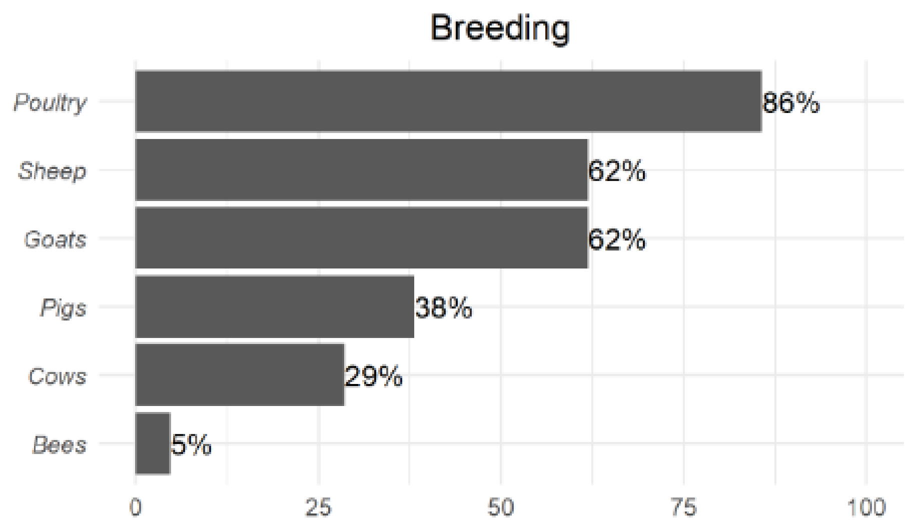
The economic activities of the villagers at the Sainte Marie and Plaine Corail sites are recorded through the analysis of the household surveys conducted. The main activities identified are livestock, agriculture and fisheries.

Breeding

91% of households surveyed practice livestock breeding.

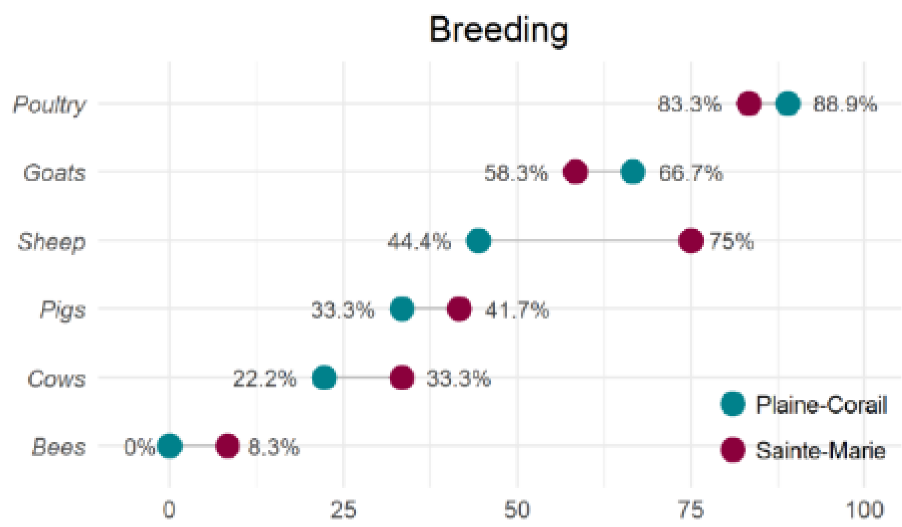
Poultry farming comes first in terms of number of heads per capita. However, sheep farms (62%) and goats (62%), which are the most represented for the two localities, are significantly more important than pig or cow farms.

Figure 2-50: 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 2-51: Share of livestock types by locality



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.

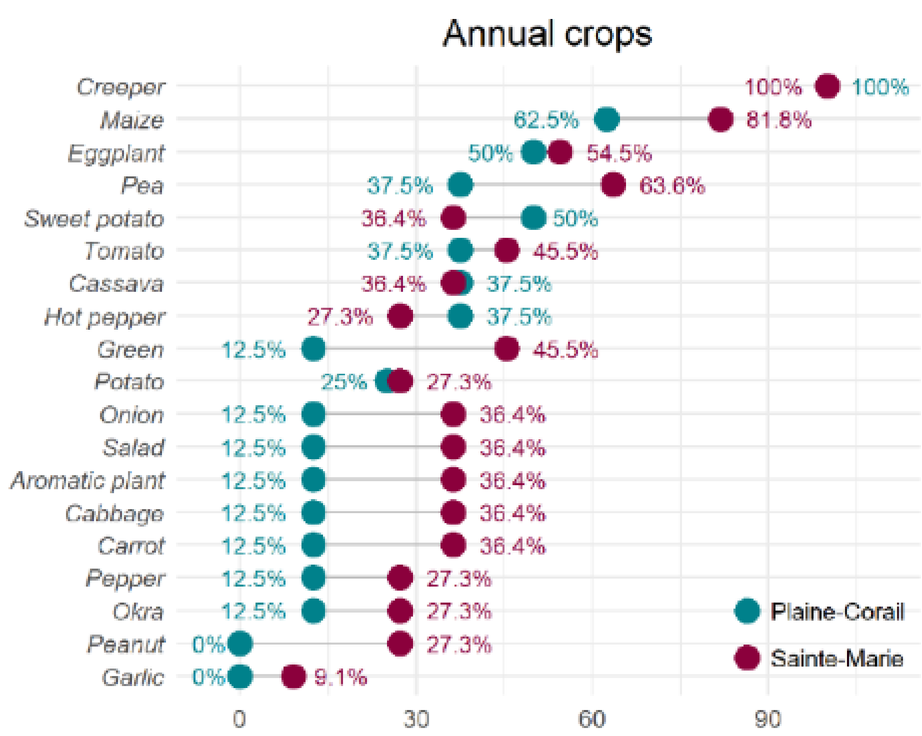
We will then see the importance of this activity in terms of household incomes.

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.

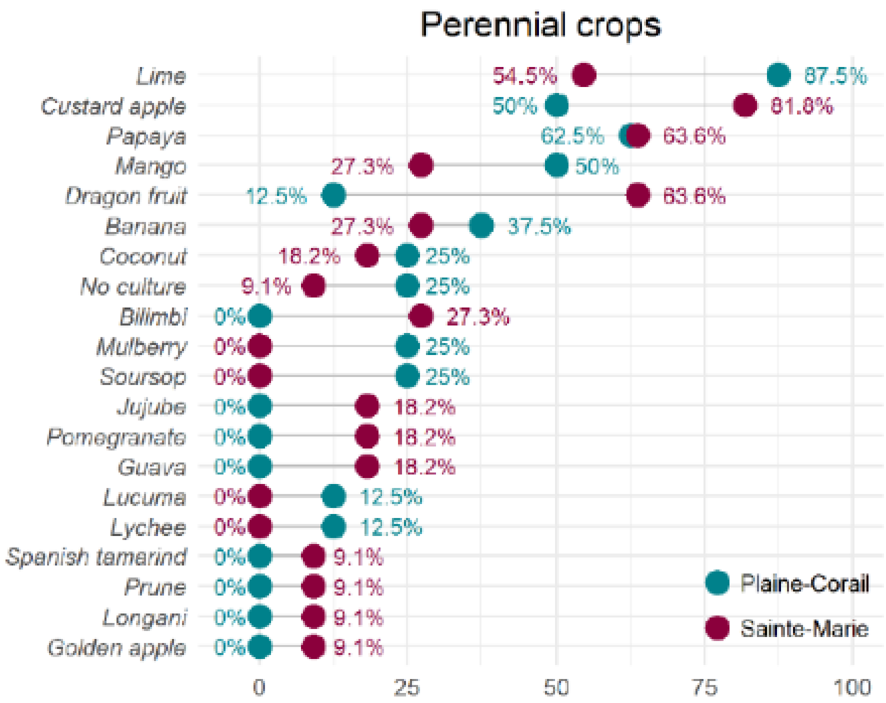
Figure 2-52: Distribution of annual crops by locality



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.

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 2-53: Distribution of fruit production by locality



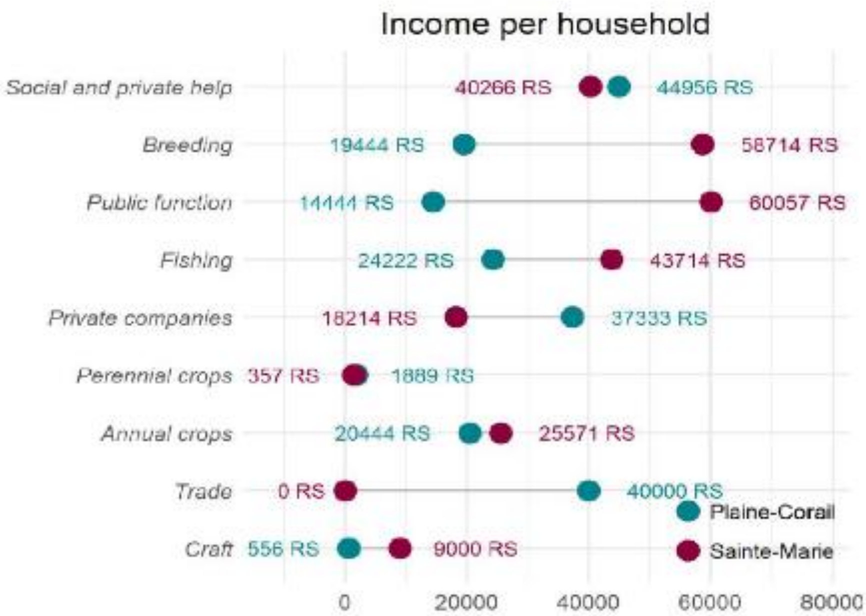
2.6.5.3 Composition of household incomes

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.

Figure 2-54 Income per inhabitant / Income per household

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 2-55: 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.

2.6.5.4 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.

2.6.6 GENDER-BASE VIOLENCE, SEXUAL EXPLOITATION AND SEXUAL HARASSMENT

2.6.6.1 Definition and available data

According to the National Gender Policy 2022-2030,[4] Gender-Based Violence (GBV) in Mauritius and Rodrigues mostly refers to cases of domestic violence. However, this limited definition of GBV does not allow to fully consider the magnitude of the GBV issue in the country. In 2022, the High Level Committee (HLC) on the Elimination of Gender Based Violence in the Republic of Mauritius underlined in its National Strategy Action Plan[5] that the limited definition of Gender Based Violence does not encompasses a whole range of actions that are not currently being captured by qualitative and quantitative indicators in the country. Data collected refers mostly to domestic violence, rape, family conflicts, but does not include all GBV issues defined as any harmful act that is perpetrated against a person's will and is based on socially ascribed gender differences between males and females.

As a result, it is currently difficult to assess the extent of GBV in Mauritius and Rodrigues. The first reason comes from a lack of unified definition, as explained above. Additionally, the existence of multiple data collection points at the levels of the Ministry of Gender Equality and Family Welfare, the Police Family Protection Unit and Police, the Citizen Support Unit, the Ministry of Health and Wellness, in Rodrigues and Shelters, implies that there is no centrally consolidated data information system on domestic violence and gender-based violence. This lack of data for Rodrigues has already been noted by international agencies fighting GBV[6].

To remediate to the lack of available data, the Domestic Violence Information Systems (DOVIS) was launched in March 2023 in Rodrigues. This data base on GBV was developed initially in Mauritius but it was not extended to Rodrigues.

Despite the limited access to data, available statistics suggest that cases of domestic violence have been increasing. In Mauritius generally, the number of domestic violence cases reported in 2017 was 2,269, in 2019

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[4] Ministry of Gender Equality and Family Welfare, the National Gender Policy 2022-2030, 2022: https://gender.govmu.org/Lists/DocumentsLinks/Attachments/3/National%20Gender%20Policy%202022-2030.pdf

[5] High-Level Committee (HLC) on the Elimination of Gender-Based Violence, National Strategy and Action Plan, 2020, https://pmo.govmu.org/Communique/PMO%20-%20National%20Strategy%20TP%20FINAL%20WEB.pdf

[6] See Committee on the Elimination of Discrimination against Women reviews the report of Mauritius, 30 October 2018, https://www.ohchr.org/en/press-releases/2018/10/committee-elimination-discrimination-against-women-reviews-report-mauritius

was 2,222 and 2,425 in 2020. According to available data in Rodrigues more specifically, there was an increase of 8.4 % in the number of cases of domestic violence reported from 2015 to 2016. This increase was confirmed later since there were 262 cases of domestic violence registered in 2017 and 274 cases registered in 2018.

These data, coupled with other sources of information, suggests that GBV is a challenging issue in Maurice and Rodrigues. According to the US Government Human rights report for Mauritius in 2022,[7] one of the salient issues in Mauritius is the lack of investigation of and accountability for gender-based violence.

It should be noted that according to the European Union, women in Rodrigues face several social and economic challenges,[8] including ones that could hamper them to escape GBV and dependence from violent spouses, despite women performing better in education than men. These include:

- Inability of some women and girls at grass root level and poorer segments of society to fully take advantage of public sector facilities for education, health, family planning;
- Increasing cases of teenage pregnancy;
- Strong patriarchal culture within the family and society with women being dominated by men;
- Women in the informal sector are unable to expand or function efficiently due to their multiple commitments and limited access to finance, markets and technology;
- Growing poverty among female-headed households in Rodrigues.

2.6.6.2 Initiatives to eliminate GBV

Since Rodrigues is an autonomous island within the Republic of Mauritius, policy and initiatives to combat gender-based violence (GBV) are adopted at the level of Mauritius, as well as by the Rodrigues Regional Assembly.

In order to fight GBV, Mauritius has adopted the Protection from Domestic Violence Act (PDVA) in the aim to provide for protection to the spouses as well as persons living under their roof including children. It also enhances protection measures by widening its definition of domestic violence to include physical, emotional, sexual and threatened violence. Additionally, the PDVA increases the powers of enforcement officers thus enabling a magistrate to grant protection orders, occupational orders and tenancy orders.

Additionally, a High-Level Committee (HLC) on the Elimination of Gender-Based Violence, under the chair of the Prime Minister of Mauritius was established in January 2020 in order to address existing gaps at the legislative, institutional and operational levels.

At the level of Rodrigues, the RRA through the Commission for Well Being and Family has adopted the following actions[9]:

- Establishment of several channels to report cases of domestic violence and provide support to victims, such as a hotline that operates 24/7;
- Sensitization campaign involving the Rodrigues Council for Social Services under the “Projet de lutte contre les violences faites aux femmes” (PLUVIF) programme;

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[7] US Government, Mauritius 2022 Human Rights Report: https://www.state.gov/wp-content/uploads/2023/02/MAURITIUS-2022-HUMAN-RIGHTS-REPORT.pdf

[8] The European Union, Gender country profile for the Republic of Mauritius, 2022: https://europa.eu/capacity4dev/file/126301/download?token=gKsNQfEW

[9] See for instance Rodrigues Regional Assembly, Violence domestique - La situation de violence domestique préoccupante à Rodrigues, 19 September 2019, http://rra.govmu.org/English/News/Pages/Violence-Domestique.aspx

- Training of healthcare personnel so that they better respond to victims of Domestic violence while attending hospital;
- Training on Men Empowerment with the collaboration of Groupe zom in views of the Perpetrator Rehabilitation Programme to promote healthy relationship in families so as to prevent GBV;
- Groupe de Parole for victims of domestic violence;
- conducting mass sensitization campaign to the broader population on GBV;
- use of mass media to sensitize the population on GBV namely: RODTALK (TV Programme) and Le Mag (Radio Programme);
- A day against violence whereby a relay march touching the overall population is organized so as to raise public awareness on GBV in Rodrigues;
- The setting up of a High Powered Committee, where there is a networking among all stakeholders working with Domestic Violence;
- The setting up of the Emergency Shelter for victims of domestic violence through a Memorandum of Understanding with Gender Links, Mauritius, which provides temporary accommodation for victims of domestic violence including their children up to a period of 15 days until the victims receive a protection order in order to return to their place or to move to another place;
- The Service of support and advice to families situated at the Integrated Family Centre of Malabar which is a one stop shop comprising of the Family Welfare and Protection Unit, the Police Family Protection Unit, a psychologist, family counselors, the Child Development Unit, the Brigade pour la Protection des Mineurs and the Women Unit.

The data and information presented above suggests that gender-based violence is an issue that is salient in Rodrigues, but the lack of data does not allow to measure its magnitude. Despite these challenges, public authorities are aware of the situation and have established the means to fight the issue. These means, which include sensitization campaigns and institutional arrangements to manage GBV issues, can contribute to better deal with GBV-related impacts of the Project.

2.6.7 SUMMARY: SOCIAL ENVIRONMENT SENSITIVITY

Table 2-28: 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
	Gender-based violence	Medium

2.7 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 also 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 and road traffic.

To assess the consequences on human health, the population exposed is first analysed.

The specialist report for Noise & Air Quality is attached in the appendices section.

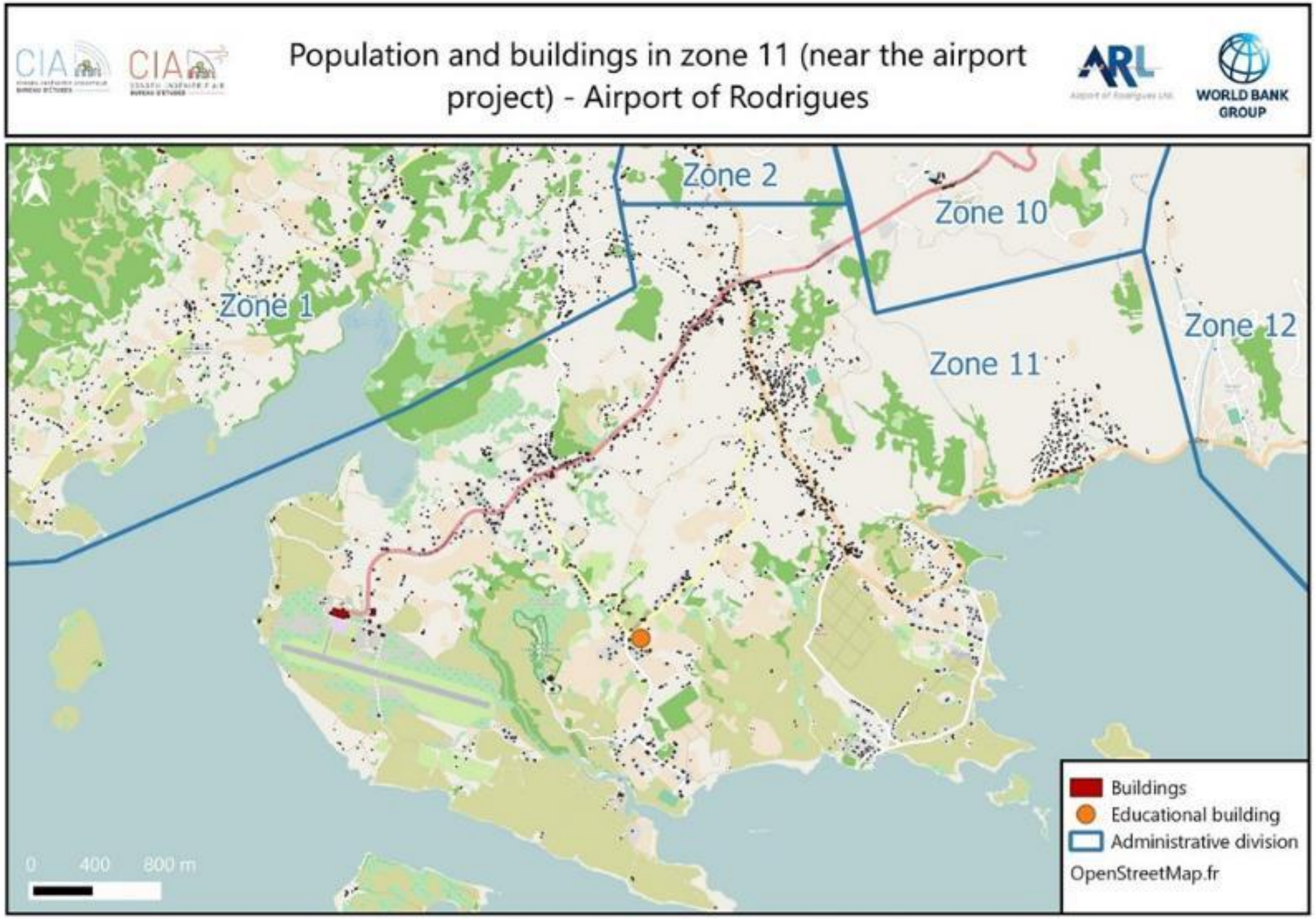
2.7.1 AREA OF INFLUENCE

The area of influence shown in Figure 2-56 below is drawn from the large area that was modified to consider the planes' landing and taking off directions, and the exposed population distribution.

2.7.2 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 2-56: Building location map and area of influence



2.7.3 AIR QUALITY

2.7.3.1 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.

Polluting activities at an airport

Aircrafts: daily activities

Final approach, taxi in, taxi out, take-off and climb-out are the main polluting phases. The use of APU (Auxiliary Power Unit) before the start-up and aircraft refuelling also contribute to air pollution.

Aircrafts: one-off activities

Aircraft, service vehicles and buildings are cleaned regularly and are subject to maintenance operations emitting air pollutants.

Stationary sources

Various sources related to the operation of the airport can produce pollution: fuel storage, petrol station, power plant, auxiliary generators.

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.

The road traffic has also been considered in the study. Indeed, the expansion of the airport will increase the traffic on the road that needs to be quantified.

2.7.3.2 Air quality measurement campaign

Measurement protocol

Location

Four sites representative of the site's environment were selected for measurements. They are located on Figure 2-57 below.

Figure 2-57 Air quality measurement locations

Typology

Two different types of measurements were performed:

- Active measures

These measurements were carried out using a continuous "NEMo" device to analyse in real time the concentrations of particulate matter (PM10 and PM2.5).

The microsensor 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 10 minutes.

The NEMo was moved every day to obtain a dynamic result in each of the 4 fixed points.

- Measure 1 Pointe Palmiste: from 15/03/2023 to 16/03/2023
- Measure 2 Plaine Corail: from 15/03/2023 to 16/03/2023
- Measure 3 Ecole des Canetons: from 14/03/2023 to 15/03/2023
- Measure 4 Plaine Caverne: from 14/03/2023 to 15/03/2023

- Passive measures

The dynamic measurement was completed by passive tube measurements at each of the 4 measurement points over a 24-hour period, between the 14/03/2023 and the 16/03/2023. nitrogen dioxide, sulphur dioxide and ozone were measured by Radiello tube and analysed by the “TERA Environnement” laboratory.

Weather conditions

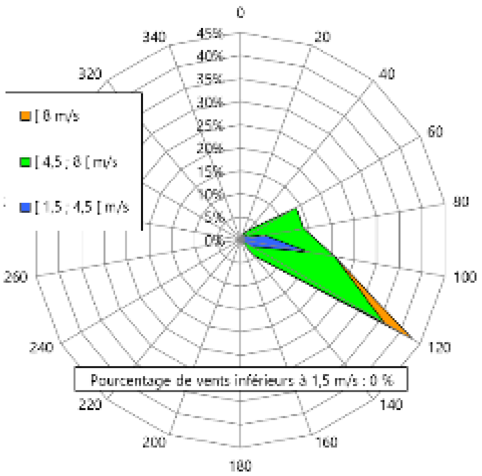
Weather conditions were recorded at the airport station.

It should be noted than the absence of rain during the measurement period could lead to higher concentrations of particles in the atmosphere. Table 2-29 shows the meterological data for Plaine Corail.

Table 2-29: Meteorological Data , Plaine Corail

Weather conditions	Day		
	14/03/2023	15/03/2023	16/03/2023
Wind speed m/s (2m high)	7.1	4.9	4.8
Temperature °C	26.3	27.4	27.9
Rainfall mm	0.1	0.0	0.0

Figure 2-58: Wind Rose at the airport Plaine Corail: 14/03/2023 – 16/03/2023



Aircraft overflights

The table 2-30 below shows the aircraft movements recorded during the air quality measurement campaign. All aircraft are Air Mauritius or Air Austral ATR-72.

Table 2-30: aircraft movements recorded during the air quality measurement

Date	14/03/2023	15/03/2023	16/03/2023
Flight	Start/Finish Time	Start/Finish Time	Start/Finish Time
MK120	9:35 a.m.	9:35 a.m.	9:35 a.m.
MK121	10:15 a.m.	10:15 a.m.	10:15 a.m.
MK126	10:10 am	10:10 am	10:10 am
MK127	10:50 am	10:50 am	10:50 am
MK130	2:05 pm	2:05 pm	2:05 pm
MK131	2:45 pm	2:45 pm	2:45 pm
MK136	2:40 pm	-	2:40 pm
MK137	3:20 pm	-	3:20 pm

Date	14/03/2023	15/03/2023	16/03/2023
Flight	Start/Finish Time	Start/Finish Time	Start/Finish Time
MK140	6:35 pm	6:35 pm	6:35 pm
MK141	7:15 pm	7:15 pm	7:15 pm
MK144	7:10 pm	-	-
MK145	7:50 pm	-	-
UU751	-	5 :20 pm	-

Results

The detailed results of the noise measurements are presented in the Specialist Report for Noise & Air Quality. The analysis is provided below.

Analysis

Active measurements

PM_{10}: The Air Quality Guideline (WHO 2021: 45 µg/m³ for 24 hours) is respected in each measurement sites during the campaign period.

$PM_{2.5}$: The Air Quality Guideline (WHO 2021: 15 µg/m³ for 24 hours) is respected for each measurement sites during the campaign period.

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

Table 2-31: Results of Passive Measurements

Measure	**Sampling date**	**Location**	**Concentration µg/m³**			
			NO_2	**SO_2**	**Total VOC**	**Ozone**
PF1	15/03/2023 13:00 - 16/03/2023 15:30	Pointe Palmiste	< 9.4	< 1.1	61.7	< 12.8
PF2	15/03/2023 12:00 - 16/03/2023 16:00	Plaine Corail	< 9.4	< 1.1	79.8	< 12.1
PF3	14/03/2023 11:00 - 15/03/2023 11:30	Ecole les Canetons	< 10.2	< 1.1	78.8	< 13.8
PF4	14/03/2023 12:30 - 15/03/2023 11:50	Plaine Caverne	< 10.7	7.0	81.1	< 14.5

The NO_2 concentrations measured by passive tubes are below 10.7 µg/m³. The Air Quality Guideline (WHO 2021: 25 µg/m³ for 24 hours) is respected in each measurement sites during the sampling period.

At the exception of point 4 (with 7.0 µg/m³), all the sulphur dioxide concentrations measured are very low (below 1.1 µg/m³). The Air Quality Guideline (WHO 2021: 40 µg/m³ for 24 hours) is respected in each measurement sites during the sampling period.

The ozone concentrations during the campaign are low (below 14.5 µg/m³). The Air Quality Guideline (WHO 2021: 100 µg/m³ for 8 hours) can't be compared to these 24 hours measurements.

The total VOC concentrations, measured during the 24 hours sampling period, are between 61.7 µg/m³ and 81.1 µg/m³.

Conclusion

Despite unfavourable conditions (absence of rain) the measures still allow positive conclusions to be drawn about air quality on Rodrigues Island. No measurements exceed regulatory thresholds which apply to PM_{10}, $PM_{2.5}$ and NO_2.

The concentrations measured are globally low, reflecting very good air quality on Rodrigues Island.

Concerning aircraft overflight, no influence is observed on concentrations for the current 4 daily overflights.

Emissions inventory: Airport Traffic

Inputs

The calculations take into account the overall annual commercial aircraft traffic (year 2022) and the type of aircraft.

Study area and pollutants investigated

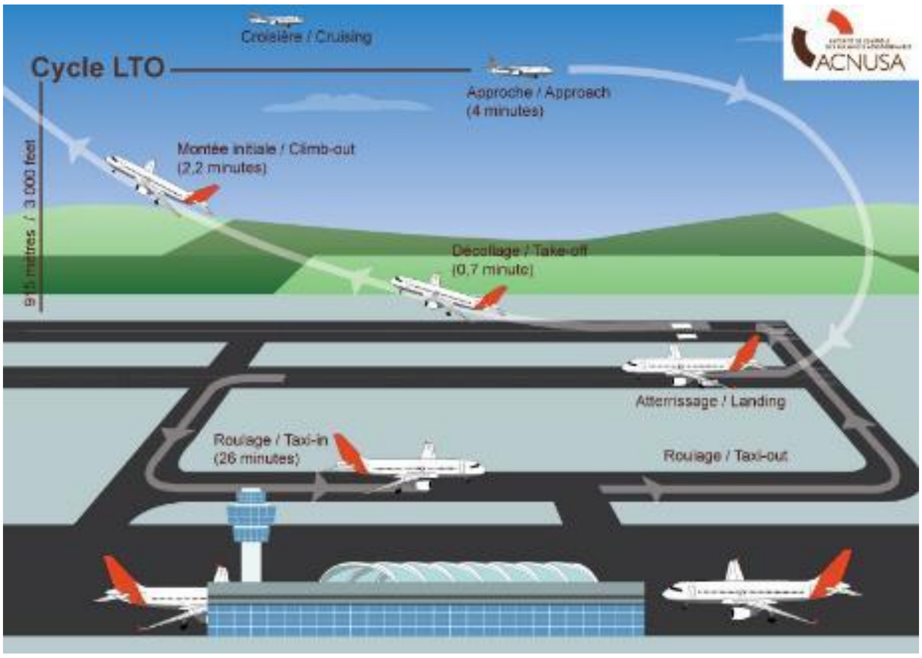
Calculations are based on a standard "Landing-Take-Off" (LTO) cycle per aircraft, as defined by OACI vol II, appendix 16. This cycle includes all aircraft operations from the ground to a height of 3000 feet, as only emissions below this height have a direct impact on local air quality.

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 2-32 and figure 2-59 below).

Table 2-32: 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
Take-off	0,7	100
Climb-out	2,2	85

Figure 2-59: LTO cycle (Source: Acnusa)



The calculation tool IMPACT provided by Eurocontrol, a pan-European Organisation dedicated to supporting European aviation is used. The calculations take into account:

- Aircraft movements,
- Aircraft types,
- Flight paths,
- Runway alignment;
- Annual average weather conditions.
- Other emission sources from airport activities are assumed to be limited compared to aircraft emissions.
- Limit of height: 1000m

IMPACT uses the OACI database of EEDB aircraft motor emissions (AEM DATA – 254 – ICAO EDDB25/FOCA), compliant with the DGAC French methodological guide of impact study for air traffic.

However, it should be noted that the database does not provide all combination of aircraft/class/motor. In this way, some aircraft can be substituted with another aircraft compliant with the same technical specifications:

- Take-off mass;
- The aircraft and engine manufacturer;
- The engine: number, type (turbojet, turboprop, piston engine), dilution rate, engine position…
- The performance: power-to-weight ratio.

Using this tool, calculations were made for Plaine Corail Airport, for emissions of

- nitrogen oxides
- carbon dioxide;
- sulphur oxides;
- dihydrogen oxide;

- carbon monoxide
- unburned hydrocarbons;
- acetaldehyde, formaldehyde and propianaldehyde;
- acrolein;
- 16 PAH;
- 7 PAH;
- styrene, 1.3-butadiene, benzene, ethylbenzene, toluene, xylene;
- PM total and volatile.

The results of the current situation, expressed in kg per year, are presented in table 2-33.

Table 2-33: Gas emissions and fuel consumption per year

	NOX emitted	**CO2** emitted	**SOX** emitted	**H20** emitted	**CO** emitted	**HC** emitted	**ACETALDEHYDE** emitted	**ACROLEIN** emitted	**16 PAH** emitted	**7 PAH** emitted	**Fuel consumption (kg/year)**
Emissions (kg/year)	1661	1044640	278	408930	344436	5271	262	150	0	0	
-	**STYRENE** emitted	**1.3 BUTADIENE** emitted	**BENZENE** emitted	**ETHYLBENZENE** emitted	**FORMALDEHYDE** emitted	**PROPIANALDEHYDE** emitted	**TOLUENE** emitted	**XYLENE** emitted	**PM Total** emitted	**PM Volatile** emitted	330 582
Emissions (kg/year)	19	103	103	11	754	45	39	27	42	0	

These results will have to be compared with the forecast emission balances, considering the traffic linked to the new runway (with the new type of aircraft: A321Neo and 737-900 Max).

This baseline emissions inventory undertaken in 2019 was supplemented by an air quality measurement campaign carried out by ARL in 2023, results of which are presented above.

The measurement campaign will be representative of the week in which it took place (including weather conditions and number of aircraft movements).

In the absence of a permanent air quality monitoring system, the assessment of the complete baseline air quality would require measurement campaigns lasting several months, spread over the two seasons. Same could not be undertaken as part of the ESIA. ARL could implement a monitoring program to this end.

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 (near Anse Quitor). The presence of agricultural parcels is also to be considered.

The aircraft traffic and road traffic growth could lead to a significant increase in pollutant emissions; thus, the receptor sensitivity to the project is considered high.

Emission inventory: Road Traffic

The emissions due to road traffic have been calculated from the road traffic data provided on the main roads of the island using TREFIC 5.2.1 software with the fleet IFSTTAR (until 2050), based on the emissions factors from COPERT V.

The spatial distribution of the NOx emissions for the current situation (2023) show that the NOx emissions near the airport at "Route de l'autonomie", are low compared to the other roads, with less than 1 kg/day of NOx emitted in the current situation 2023.

Modelled air ambient concentrations: road traffic

The pollutants modelled are the nitrogen dioxide and the particles PM10 and PM2.5. A background concentration is included in the calculation to approach the most representative result of the real concentrations.

Due to the lack of bibliography on concentrations in Rodrigues Island, the data measured during the 15th to 16th of March 2023 at Pointe Palmiste (a site distant from road sources) has been used as background concentration (table 2-34). It should be noted that this assumption is overrated: The annual mean concentrations are usually lower than the daily concentrations.

Table 2-34: Background concentrations included in the calculations of the modelled concentrations

Pollutant	Background concentration used µg/m³	Source	WHO annual Air Quality Guideline 2021	Comment
NO_2	9.4	Measurements between the 15th and the 16th march 2023 at Pointe Palmiste (measuring point number 1)	10	Lack of bibliography at Rodrigues Island Background concentrations used are daily concentrations -> overrating the annual mean The annual Air Quality Guideline (WHO 2021) are already exceeded by these background concentrations for the particles PM10 and PM2.5
PM10	19.5		15	
PM2.5	10.2		10	

The concentrations modelled in the area of 500 meters around the roads are superior to the WHO Annual Air Quality Guidelines for the particles: Indeed, the background concentrations included in the calculation are already superior to those guidelines.

For the nitrogen dioxide, the WHO Annual Air Quality Guideline is respected in all the area.

Indicator Pollution-Population (IPP) : road traffic

The Indicator Pollution Population (IPP) is calculated by multiplying the number of inhabitants of each zone by the mean concentration of nitrogen dioxide of the zone.

It allows to discriminate the areas with higher population and/or higher concentrations.

The higher IPP is located in the zone 5 around Port Mathurin: it's the zone with the higher number of inhabitants.

The zone 11 where the airport is located, has a low IPP.

2.7.4 NOISE

2.7.4.1 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.

2.7.4.2 Noise measurements campaigns

Two measurement campaigns were carried out, one in 2019 and the other in 2023.The results of the 2023 campaign are summarized below and are detailed in the Specialist Report for Noise & Air Quality.

The 2023 measurement campaign:

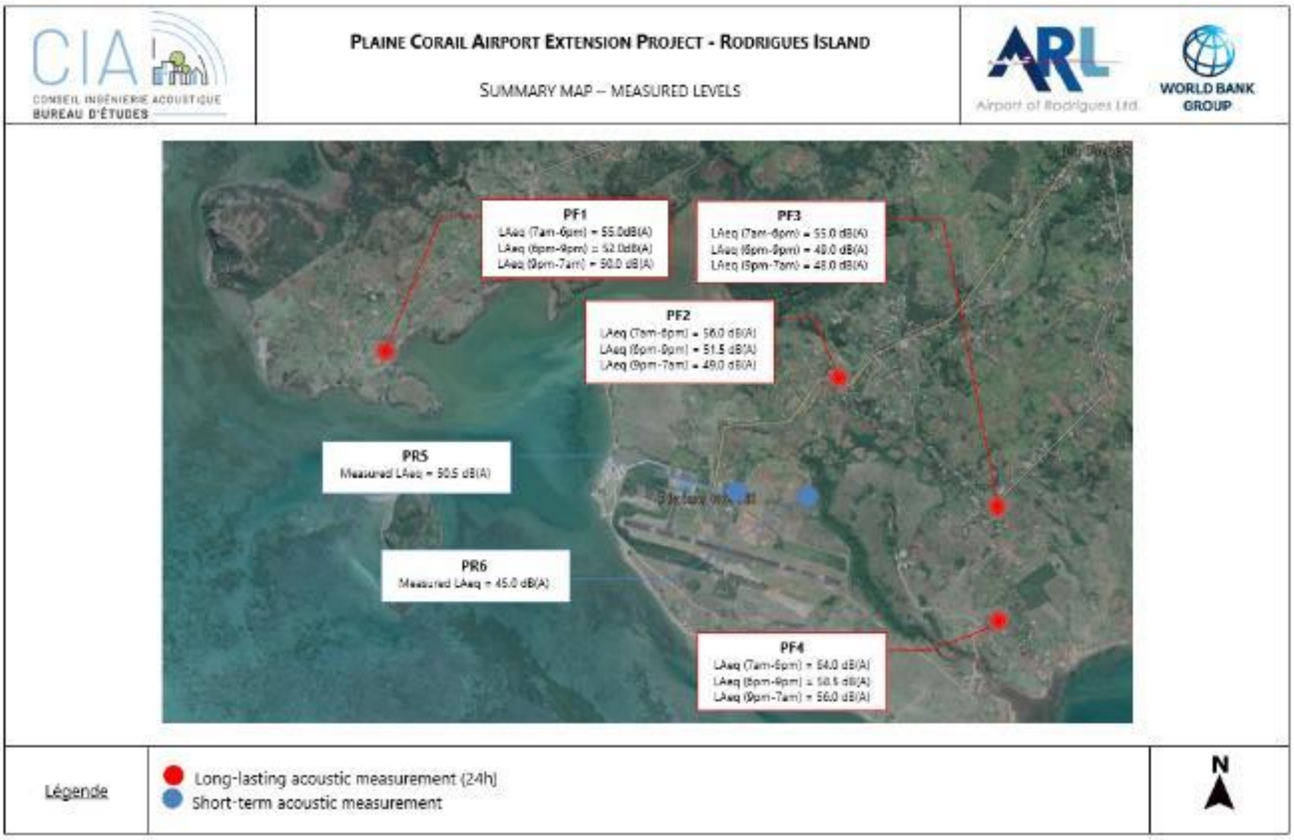
Measurement protocol

The acoustic measurement campaign was carried out from 14/03/2023 to 16/03/2023.

Location

In total, 4 long-term measurements over 5 days 24 hours points were distributed over the study area. The locations are shown on the map below.

Figure 2-60: Noise measurements - location and results



Typology

The positions of the long-term 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.

The short-term measurements are positioned to characterize the sound environment at the level of the houses around Mont Travers with a view to its future exploitation (quarry), linked to the project.

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).

Weather conditions

Weather conditions were recorded at the airport station and are indicated in tables 2-35 and 2-36 below.

Table 2-35: Meteorological Data, Plaine Corail

Weather conditions	Day		
	14/03/2023	15/03/2023	16/03/2023
Wind speed m/s (2m high)	7.1	4.9	4.8
Temperature °C	26.3	27.4	27.9
Rainfall mm	0.1	0.0	0.0

These results can be interpreted as follows.

Table 2-36: Interpretation of the Meteorological Data, Plaine Corail

Weather conditions	Day		
	14/03/2023	15/03/2023	16/03/2023
Wind speed m/s (2m high)	Strong wind	Strong wind	Strong wind
Wind direction	East	East	East
Temperature °C	From 22.6 to 28.7	From 25.6 to 29.2	From 26.0 to 30.2
Rainfall mm	Very low	None	None

Day 1: The weather conditions were very windy; measurements were disrupted a lot.

Day 2 and 3: Weather conditions were more stable, there was less wind, the impact of the weather was moderate.

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 in order to avoid the effects of gusts which could disrupt measurements.

Aircraft overflights

The table 2-37 below shows the aircraft movements recorded during the noise measurement campaign. All aircraft are Air Mauritius ATR-72.

Table 2-37: aircraft movements recorded during the air quality measurement

Aircraft movement at Plaine Corail Airport for the period 14-16 March 2023

Date	14/03/2023	15/03/2023	16/03/2023
Flight	Start/Finish Time	Start/Finish Time	Start/Finish Time
MK120	9h35	9h35	9h35
MK121	10h15	10h15	10h15
MK126	10h10	10h10	10h10
MK127	10h50	10h50	10h50
MK130	14h05	14h05	14h05
MK131	14h45	14h45	14h45
MK136	14h40	-	14h40
MK137	15h20	-	15h20
MK140	18h35	18h35	18h35
MK141	19h15	19h15	19h15
MK144	19h10	-	-
MK145	19h50	-	-

Results

The table 2-38 below and map above (figure 2-60) show the overall noise levels measured by regulatory period.

Note: it should be noted that the passages of planes are mainly distributed over the period 07-18h (3 or 4 planes), only 1 or 2 planes circulate on the period 18h-21h and none during the night period. The planes land and take off systematically facing the wind, on Rodrigues Island, from West to East.

Each measurement was treated separately 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 2-38: Overall noise levels measured in 2023

Measure	**Date**	**Location**	**1 hour**	**Laeq 7h-18h dB(A)**	**Laeq (18h-21h) dB(A)**	**Laeq (21h-7h dB(A)**
	From 15/03/2023 to 16/03/2023	Point Palmiste	-	55	52	50
	From 15/03/2023 to 16/03/2023	Plaine Corail	-	56	51.5	49.0
	From 14/03/2023 to 15/03/2023	Ecole des Canetons	-	55	49	48
	From 14/03/2023 to 15/03/2023	Plaine Caverne	-	64	58.5	56
	15/03/2023 (1h)	Near to Mont Travers	61	-	-	-
	15/03/2023 (1h)	Near to Mont Travers	51	-	-	-

Analysis

The detailed results of the noise measurements are shown in the Specialist Report for Noise & Air Quality.

Conclusion

The noise measurements present the pre-existing sound environment. In each of the sectors studied, there is a strong impact of the elements (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 east side of the airport) while landings are less noticeable to the west of the site (the proximity of the building to the airport in the east 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 between 12 dB(A) to 30 dB(A) lower than the permissible thresholds during the day and night (exceptional at night because there is no overflight).

2.7.4.3 Aircraft noise emissions

The baseline noise levels are assessed with the calculation tool “IMPACT” compliant with ICAO recommendations. This online software is provided by Eurocontrol, a pan-European Organisation dedicated to supporting European aviation.

The calculations take into account:

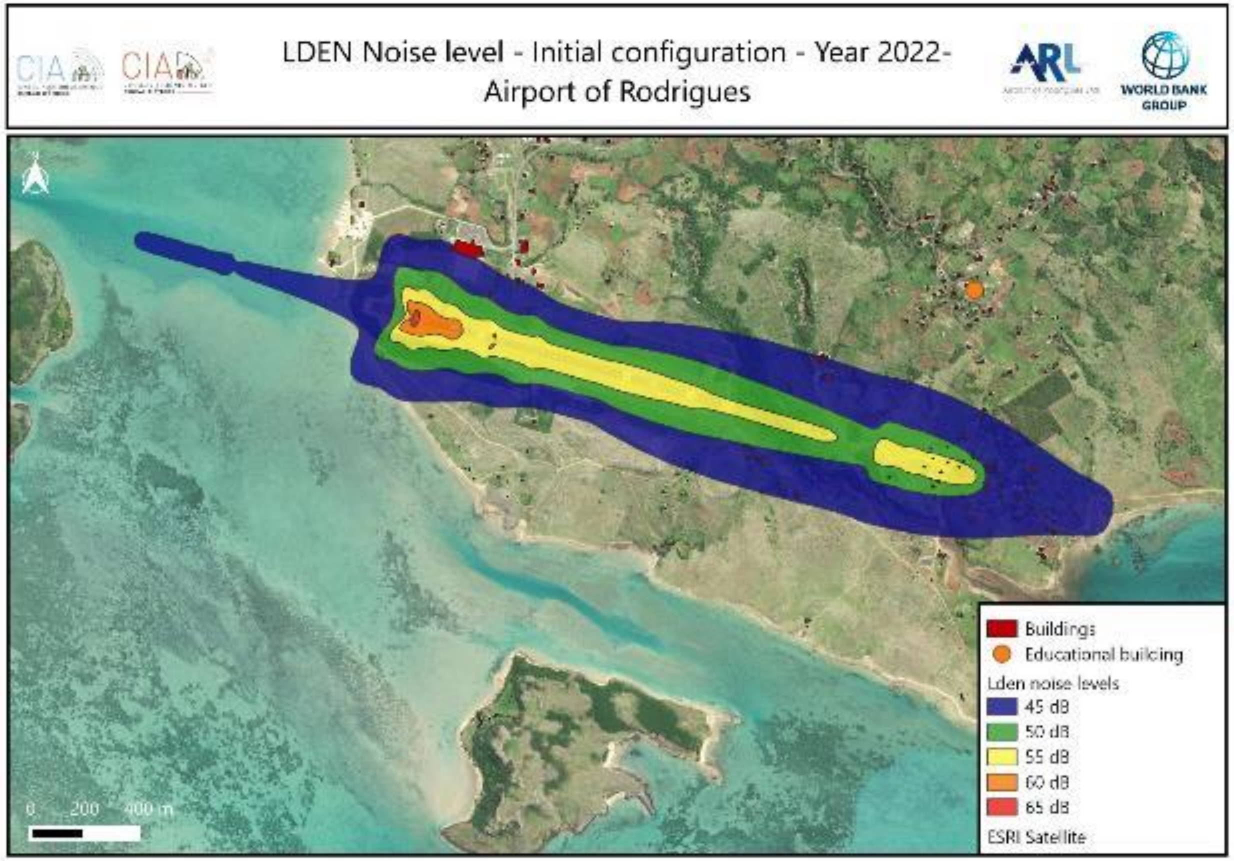
- Aircraft movements,
- Aircraft types,
- Flight paths,
- Runway alignment;
- Annual average weather conditions.
- Other noise sources from airport activities are assumed to be limited compared to aircraft noise.

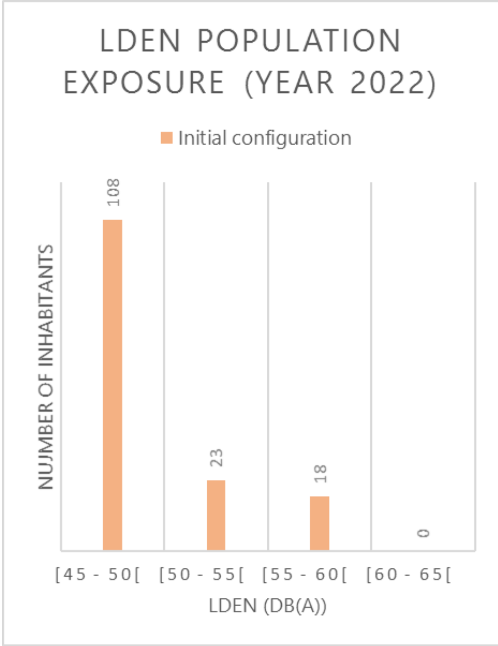
IMPACT uses the most recent aircraft databases BADA 3 and 4 of Eurocontrol which include model specifications for nearly 100% of aircraft types in the ECAC area. BADA enables to reproduce the geometric, kinematic and kinetics aspects of the aircrafts over the entire operation flights envelope.

The resulting noise contours around the airport are represented on the maps below indicating the presence of population with the buildings, thus, these maps illustrate the exposure of populations to current aircraft noise The ratio between the number of building and the number of buildings in the zone 11 give an approximation of the impacted population. The scale representing sound levels range from

- Lden 45 dB(A) (very low noise exposure) to 65 dB(A) (medium noise exposure). The noise indicator Lden, used in European noise directives and French noise exposure plans, has been chosen because it takes into account the nuisances felt during evening and night periods ;
- LAmax 60 dB(A) (low noise exposure) to 80 dB(A) (high noise exposure). The noise indicator LAmax used in French noise exposure plans has been also chosen to see the maximum noise level exposure;
- NA62 : 2 to 6 (low number of events LAmax > 62 dB(A)). The NA62 indicator is helpful to contextualize the LAmax indicator. This indicator can be used in French noise exposure plans;
- NA65 : 2 to 6 (low number of events LAmax > 65 dB(A)). The NA65 indicator is helpful to contextualize the LAmax indicator. This indicator can be used in French noise exposure plans..

Figure 2-61: Lden noise contour and population exposure - initial configuration – Plaine Corail Airport





Refer to specialist study report for all other maps :

- LAmax noise contour and population exposure - initial configuration – Plaine Corail Airport
- Number of events LAmax > 65 dB(A) contour and population exposure - initial configuration – Plaine Corail Airport
- Number of events LAmax > 62 dB(A) contour and population exposure - initial configuration – Plaine Corail Airport

As few airplanes land on Plaine Corail Airport, with no major noise emission therefore 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.

However, it should be noted that the sensitive building pre-primary school Le Caneton is exposed to LAmax = 70dB(A) two times a day (NA65 = 2).

2.7.4.4 Aircraft Noise 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 could lead to a significant increase in noise; thus, the receptor sensitivity to the project is considered high

2.7.4.5 Road Noise Emissions

The noise emitted by the roads around the airport is studied in order to establish the acoustic impact on the population. The project does not foresee any modification on the road infrastructures, but an increase of the airport attendance will lead to an increase of traffic in Plaine Corail.

The WHO (World Health Organization) published in 2018 recommendations for average exposure to road traffic noise based on the European Lden and Ln indicators as indicated in table 2-39 below.

Table 2-39: Lden and Ln indicators

Indicator	Maximum noise level	Effect
Lden	53 dB	**Noise levels above this value are associated with adverse health effects**
Ln	**45 dB**	**Night-time noise levels above this value are associated with adverse effects on sleep.**

Input Data

The traffic data used for the present study was taken from the traffic study conducted by ITMD. The figure 2-62 and table 2-40 below summarize the different traffic routes used for the study and the acoustic simulation of the project during the current situation.

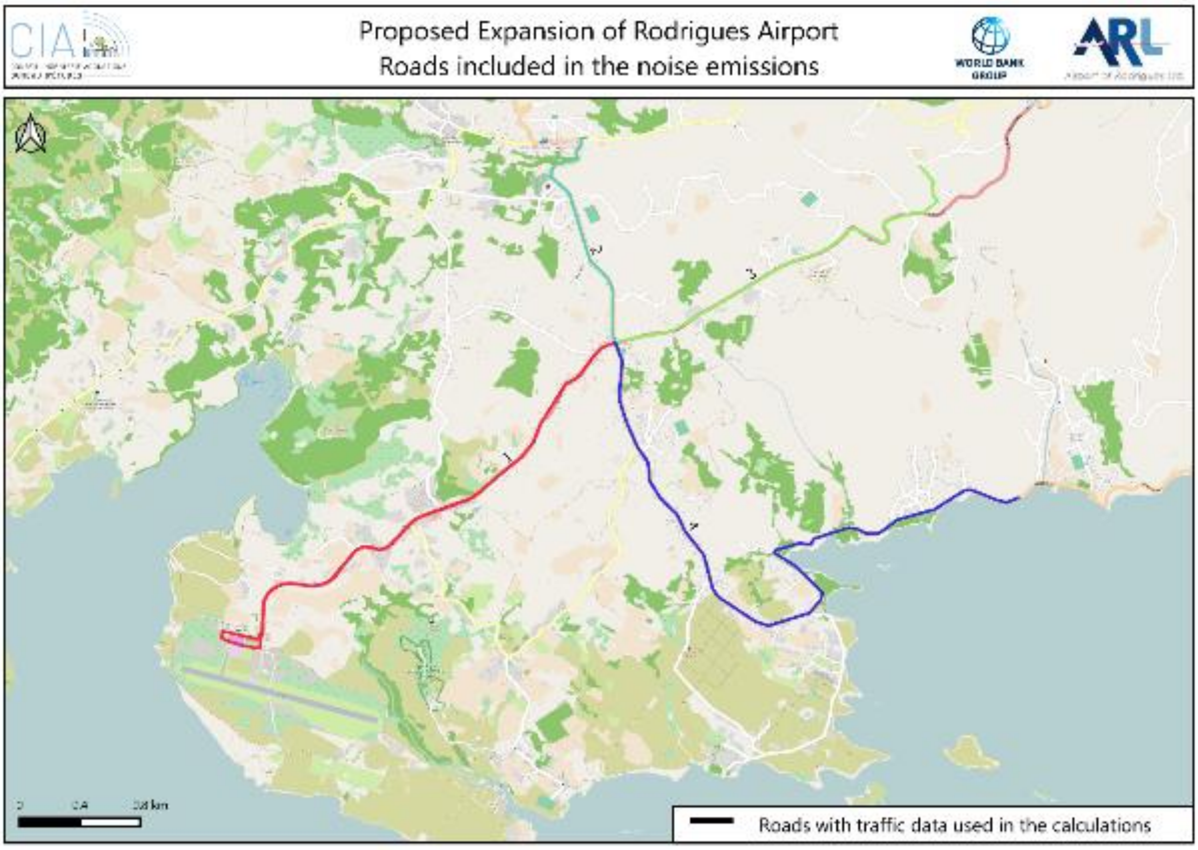
Table 2-40: Road traffic in the current situation

Current situation – 2023			
Road	**AADT* Light vehicles**	**AADT* Heavy vehicles**	**AADT* All types of vehicles**
1	1070	229	1299
2	1554	192	1746
3	2116	191	2307
4	821	102	923

**:AADT: Average Annual Daily Traffic*

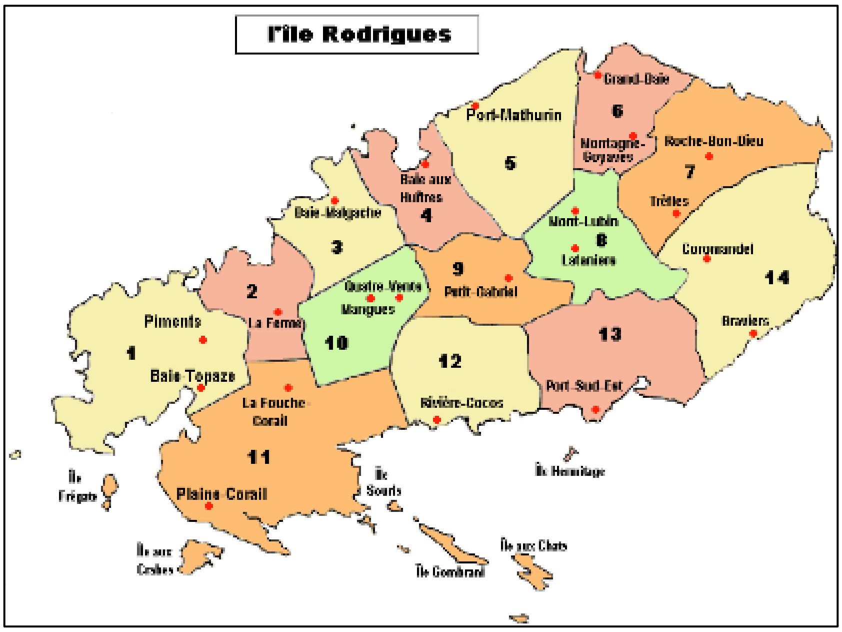
Note: traffic data are only given for the main roads, secondary roads are not taken into account.

Figure 2-62: Roads included in the noise emissions



In order to determine the road impact on the population, we must identify the latter in the studied area. The data provided according to the administrative division of the island of Rodrigues are shown in the figure 2-63 and the table 2-41 below.

Figure 2-63: administrative breakdown



Note: The population zones used for the calculations are zones n°2, n°10 and n°11.

Table 2-41: Administrative division by area

N°	Administrative Division	2000	2021	2023
1	Piments-Baie Topaze	1445	1794	1904
2	La Ferme	1112	1381	1465
3	Baie Malgache	1076	1336	1417
4	Baie-aux-Huîtres	2594	3221	3417
5	Port Mathurin	5929	7362	7810
6	Grand Baie-Montagne Goyaves	844	1048	1112
7	Roche Bon Dieu-Trèfles	2059	2557	2712
8	Lataniers-Mont Lubin	3806	4726	5014
9	Petit Gabriel	3658	4542	4819
10	Mangues-Quatre Vents	2870	3564	3781
11	Plaine Corail-La Fouche Corail	2832	3517	3731
12	Rivière Cocos	2893	3592	3811
13	Port Sud-Est	2717	3374	3579
14	Coromandel-Graviers	1944	2414	2561
TOTAL		**35779**	**44427**	**47133**

Acoustic simulation of the initial state

From the topographic files provided, the studied site has been modelled in 3 dimensions with the Mithra SIG V5 software. The right-of-way and its geometrical characteristics were taken into account.

Calculation in initial situation

Acoustic calculations were performed on the entire studied area without the project to characterize the impact of noise pollution due to existing road traffic on the population.

The following calculation parameters were used:

- Calculation method : NMPB 08;
- Meteorological effects: 100% favourable;
- The pavement surface considered is an R2 10-year type pavement (medium asphalt type).
- Traffic and speed:
    - AADT 2023 (traffic study - Input data),
    - Speeds were considered to be regulatory (50 km/h).

Results are presented in the form of result maps, which can be broken down as follows:

- Horizontal noise map at 4 meters - Lden (noise level between 45 to 75 dB(A)),
- Horizontal noise map at 4 meters - Ln (noise level between 45 to 75 dB(A)).

Figure 2-64: Initial Configuration 2023 - Lden

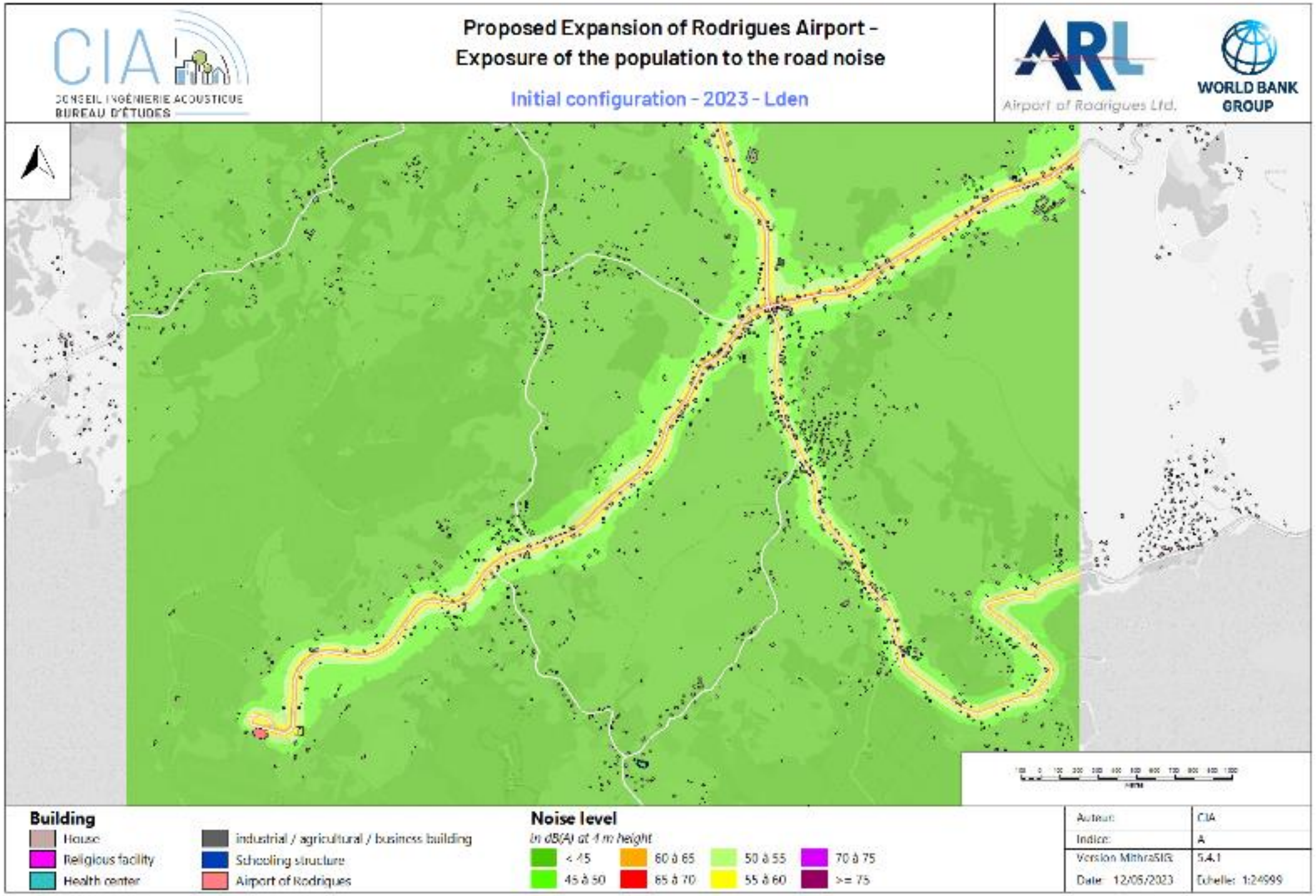
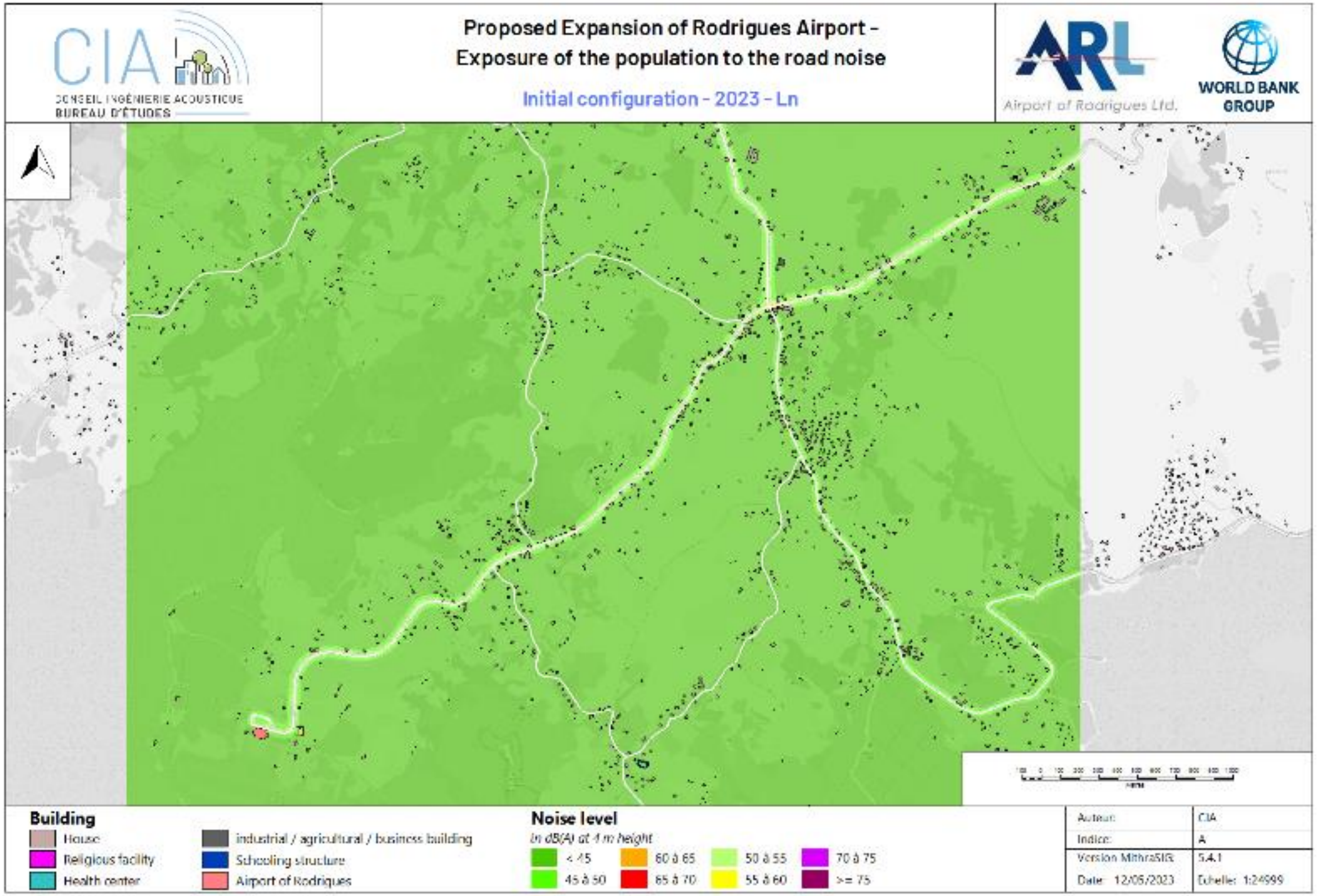


Figure 2-65: Initial Configuration - Ln



Map Interpretation:

The use of noise maps at a height of 4 m allows us to estimate the noise exposure of the population in the studied area. The methodology used considers the exposure of the residents on the most exposed façade at a height of 4 meters. This calculation method leads to an overestimation of the noise exposure of the population. The number of inhabitants is brought back to the habitable surface of this perimeter; thus a number of persons is attributed to each building.

The table 2-42 below presents a summary of the results for the dwellings exposed in the current situation.

Table 2-42: Population noise exposure

Intervals (dB)	Current situation (2023) - existing buildings							
	Lden				Ln			
	Nb of homes		Nb of residents		Nb of homes		Nb of residents	
< 45	1486	72%	2532	53%	1849	89%	3872	80%
[45 - 50[	230	11%	929	19%	180	9%	715	15%
[50 - 55[	148	7%	457	9%	45	2%	233	5%
[55 - 60[	171	8%	689	14%	0	0%	0	0%
[60 - 65[	39	2%	213	4%	0	0%	0	0%
[65 - 70[	0	0%	0	0%	0	0%	0	0%
[70 - 75[	0	0%	0	0%	0	0%	0	0%
> 75	0	0%	0	0%	0	0%	0	0%
Lden* 53 dB	260	13%	1079	22%				
Ln* 45 dB					225	11%	948	20%
Total	2074	100%	4820	100%	2074	100%	4820	100%

** WHO Recommendation*

Table Interpretation:

It is noted that 20% of the population is currently exposed to noise levels above the WHO thresholds.

Note: As the secondary roads are not very frequented, only the main road network has been considered, which may lead to a slight underestimation of the population exceeding the WHO thresholds.

2.7.5 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 and to road traffic.

Table 2-43: Air and noise sensitivity

Theme	Sub-theme	Receptor	Sensitivity
Air quality and noise	Air quality	Population exposed	High
	Noise	Population exposed	High

2.8 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.

2.8.1 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.

2.8.2 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)

2.8.2.1 Information collected during the field interviews

Interviews conducted 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, Pointe Corail). 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 Corail). 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.

2.8.3 ARCHAEOLOGY AND PALAEONTOLOGY

In the restricted area, several sites have been identified as having a paleontological interest.

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).

2.8.4 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.

2.8.4.1 Area of influence

From a visual and landscape perspective, the area of influence exceeds the large area of influence defined in the introduction chapter.

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 (ZTV) or Zone of Visual Influence (ZVI).

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 Sainte Marie Hill. The phrase "potential visibility" is used to describe the result because the analysis consider any landscape artefacts such as trees, woodland or buildings etc. The analysis is made based on of topography alone.

The results are not intended to show the actual visibility of the Sainte Marie Hill, 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.

Figure 2-66: Visibility Map

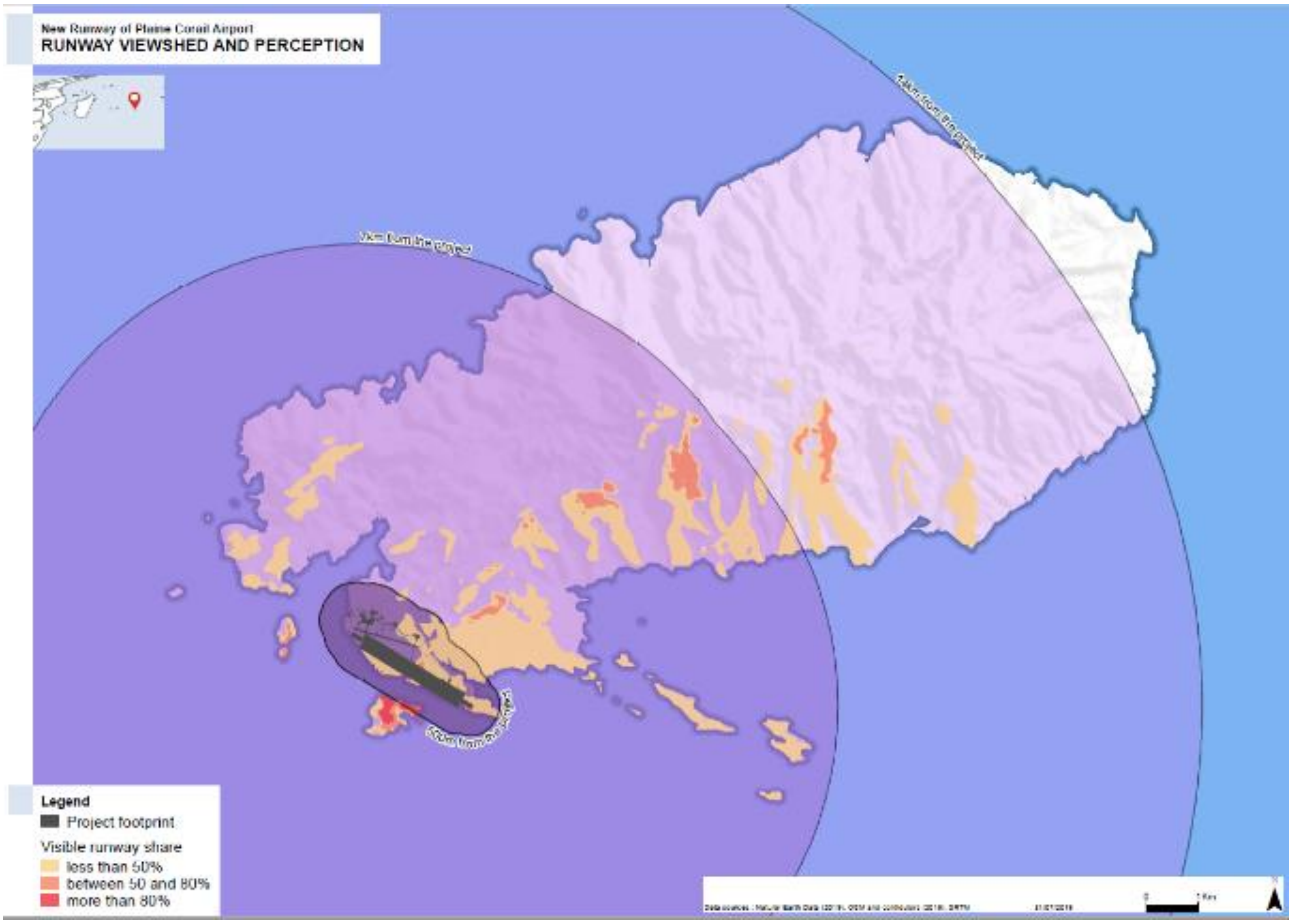
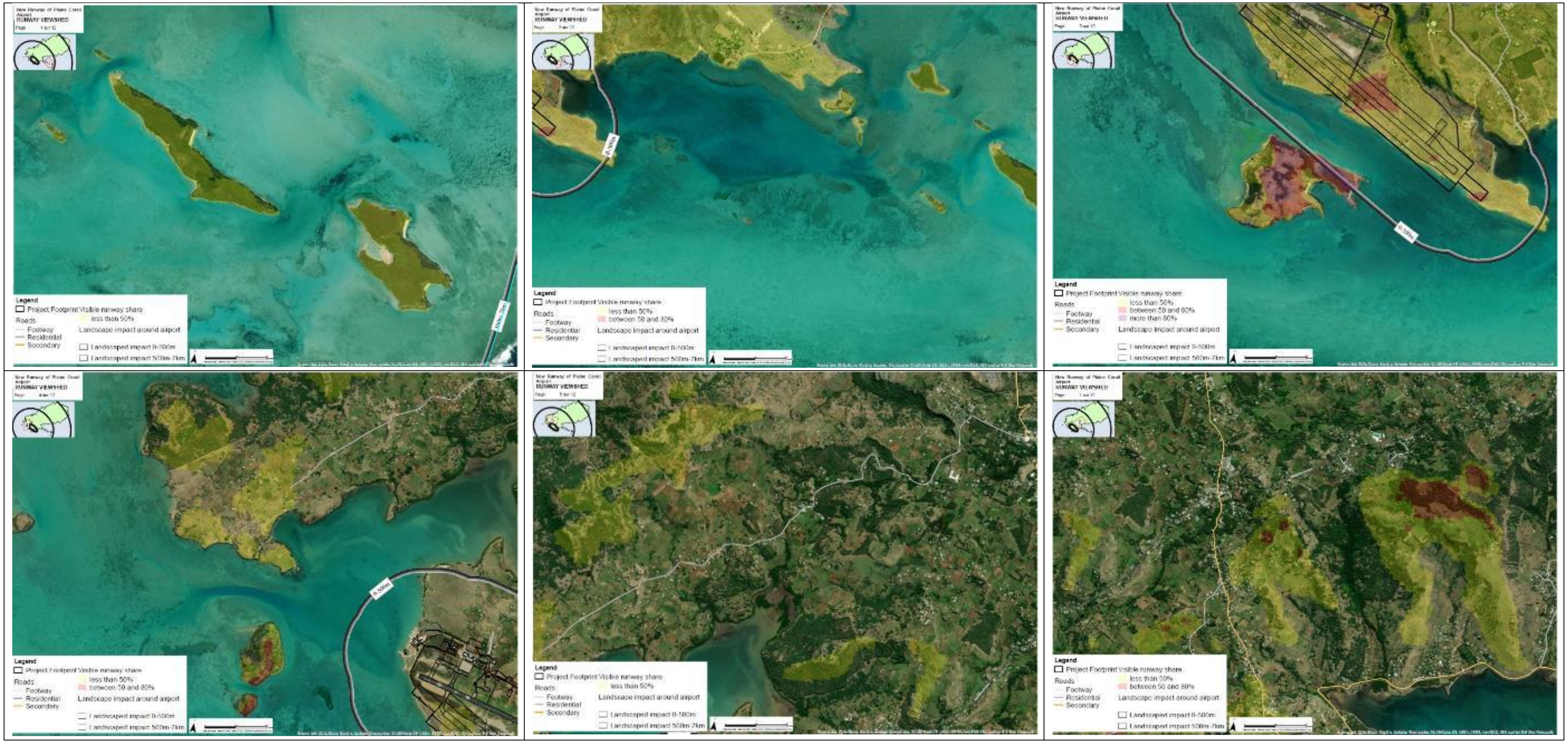
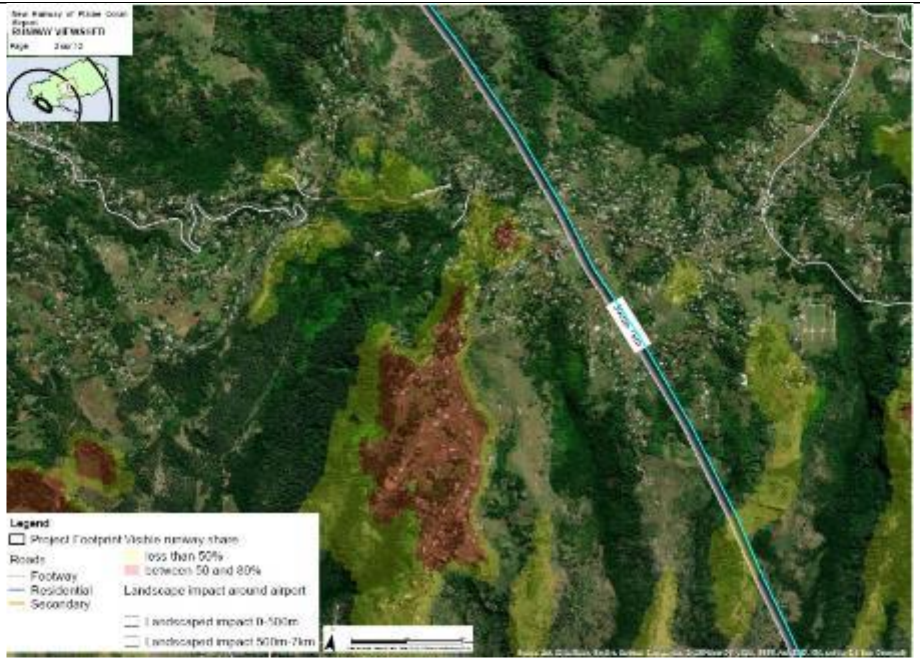
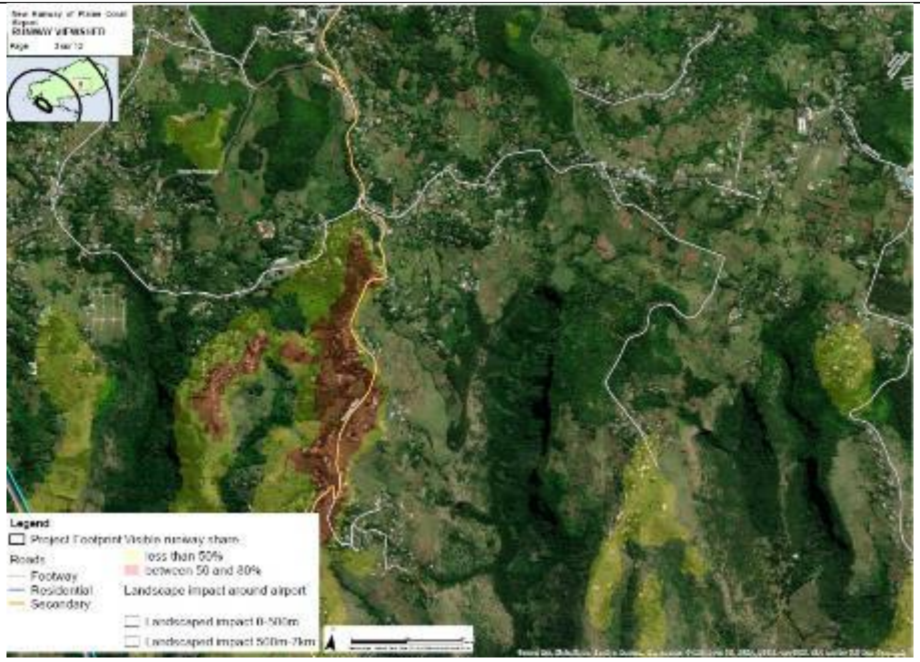


Figure 2-67: Results of the Visual Impact Assessment: runway viewshed




RUNWAY VIEWSHED
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


RUNWAY VIEWSHED
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


RUNWAY VIEWSHED
Legend
Project Footprint
Visible runway share
less than 50%
between 50 and 80%
Roads
Footway
Residential
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Landscape impact around airport
Landscaped impact 0-500m
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RUNWAY VIEWSHED
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Project Footprint
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RUNWAY VIEWSHED
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


RUNWAY VIEWSHED
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

2.8.4.2 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.

2.8.4.3 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 2-68: Locally, the only built visual reference points are the airport buildings

Figure 2-69: The large plain backed with forested mountains and hills in the mid distance

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 2-70: The plain area is marked by open landscapes of large grassland

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.

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.

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.

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.

2.8.4.4 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 cut 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 2-71: Grazing is the most common form of anthropogenic pressure on landscape and environment

2.8.5 SUMMARY: CULTURAL AND VISUAL ENVIRONMENT SENSITIVITY

Table 2-44: 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

2.9 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 Muricata* and marine turtles,
- The expected change in the landscape resulting from the development due to the massive volumes of earthwork involving the cut 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 has been carried out in 2021. As of March 2023, all families are relocated in Plaine Corail. 2 households shall be resettled because of the control tower and fire station design.

As is the case for any project, other predictable impacts can already be listed; (noise, air pollution, impact on fauna and flora, impact on the socio-economic development, etc.). These shall be mitigated by avoiding or compensating measures.

3 LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 MAIN NATIONAL LEGISLATION ON ENVIRONMENTAL ASPECTS

3.1.1 THE ENVIRONMENT PROTECTION ACT 2002

3.1.1.1 Legal framework for the Environmental Impact Assessment

The Environment Protection Act (No 19 of 2002) (EPA 2002), 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 EPA 2002 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 fifth Schedule of the Act sets out a list of activities for which a preliminary environmental report or environmental impact assessment need to be prepared and submitted to the authority for approval. 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 come into operation on 17 September 2022.

3.1.1.2 Application for an EIA Licence

(1) A proponent applying for an EIA licence in respect of an undertaking specified in Part B and Part C of the Fifth Schedule, or in accordance with a request under section 16 (6) (c) or 17 (1), shall submit to the Director an EIA report—

(a) in electronic form, and in 15 printed copies, and such additional copies as may reasonably be required by the Director;

(b) signed by the proponent or his duly appointed legal representative and countersigned by the consultant referred to in section 19 who prepared the report;

(c) accompanied by—

(i) satisfactory proof of ownership of the undertaking;

(ii) a site plan prepared and signed by a land surveyor;

(iii) a non-technical summary of the report;

(iv) a certificate issued by a notary expressing his opinion as to the ownership of the land on which the undertaking is to be executed, or where the proponent is not the owner of the land, by written evidence of the permission of the owner, and a certificate issued by a notary expressing his opinion as to the owner's title.

3.1.1.3 Section 2 of the Act further prescribed the minimum content that the EIA report should contain. Requirements on Public Consultations and Disclosure

Section 19(1)(b) of the EPA2002 stipulate that an EIA shall enclose particulars of the schedule of works undertaken by the proponent and his consultants in the preparation of the EIA, including particulars of any consultation held with the public in the area where the undertaking is to be located. However, the EPA 2002 does not refer to the organization of public consultation in other sections.

Section 20(1) of the EPA2002 stipulate that an EIA submitted under section 18 shall be open for public inspection. As per section 20(3)(d), the time limit for the submission of public comments in writing shall be not less than 10 days and not more than 21 days after the date of the publication of the notice in the Gazette; the time limit specified in subsection (2) may be extended to afford reasonable opportunity for any person to submit public comments on the EIA. For this purpose, information on the Project must be disclosed, including a non-technical summary.

The guide issued in July 2004 by the Department of Environment for conducting Environmental Impact Assessments, clarifies the consultation requirement as follows:

Consultations. This section should indicate who has been contacted about the project. It should include:

- Statutory bodies, environmental and amenity groups and local residents likely to be affected by the proposals.
- Means for contacting them and for providing publicity about the project (leaflets, public display, questionnaires, letters, etc.).
- A brief summary of their responses detailing the areas of concern highlighted and their contribution to the EIA.
- For all development projects viz construction of hotels, golf courses, jetties, etc in the coastal zone, the proponent shall have consultation with fishers of the area explaining to them their projects. The consultation shall be done under the aegis of Ministry of fisheries

It should be noted that Sections 53 and 54 allows any person impacted by the granting of an EIA license to challenge this decision before the Environment and Land Use Appeal Tribunal.

3.1.1.4 Regulations for Rodrigues

Section 92 of the Environment Protection Act 2002 as amended caters for application of the law to Rodrigues.

(1) Subject to subsection (3) and notwithstanding section 96 (2) (d), the Rodrigues Regional Assembly may, after consultation with the Rodrigues Environment Committee, make regulations applicable to the Island of Rodrigues.

(2) Regulations made under subsection (1) may provide—

(a) for the issue, amendment and revocation of licences;

(b) for the taking of fees and the levy of charges;

(c) that any person who contravenes them shall commit an offence and shall, on conviction, be liable to a fine not exceeding 250,000 rupees and to imprisonment for a term not exceeding 10 years;

(d) for categories of undertakings, projects or activities on the Island of Rodrigues requiring—

(i) a preliminary environmental report;

(ii) an EIA licence;

(e) for any matter relating to the protection and management of the environment on the Island of Rodrigues.

(3) Nothing in this section is to be taken as empowering the Rodrigues Regional Assembly to make regulations for—

(a) the processing, approval and revocation of approvals in respect of preliminary environmental reports and EIA licences;

(b) establishing environmental standards.

Under this section of the Act, the Rodrigues Regional Assembly may, after consultation with the Rodrigues Environment Committee, make regulations applicable to the Island of Rodrigues and in particular to the Airport development in the course of its life cycle.

3.1.2 MAIN NATIONAL ENVIRONMENTAL STANDARDS UNDER THE ENVIRONMENT PROTECTION ACT 2002

A number of Standards have been promulgated as Regulations under the EPA2002 (as amended); the following standards deemed applicable to the proposed project include, but are not limited to, the following:

3.1.2.1 Standards for Air

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

Table 3-1 below reproduced the First Schedule (Regulation 3): Emission Standards being the maximum limits for the corresponding pollutant.

Table 3-1: Environment Protection (Standards for Air) Regulations 1998 - Emission Standards

Pollutant	***Applicable to***	***Standard***
(i) Smoke	All stationary fuel burning source	Ringelmann No. 2 or equivalent opacity (not to exceed more than 5 minutes in any period of one hour)
(ii) Solid particles	(a) Any trade, industry, process, industrial plant or fuel-burning equipment (b) Any existing trade, industry, process or industrial plant using bagasse as fuel	200 mg/m^3 400 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) (b) Any trade, industry or process in which sulphuric acid is manufactured	120 mg/m^3 as sulphur trioxide 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
(v) Hydrogen Chloride	Any trade, industry or process	200 mg/m^3 as hydrogen chloride
(vi) Chlorine	Any trade, industry or process	100 mg/m^3 as chlorine
(vii) Hydrogen sulphide	Any trade, industry or process	5 ppm as hydrogen sulphide gas
(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) Carbon monoxide	Any trade, industry or process	1 000 mg/m^3 as carbon monoxide

Table 3-2 below reproduced the Second Schedule (Regulation 5): Ambient Air Quality Standards and Measurement Methods

Table 3-2: Environment Protection (Standards for Air) Regulations 1998 - Ambient Air Quality Standards

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 Analyzer, Colorimetry
Nitrogen Dioxide	200	24-hour	Sodium Arsenite, Chemiluminescence
Carbon Monoxide	25,000 10,000	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.			

The Ambient Air Quality limits allowed for under national laws are more stringent than the World Bank Group EHSG - WHO Ambient Air Quality Guidelines; hence the national laws shall apply to the project during construction and operation.

3.1.2.2 Standards for Noise

Control of Noise is regulated by the Environment Protection (Control of Noise) Regulations 2022 (Government Notice No. 251 of 2022).

Standards for noise emissions are set under the Environment Protection (Environmental Standards for Noise) Regulations 2022 (Government Notice No. 250 of 2022). Given that "neighbourhood noise'' does not apply to noise emissions from aircraft or traffic, these standards will apply to the project during construction and to the project during operation for noise sources other than aircraft or traffic. Noise emissions from aircraft or traffic during operations will comply with the World Bank Group General Environmental, Health and Safety Guidelines (EHSG).

Table 3-3 below reproduces the Schedule (Regulation 3): Noise Exposure Limits

Table 3-3: Environment Protection (Environmental Standards for Noise) Regulations - Noise Exposure Limits

Noise Type	***Time***	***Noise Exposure Limits In dB(A) Leq***
Industrial Noise	07.00 - 21.00 hrs 21.00 - 07.00 hrs of following day	60 * 55 *
Neighbourhood Noise	7.00 - 18.00 hrs 18.00 - 21.00 hrs 21.00 – 07.00 hrs of following day	60 55 50
Power Station Noise In residential area	07.00 - 21.00 hrs 21.00 - 07.00 hrs of following day	60 55
Power Station Noise In any other area	At any time	70
*Apply a tonal character adjustment of +5 dB(A) to the measured value where the noise has a definite continuous note such as a whine or hiss		

3.1.2.3 Effluent Discharge Standards

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

Surface water run-off will be discharged on land and/or underground; hence these standards shall be applicable.

Table 3-4 below reproduces the Second Schedule (Regulation 4): Effluent discharge Standards

Table 3-4: Environment Protection (Standards for effluent discharge) - Maximum permissible limit

Parameter	***Unit***	***Maximum permissible limit***	
		Land/Underground	***Surface water courses***
Total coliforms	MPN per 100 ml	-	<400
E. Coli	MPN per 100 ml	<1000	<200
	mg/1		
Free Chlorine	mg/1	-	0.5
Total Suspended Solids (TSS)	mg/1	45	35
Reactive Phosphorus		10	1
Colour	-	Not objectionable	
Temperature	°C	40	
pH	-	5 – 9	
Chemical Oxygen Demand (COD)	mg/1	120	
Biochemical Oxygen Demand (BOD5)	mg/1	40	
Chloride	mg/1	750	
Sulphate	mg/1	750	
Sulphide	mg/1	0.002	
Ammoniacal Nitrogen	mg/1	1	
Nitrate as N	mg/1	10	
Total Kjeldahl Nittogen (TKN)	mg/1	25	
Nitrite as N	mg/1	1	
Aluminium	mg/1	5	
Arsenic	mg/1	0.1	
Berylium	mg/1	0.1	
Boron	mg/1	0.75	
Cadmium	mg/1	0.01	
Cobalt	mg/1	0.05	
Copper	mg/1	0.5	
Iron	mg/1	2.0	
Lead	mg/1	0.05	
Lithium	mg/1	2.5	
Manganese	mg/1	0.2	
Mercury	mg/1	0.005	
Molybdenum	mg/1	0.01	
Nickel	mg/1	0.1	
Selenium	mg/1	0.02	
Sodium	mg/1	200	
Total Chromium	mg/1	0.05	
Vanadium	mg/1	0.1	
Zinc	mg/1	2	
Oil & Grease	mg/1	10	
Total Pesticides	mg/1	0.025	
Total organic halides	mg/1	1	
Cyanide (as CN)	mg/1	0.1	
Phenols	mg/1	0.5	
Detergents (as LAS*)	mg/1	15	
(* Linear Alkylate Sulphonate)			

Standards for discharge into the ocean are set under the Environment Protection (Standards for effluent discharge into the ocean) Regulations 2003.

Surface water run off will be discharged into the ocean; hence these standards shall be applicable.

Table 3-5 below reproduces the Schedule (Regulation 3): Effluent discharge Standards into the ocean being permissible limits or range for the corresponding parameters.

Table 3-5: Environment Protection (Standards for effluent discharge into the ocean) - Maximum permissible limit

Parameter	***Unit***	***Permissible limits***
Temperature	**°C**	**40**
PH	-	*5 – 9*
Floatables	*mm*	*6*
Biochemical Oxygen Demand (BOD5)	**mg/l**	**250**
Chemical Oxygen Demand (COD)	*mg/l*	*750*
Suspended Solids	*mg/l*	*300*
Cadmium	*μg/l*	**20**
Chromium (VI)	*μg/l*	*100*
Chromium, Total	*μg/l*	*500*
Cyanides (as CN-)	*μg/l*	*100*
Lead	*μg/l*	*2*
Nickel	*μg/l*	*2*
Zinc	*μg/l*	*2*
Total Mercury	*μg/l*	*10*
Arsenic	*μg/l*	*200*
Total pesticides	**mg/l**	**1**
Oil & Grease	*mg/l*	*20*

Standards of effluent for use in irrigation are set under the Environment Protection (Standards for effluent for use in irrigation) Regulations 2003.

It is understood that treated effluent will be reused for irrigation; hence these standards shall be applicable.

Table 3-6 below reproduces the Schedule (Regulation 3(1)): Effluent discharge Standards for use in irrigation being maximum limits for the corresponding parameters except where an upper and a lower limit are specified.

Table 3-6: Environment Protection (Standards for effluent for use in irrigation) - Maximum permissible limit

List	***Parameter***[1]	***Unit***	***Standards***
A	pH	-	5 – 9
	Colour	-	not objectionable
B	Biochemical Oxygen Demand (BOD_5)	mg/l	40
	Chemical Oxygen Demand (COD)	mg/l	120
	Suspended Solids	mg/l	45
	Chloride	mg/l	250
	Sulphate	mg/l	500
	Nitrate N	mg/l	20
	Total Dissolved Solids	mg/l	2000

	Sodium Adsorption Ratio (SAR)	-	<6
C	Aluminium Arsenic Beryllium Boron Cadmium Chromate chromium Cobalt Copper Fluorine Iron Lead Lithium Manganese Molybdenum Nickel Mercury Selenium Vanadium Zinc	mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l	5 0.10 0.10 0.75 0.01 0.10 0.05 0.20 1 5 2 2.5 0.2 0.01 0.20 0.02 0.02 0.10 2
D	Total Pesticides Oil & Grease Detergents)	mg/l mg/l mg/l	0.025 10 5
E	Faecal coliforms[2] Intestinal nematodes[2]	MPN per 100 ML Arithmetic mean no. of eggs per Litre	1000[3] ≤1
Notes: - (a) [1]A 95% compliance limit will be accepted based on the series of samples taken in a year (b) [2]Prohibited for crops to be eaten raw (c) [3]200 faecal coliforms MPN/100 ml for public lawns such as hotel lawns, with which the public may have direct contact			

3.1.2.4 Drinking Water Standards

Drinking Water Standards are set under the Environment Protection (Drinking Water Standards) Regulations 1996.

Any water used for potable water supply shall meet these standards

Table 3-7 below reproduces the Second Schedule (Regulation 3): Drinking Water Standards being maximum limits for the corresponding parameters except where an upper and a lower limit are specified.

Table 3-7: Environment Protection (Drinking Water Standards) - Maximum permissible limit

Parameter	***Standards***
Microbial	
E. coli	must not be detectable in any l00ml 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 consecutive samples
Physico-chemical	
pH	6.5-8.5
Total dissolved solids	1000mg/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	0.01 mg/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	250mg/l
Nitrate	50 mg/l(as No3)
Nitrite	3 mg/1(as No2)
Pesticides	
Aldrin and Dieldrin	0.03 microgram/l
DDT	2 microgram/l
HCB	1 microgram/l
Methoxychlor	20 microgram/l
Heptachlor and Heptachlor Oxide	0.03 microgram/l

3.1.3 Other Main Applicable Legislation for the Matter of Environment

3.1.3.1 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.

3.1.3.2 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 2007, 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 or remove, 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.

The Fisheries and Marine Resources (Marine Protected Areas) Regulations 2001 were made under the Fisheries and Marine. To conserve marine biodiversity, a system of Marine Protected Areas comprising fishing reserves, marine parks and marine reserves, has been established in the waters around Mauritius and Rodrigues. The Republic of Mauritius has, so far, proclaimed 6 Fishing Reserves and 2 Marine Parks namely Balaclava (485 ha) and Blue Bay (353 ha) as well as 5 Fisheries Reserved Areas (MOEMRFSOI, MID, 2013), 4 Marine Reserves (Rivière Banane, Anse aux Anglais, Grand Bassin, Passe Demie) and a multiple-use Marine Protected Area in the south-east of Rodrigues (SEMPA).

The project is not located within or adjoining a Marine Protected Area. This act is applicable as the activities supported under this project will include construction activities within the marine environment as well as likely to cause discharge into the ocean.

3.1.3.3 The Forest and Reserves Act 1983

The Forest and Reserves Act of 1983 is an Act to amend and consolidate the law relating to forests, reserves and related matters.

Under the Second Schedule (section 2) of the Act, Anse Quitor which adjoins the proposed project is a declared Nature Reserve.

Under the Fourth Schedule (section 2) of the Act Riviere Anse Quitor which is located near the proposed project is a declared river, and as such a river reserve applies as follows:

- 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.

3.1.3.4 The Wildlife and National Parks Act 1993

The Wildlife and National Parks Act of 1993 is 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. Anse Quitor Nature Reserve has been proclaimed under Part IV section 12 of the Act. "Nature reserve" has the same meaning as in the Forest and Reserves Act 1993.

Part V of the Act refers to 'Protection of Fauna and Flora'. "Protected wildlife" means wildlife, other than game and the wildlife specified in the Second Schedule. The third schedule specifies the protected wildlife that may be captured and reared, whereas the fourth schedule specifies the species of wildlife in respect of which more reserve penalties are provided; these include reptiles, birds and mammals some of which are found in Anse Quitor Nature Reserve.

3.1.3.5 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.

Drawing water from river is allowed for any person for the use of himself, his family, and any animals possessed by him without any permits; whereas Supreme Court approval would be required for drawing water by means of machinery, or by turning aside any portion of the river or stream.

Under section 87 (1) of the Act, any person who throws, or causes to be thrown, or sends or allows to flow into a river or into a canal, pipe or other conduit discharging into a river or canal, any scum, residue, refuse, washing or other dirty waters or other liquid that may be tend to pollute the water of such river or canal shall commit an offence and shall, on conviction, be liable to a fine not exceeding 1,000 rupees.

Anse Quitor river runs to the north and east of the project area.

3.1.3.6 Sustainable Integrated Development Plan Rodrigues 2022

The first Sustainable Integrated Development Plan for Rodrigues (SIDPR) was prepared by KPMG in 2009 and has been revised in 2022.

With the new SIDPR, Rodrigues long-term sustainable development strategy will be based on:

- The greening of the economy.
- Building resilience.
- Investing in sustainability-related research and development.
- Building an innovative, inclusive, modern, and emission-free economy.

The road map will seek to:

- Involve jointly both the private and public sectors creating a sustainable business environment with as much support as possible from the civil society.
- Improve the understanding of climate change management, climate services, and local and institutional capacities for development.
- Strengthen the resilience of human and natural systems through adequate land use and marine planning.

- Deliver appropriate biodiversity, ecosystems, basin, and marine-coastal management to favour local communities with special attention to the youth.
- Institute climate-resilient public services and infrastructure.
- Identify pathway towards 100% Renewable Energy
- Design eco-conscious production systems.

3.1.3.7 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'.

3.2 Main National Legislation on Social Aspects

The relevant legislation and regulations regarding social issues regard land rights and land acquisition, labour law, cultural heritage protection, and equality. This section provides a brief overview of Mauritius' legal requirements in this respect.

3.2.1 Main Legislation on Labour and Working Conditions

This section provides a brief overview of labour laws. More detailed provisions are included in the Labour Management Plan. Mauritius' labour aligns with the International Labour Organisation conventions' requirements.

3.2.1.1 The Workers Right Act 2019

This Act sets basic workers' rights in Mauritius. More particularly, it provides that employer must not treat workers in a discriminatory manner in employment and in access to employment. Additionally, it sets the minimum age for working at 16 and at 18 for dangerous works. Additionally, the Act requires employers to keep a record of young persons.

Moreover, the Workers' Rights Act also provides with general regulations on labour contracts such as the hours worked per week, various leaves, remuneration conditions, termination of labour contracts, retirement, workfare programme fund and the prohibition of violence and harassment at work**.**

3.2.1.2 The Employment Relations Act 2008

The Employment Relations Act 2008 (Act No. 32 of 2008) is the second key labour law in Mauritius. This Act:

- Defines the formal conditions to create and administer a trade union;
- Details the basic workers' rights to freedom of association, which should not lead to discrimination and victimization;
- Regulates collective bargaining;
- Provides basic procedures to deal with labour disputes and strikes; and
- Sets up basic labour relations institutions such as the employment relations tribunal, the commission for conciliation and mediation, and the National Remuneration Board.

In Rodrigues, a Commission for Conciliation and Mediation must be created as the institution that will deal with labour disputes.

3.2.1.3 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

3.2.2 MAIN LEGISLATION ON LAND USE

3.2.2.1 Rodrigues (State Land and Pas Geometriques) Regulations 1915

Section 6 or the Regulations refers to Leases. The Minister may grant a lease of a portion of State Land or of a portion of Pas Geometriques or annexes for a period not exceeding 20 years on such terms and conditions as to rent, planting and felling of trees, transfer of the lease and other conditions, as he may impose.

The site where the boat house wil be located will be leased by RRA to ARL for the purpose.

The Forestry Services is responsible for the proper administration and management of all forest lands, 'pas geometriques', mountains, rivers, reserves and offshore islets.

3.2.2.2 The Rodrigues Regional Assembly Act 2001

Section 54 of the Rodrigues Regional Assembly Act makes provision for the vesting of powers, rights and property in the Regional Assembly.

Section 54A of the Rodrigues Regional Assembly Act makes specific provision for the vesting back of aerodrome at Plaine Corail.

3.2.2.3 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

3.2.2.4 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.

3.2.2.5 The Planning and Development Act 2004

The Planning and Development Act is not directly relevant to the Project since it applies to the planning stage, which has already been completed for the Project. However, one of the objectives of this Act is to ensure a land development that is ecologically sustainable. For this purpose, the Planning and Development Act articulates the granting of the development permit with the Environmental Impact Assessment procedure. This articulation takes place through conditions, consultation requirements and the content of the planning agreement that are relevant to environmental and social safeguards.

A development plan must include items such as a report on the principal physical, economic, environmental and social conditions, resources and facilities of the planning area, and information in a form which is comprehensible to the persons and communities in the local planning area to which the plan will apply (Section 15).

Moreover, the Act sets consultation requirements. According to Section 29, the authority granting the permit shall consult with:

- The Director of Environment when an application has or is likely to have significant environmental effects and the applicant is to be required to prepare a preliminary environmental report or an EIA,
- The Ministry responsible for the subject of roads where an application has or is likely to have a significant impact on roads or traffic management;
- Local authorities when an application to develop land affects or is likely to affect the land of or services provided by a neighbouring local authority

Additionally, the permitting authority must receive an EIA license or an approved preliminary environmental report where such license or report is necessary in respect of the development before considering and determining an application for a development permit (Section 30).

The Act also provides conditions for granting a development permit (Section 32). Among these are:

- landscaping and the preservation of trees and other natural resources on or contiguous to the land on which the development is to take place;
- the preservation of any buildings on the site of or in connection with or contiguous to the development;
- measures to be taken and works to be carried out to protect public health, safety and convenience during the carrying out of the development;
- the contribution including the financial contribution which the developer will be required to make to the provision of infrastructure, public utility services, roads, car parking and social and community facilities in connection with the development;

- the removal of waste from the site of the development during and after any building or engineering operations;
- any action to ensure that any proposals for the containment of environmental damage likely to be caused by the development made in a preliminary environmental report or an EIA are complied with.

In the Section 35 on Planning agreements, the Planning and Development Act states that "where any person is likely to be required to move from where he is living or where he is using land for his livelihood by the development, the arrangements to be made by the developer to provide that person with alternative living accommodation and alternative methods of obtaining his livelihood or other forms of compensation".

Finally, the planning agreements can provide for the community facilities and physical infrastructure to be provided for the development and for any land contiguous to the development and the timing for the construction of, or the payment for the provision of the facilities and infrastructure. This will include, the nature, scope and cost of any benefits to be provided for any community likely to be adversely affected by the development and the arrangements to be made by the developer to provide resettled persons with alternative residential structures and alternative livelihoods when the resettled persons lose land they used for livelihoods.

3.2.3 LEGAL FRAMEWORK FOR LAND ACQUISITION AND EXPROPRIATION

3.2.3.1 The Constitution of Mauritius – Property as a Fundamental Right

In Rodrigues, property right is recognized as a fundamental right in the Constitution. The Constitution of Mauritius adopted in 1968 states in its section 8 that property cannot be compulsorily acquired except for public purpose. Other conditions are stated in the Constitution, which includes the payment of an adequate compensations and the right to access to the Supreme Court to contest the compulsory acquisition.

These provisions are articulated in the Land Acquisition Act 54 of 1973 as detailed in the section 4.1.2.3 below.

3.2.3.2 Land Tenure and Eviction in Rodrigues

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. It should be noted that Mauritius does not deal with customary land rights for historical reasons. Legal pluralism is not existing in Mauritius or Rodrigues and formal law is therefore the only legal system regulating land tenure.

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.

It should be noted that the law does not recognize rights to informal occupants, also named squatters, but allows for some form of support. According to the State land act 21 of 1982, informal occupants should be notified of the necessity to vacate the land and may face imprisonment if he or she fails to do so. Upon vacation of the occupied land, any structure erected on it is demolished. The section 22-9 of the Act states that the materials that are still in good or usable conditions should be collected by the State and returned to the squatter upon the payment of a sum to recover the expenses induced by the demolition. Finally, the damage resulting from the demolition of the illegally built structure cannot give rights to actions against the Minister or the authority carrying out the eviction, which indicates that informal occupants are not eligible to compensation (Section 22-11). Despite this strict procedure, the State land Act allows the Minister to regularize squatters by the grant of a building lease over the occupied site or another site for a limited cost, depending on the occupiers' resources (Section 28). For instance, squatters have recently received support in their resettlement through the National Housing Development Company (NHDC) assistance.[10]

It should be noted that the law allows for acquisitive prescription in case of residence or occupancy of an immovable property. The acquisitive prescription act No. 13 of 2018 allows the occupier of an immovable property to formalize its right on this property by applying to a deed of property to a notary. This procedure includes the publication of a notice for a period of 3 month of time during which potential formal owners can object the request of prescription. The transcription of the deed of property confers any rights to its owner. Therefore, the legal system in place leaves a room for the recognition of rights of informal occupants.

3.2.3.3 The Land Acquisition Act 1973

The Land Acquisition Act applies to all cases of compulsory acquisition of land (note that "land" includes buildings and any right or interest in land).

The land acquisition procedure is defined in the Land Acquisition Act No. 54 of 1973 and is essentially administrative. This procedure is launched after attempts to acquire the land through amicable negotiation has failed, and transfer of property can take place only once the compensation has been paid.

The procedure starts with the publication of a notice describing precisely: the land to be acquired, the purpose of land acquisition, and the request for any interested person to declare its interest on the impacted land. The notice shall be published in 2 issues of the national Gazette and 2 issues of daily newspapers, with an interval of 7 days between the first and the second publications. A copy of the notice should also be sent to the identified owners of the land. This decision to acquire land compulsorily can be challenged before the Supreme Court.

Following the publication of the notice, the Land Acquisition Act requires the competent officer to determine the eligibility to compensation. This can be done through discussions with people who received notification or with individuals who made a claim regarding their rights following the publication of the notice in gazettes and newspapers.

The calculation of compensation is made by a Board, based on claims made by eligible owners to the officer leading the expropriation. The claim is transferred to a Board of Assessment together with a report describing the nature of the land and the value of the land estimated by the officer. The Board shall determine the

[10] See for instance Government of Mauritius, Evicted squatters will benefit from NHDC assistance, 2020.06.03: http://www.govmu.org/English/News/Pages/Evicted-squatters-will-benefit-from-NHDC-assistance,-says-Minister-Obeegadoo.aspx

compensation by holding an inquiry involving the interested people. The compensation is defined by taking into account the value of the property on the open market at the date of the first publication of the notice. Additionally, the compensation includes loss for any loss resulting from the compulsory acquisition, and the loss of value of adjacent properties.

It should be noted that as a rule, compensation is monetary but can be done in kind, notably through land replacement. Indeed, the Act states that in the case of compulsory acquisition, when the land is devoted to a purpose for which land is not readily available, the Board can accept that the interested person continues its activity in some other place. In that case, compensation may be assessed on the basis of the cost of reinstating the interested person on other land.

Once the compensation amount has been defined, it is filled in the registry and notified to the parties within 7 days. The parties can appeal the award before the Supreme Court.

3.2.4 THE DIFFERENT POLICIES INVOLVED IN THE PROJECT

3.2.4.1 Social Housing Construction Policy

The RRA has a social housing policy targeting low-income families that allows them to access 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).

3.2.4.2 Marine Park Protection Policy

The provisions of the South East Marine Protected Area (SEMPA) Regulations 2011 have to be considered in the selection of sites identified for the relocation of those with fishing activities. Indeed, the SEMPA defines several categories of areas, including in-take and in-take" and "no-take" areas and the same law also stipulates the activities that are permitted in these zones. Fishermen will be attributed areas that are permitted by the SEMPA.

3.2.5 LEGAL REQUIREMENTS ABOUT GENDER AND GENDER-BASED VIOLENCE

3.2.5.1 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. [11]

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.

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

3.2.5.2 The Equal Opportunities Act 2008

The national policies are strengthened and implemented by the Equal Opportunities Act No. 42 of 2008.

This Act defines direct and indirect discrimination, as well as discrimination by victimisation. On these issues, the definitions provided in the Act align with key pieces of international law such as the International Covenant on Economic, Social and Cultural Rights and ILO Convention No. 111 Employment and Occupation Discrimination.

Additionally, the Act reiterates the principle of equality and non-discrimination at work, during recruitment and in trainings. The Act also prohibits discrimination in the field of education, in the provision of goods and services, accommodation, access to immovable property and sport.

The Act contains a specific chapter on the prohibition of sexual harassment not only applicable to the workplace, but in other contexts such as education.

Finally, the Act sets up the institutions in charge of enforcing the Act and dealing with complaints, namely the Equal Opportunities Commission and the Equal Opportunities Tribunal.

3.2.5.3 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
- specific vulnerability issues in environmental and social impact assessments
- specific measures regarding women and vulnerable people in resettlement processes

3.2.6 THE PROTECTION OF CULTURAL HERITAGE

Mauritius has adopted several acts and regulations related to cultural heritage protection. The main legislation is the National Heritage Fund (NHF) Act No. 40 of 2003, which states that cultural heritage must be preserved as a source of material for scientific and cultural investigation and on an “enduring basis” for the purposes of development.

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.

This Act will therefore apply to the project if any objects or areas of cultural heritage is uncovered or impacted on by the activities supported under this project.

Mauritius legislation states that the preservation of cultural heritage is an objective but provides limited provisions on the procedures to achieve such objective. Some provisions are found in the Environment Protection Act, which requires to assess a Project's cultural effects on the people and society (Section 18), and in the Planning and Development Act, which provides special powers to the Minister for the preservation of any building or site for architectural, environmental cultural or historical reasons. After a survey and a consultation with the Planning Commission, the Minister may request the National Heritage Fund Board to declare the site as a national heritage sites.

Moreover, specific regulations are adopted to protect defined areas or heritage on a case-by-case basis.

Finally, the Act establishes the NHF which aims at safeguarding managing and promote Mauritius' national heritage, for the purpose of tourism, leisure and transmission to future generation. The Fund also aims at educating and sensitizing the public on tangible and intangible heritage. For this purpose, the NHF shall establish and maintain a register of national heritage, regulate and authorize activities related to heritage conservation, and may declare a site as cultural heritage.

It should be noted that Mauritius' legal framework regarding the protection of cultural heritage includes several limits:

- Mauritius' legislation does not provide with a chance find procedure.
- The legislation does not refer to consultation regarding cultural heritage, nor at the stage of identifying and registering heritage sites, nor during activities that may impact such site. NGOs are not involved in the NHF activities.
- The legislation does not refer to the need to share benefits from the use of cultural heritage.

3.3 International Conventions and Treaties

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

Most relevant conventions/treaties to the project are provided in the Table 3-8 below.

Table 3-8: Most relevant conventions/treaties to the project

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 and 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
Human rights	
International Covenant on Civil and Political Rights	Ratified on12.12.1973
International Covenant on Economic, Social and Cultural Rights	Ratified on 12.12.1973
Convention on the Elimination of All Forms of Discrimination against Women	Ratified on 09.07.1986
International Convention on the Elimination of All Forms of Racial Discrimination	Ratified on 30.05.1972
Convention on the Rights of the Child	Ratified on30.05.1972

Convention on the Rights of Persons with Disabilities	Ratified on 08.01.2010
10 ILO fundamental conventions	Ratification from1969 to 2012

3.4 INTERNATIONAL GUIDELINES AND STANDARDS

3.4.1.1 World Bank Environmental and Social Standards

The ESIA will meet the requirements of the World Bank Environmental and Social Framework (ESF) including the requirements of the World Bank Environmental and Social Standards (ESSs).

Table 3-9 below details the ESSs and their relevancy to the Project.

Table 3-9: World Bank ESSs and their relevancy to the Project

World Bank ESS	Relevancy to the Project
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	ESS1 is relevant. ESS1 sets out the Borrower's responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project supported by the Bank through Investment Project Financing, in order to achieve environmental and social outcomes consistent with the Environmental and Social Standards (ESSs).
ESS2: Labour and Working Conditions	ESS2 is relevant. ESS2 recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions
ESS3: Resource Efficiency and Pollution Prevention and Management	ESS3 is relevant. ESS3 recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels. The activities supported under this project is likely to lead to environmental pollution to air, land and marine environment if not adequately managed. Furthermore, air travel is seen as a major contributor to Greenhouse Gas emissions and therefore it is anticipated that the increase in air travel due to the upgrading of the airport may lead to an increase in GHG emissions.
ESS4: Community Health and Safety	ESS4 is relevant ESS4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration or intensification of impacts due to project activities.

ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	ESS5 is relevant. ESS5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons. Project-related land acquisition or restrictions on land use may cause physical displacement (relocation, loss of residential land or loss of shelter), economic displacement (loss of land, assets or access to assets, leading to loss of income sources or other means of livelihood), or both. The term "involuntary resettlement" refers to these impacts. Resettlement is considered involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in displacement
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	ESS6 is relevant ESS6 recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development. Biodiversity is defined as the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems. Biodiversity often underpins ecosystem services valued by humans. Impacts on biodiversity can therefore often adversely affect the delivery of ecosystem services. The activities supported under this project will have a direct and indirect impact on sensitive fauna and flora species which need to be mitigated through the preparation of a biodiversity management plan.
ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	ESS7 is not relevant
ESS8: Cultural Heritage	ESS8 is relevant ESS8 recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present and future. People identify with cultural heritage as a reflection and expression of their constantly evolving values, beliefs, knowledge and traditions. Cultural heritage, in its many manifestations, is important as a source of valuable scientific and historical information, as an economic and social asset for development, and as an integral part of people's cultural identity and practice. ESS8 sets out measures designed to protect cultural heritage throughout the project life cycle. The project will support large scale/ bulk earthworks and therefore it is likely that objects of cultural heritage may be uncovered which will be managed through the preparation of a chance finds procedure as part of the Environmental and Social Management Plan (ESMP).
ESS9: Financial Intermediaries	ESS9 is not relevant
ESS10: Stakeholder Engagement and Information Disclosure	ESS10 is relevant. This ESS recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can

	improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation.

3.4.1.2 World Bank Group Environment, Health, and Safety Guidelines

- The World Bank Group General Environmental, Health and Safety Guidelines (EHSG)

The Environmental, Health and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). They contain the performance levels and measures that are normally acceptable to the World Bank Group, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology.

The General EHS Guidelines contain the following information:

1. Environmental 1.1 Air Emissions and Ambient Air Quality 1.2 Energy Conservation 1.3 Wastewater and Ambient Water Quality 1.4 Water Conservation 1.5 Hazardous Materials Management 1.6 Waste Management 1.7 Noise 1.8 Contaminated Land	2. Occupational Health and Safety 2.1 General Facility Design and Operation 2.2 Communication and Training 2.3 Physical Hazards 2.4 Chemical Hazards 2.5 Biological Hazards 2.6 Radiological Hazards 2.7 Personal Protective Equipment (PPE) 2.8 Special Hazard Environments 2.9 Monitoring
3. Community Health and Safety 3.1 Water Quality and Availability 3.2 Structural Safety of Project Infrastructure 3.3 Life and Fire Safety (L&FS) 3.4 Traffic Safety 3.5 Transport of Hazardous Materials 3.6 Disease Prevention 3.7 Emergency Preparedness and Response	4. Construction and Decommissioning 4.1 Environment 4.2 Occupational Health and Safety 4.3 Community Health and Safety

The following guidelines/standards are provided in the General EHSG:

Ambient Air Quality. Projects with significant sources of air emissions, and potential for significant impacts to ambient air quality, should prevent or minimize impacts by ensuring that emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines shown in Table 3-10 below.

Table 3-10: WHO Ambient Air Quality Guidelines

	Averaging Period	***Guideline value in µg/m³***
Sulphur 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 1-hour	40 (guideline) 200 (guideline)
Particulate Matter PM_{10}	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $PM_{2.5}$	1-year 24-hour	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone O_3	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Sanitary Wastewater. If sewage from the industrial facility is to be discharged to surface water, treatment to meet national or local standards for sanitary wastewater discharges or, in their absence, the indicative guideline values applicable to sanitary wastewater discharges shown in Table 3-11 below.

Table 3-11: 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] /100ml	400[a]
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		

Noise Level Guidelines. Noise impacts should not exceed the levels presented in Table 3-12 or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

Table 3-12: Noise Level Guidelines

	One Hour L_{Aeq} (dBA)	
Receptor	Day time 07:00 - 22:00	Night time 22:00 - 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

- The World Bank Group EHSG for Airports projects

This EHS Guidelines for Airports apply to the operation of commercial airports. It provides a summary of EHS issues associated with airports which occur during the operational phase, along with recommendations for their management. This document is organized according to the following sections:

1) Section one provides information about industry-specific impacts and management;
2) Section two describes performance indicators and monitoring; and
3) Section three concludes with references

Standards applicable are those provided in the General EHS Guidelines.

- The World Bank Group EHSG for Waste Management Facilities

The EHS Guidelines for Waste Management cover facilities or projects dedicated to the management of municipal solid waste and industrial waste, including waste collection and transport; waste receipt, unloading, processing, and storage; landfill disposal; physico-chemical and biological treatment; and incineration projects.

These Guidelines provide the following specific Standards

- Air Emission Standards for Municipal Solid Waste Incinerators
- Air Emission Standards for Hazardous Waste Incinerators
- Air Emission Standards for Industrial Non-Hazardous Waste Incinerators
- Effluent Standards for Landfills

- The World Bank Group EHSG for Construction Material Extraction

This document includes information relevant to construction materials extraction activities such as aggregates, limestone,

slates, sand, gravel, clay, gypsum, feldspar, silica sands, and quartzite, as well as to the extraction of dimension stone. It

addresses stand-alone projects and extraction activities supporting construction, civil works, and cement projects.

Although the construction materials extraction guidelines emphasize major and complex extraction schemes, the concepts are also applicable to small operations.

3.4.1.3 International Civil Aviation Organization Guidelines

Good International Industry Practices and Standards for Airports as set out by the International Civil Aviation Organization (ICAO) are relevant to the project.

ICAO has established five comprehensive Strategic Objectives, namely:

- Safety. Enhance global civil aviation safety. This Strategic Objective is focused primarily on the State's regulatory oversight capabilities: The Global Aviation Safety Plan (GASP) outlines the key activities for the triennium.
- Air Navigation Capacity and Efficiency: Increase the capacity and improve the efficiency of the global civil aviation system. Although functionally and organizationally interdependent with Safety, this Strategic Objective is focused primarily on upgrading the air navigation and aerodrome infrastructure and developing new procedures to optimize aviation system performance. The Global Air Navigation Capacity and Efficiency Plan (Global Plan) outlines the key activities for the triennium.
- Security & Facilitation: Enhance global civil aviation security and facilitation. This Strategic Objective reflects the need for ICAO's leadership in aviation security, facilitation and related border security matters.
- Economic Development of Air Transport: Foster the development of a sound and economically viable civil aviation system. This Strategic Objective reflects the need for ICAO's leadership in harmonizing the air transport framework focused on economic policies and supporting activities.
- Environmental Protection: Minimize the adverse environmental effects of civil aviation activities. This Strategic Objective fosters ICAO's leadership in all aviation-related environmental activities and is consistent with the ICAO and UN system environmental protection policies and practices.

3.5 LEGAL GAP ANALYSIS

Table 3-13 below summarises the Key Requirements under World Bank Standards, the national legislation and provides a gap analysis, to the extent possible.

Table 3-13: Legislative Gap Analysis

Key Requirements of WBG ESS	***Related Provisions in Mauritius Legal framework***	***Gap Analysis***
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	- Environmental Protection Act 2002 as amended (which refers to Environmental impact Assessment) and applicable Regulations - Environment Protection (Declaration of Environmental Laws) Regulations 2005.	ESS 1 has a greater focus on social risks in comparison to the national legislation which focuses on the environmental aspects. Notably, the EIA process does not contain specific provisions on the engagement of vulnerable groups in consultation. Therefore, there is a gap between ESS1 and the various national laws. **ESS1 and national legal framework to apply**
ESS2: Labour and Working Conditions	- The Workers Right Act - The Employment Relations Act No. 32 of 2008; and	Mauritius' labour law complies with standards set in ILO conventions regarding workers management requirements, labour conditions, the prohibition of discrimination, freedom of association, the prohibition

Key Requirements of WBG ESS	***Related Provisions in Mauritius Legal framework***	***Gap Analysis***
	- The Occupational Safety and Health Act 28 of 2005 and its regulations, including but not limited to: Occupational Safety and Health (Foundries and Construction Works) Regulations GN No 167 of 2019, Occupational Safety and Health (Personal Protective Equipment) Regulations GN No 146 of 2012, Occupational Safety and Health (Noise at Work) GN No 107 of 2012; and Occupational Safety and Health (Employees' Lodging Accommodation) GN No 27 of 2011.	of child and forced labour, grievance mechanism, and OHS requirements. Domestic law is more stringent the ESS2 regarding the legal age to work (16 instead of 14); There is a gap between domestic law and ESS2 requirements regarding due diligence for child labour and forced labour within the supply chain and primary suppliers., The Occupational Safety and Health Act 28 of 2005 and its regulations shall apply **ESS2 and national legal framework to apply**
ESS3: Resource Efficiency and Pollution Prevention and Management	- Environmental Protection Act 2002 as amended (which refers to Environmental impact Assessment) and applicable Regulations - Environment Protection (Declaration of Environmental Laws) Regulations 2005.	The national legal framework is in place. There might be some weaknesses in the application of some aspects such as waste management due to lack of specialised facilities in Rodrigues . In terms of air emissions limits the World Bank Group EHSG - WHO Ambient Air Quality Guidelines shall apply as it is more stringent than the limits allowed for under national laws. In terms of Effluent Discharge to the ocean, likelwise the WB EHSG shall apply as they are genrally more stringent than the the Standards for Mauritius **ESS3 and national legal framework to apply**
ESS4: Community Health and Safety	- The Environment Protection (Collection, Storage, Treatment, Use and Disposal of Waste Oil) Regulations of 2006; The Environmental Protection (Environmental Standards for Noise) Regulations of 2022; - The Climate Change Act No. 11 of 2020;	Communities' health and safety protection in project development is not explicitly considered in Mauritius legislation. These are considered generally in the Environment Protection Act No. 19 of 2002 in the scope of the EIA, which includes the "social, economic and cultural effects which the undertaking is likely to have on the people and society" (§18).

Key Requirements of WBG ESS	*Related Provisions in Mauritius Legal framework*	*Gap Analysis*
	- The Environment Protection (Standards for hazardous wastes) Regulations of 2001; - The Planning and Development Act No. 32 of 2004; and The Public Health Act No. 47 of 1925.	Other legislation and regulations regarding communities' health and safety in Projects are included in sectoral legislation detailed on this line. Main gaps regard: - The absence of consideration for the use of ecosystem services by communities; - No requirements to implement programs to minimize the potential for community exposure to disease during projects implementation; - No consideration for risks posed by security guards in projects **ESS4 and national legal framework to apply**
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	- The Land Acquisition Act - The Planning and Development Act	Overall, Mauritius' legal framework is not aligned with ESS5 requirements. Whereas it is aligned with the requirement to pay a compensation at replacement cost and market value for loss of property and opportunity, the gaps are the following: • The Land Acquisition Act does not require to limit expropriation operations at the strict minimum; • Only formal occupants are entitled to compensation whereas informal occupants, also named "squatters", are not eligible to resettlement (only upon a decision from the Minister); • General requirements to restore livelihood in the Planning and Development Act. • No public consultation or engagement with impacted communities prior decision to expropriate; • No grievance mechanism required, only judicial remedy; • Compensation in kind only offered for land, not for structures; • No requirement to elaborate a RAP; • No specific measures for vulnerable groups. **ESS5 and national legal framework to apply**
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	- All laws listed under section 3.1 'Main National Legislation on Environmental Aspects'	The national legal framework is in place and meets the requirements under ESS6 for protection and conservation of biodiversity and habitats. Sustainable Management of Living Natural Resources does not apply for the present project **ESS6 and national legal framework to apply**

Key Requirements of WBG ESS	*Related Provisions in Mauritius Legal framework*	*Gap Analysis*
ESS8: Cultural Heritage	- National Heritage Fund (NHF) Act No. 40 of 2003 - Planning and Development Act No. 32 of 2004 - Environment Protection Act No. 19 of 2002	The national legal framework on the protection of cultural heritage includes significant gap with ESS8, including: the absence of a chance find procedure, no provisions on public participation in cultural heritage protection, no reference to the need to share benefits from the use of cultural heritage. **ESS8 to apply**
ESS10: Stakeholder Engagement and Information Disclosure	Environment Protection Act of 2002, Section 20	Several gaps are identified: According to the Environment Protection Act, public participation is mostly foreseen through comments in written form. Since comments are mostly done in a written form through specific points, people with limited education or disability are less able to provide observations and are, therefore, less involved in engagement activities. **ESS10 and national legal framework to apply**

4 ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS

4.1 DEFINITIONS AND METHODOLOGY

4.1.1 DEFINITION

The environmental and social assessment stands guided by paragraph 28 of the Guidance Note for Borrowers - ESS1: Assessment and Management of Environmental and Social Risks and Impact.

> 28. The environmental and social assessment, informed by the scoping of the issues, will take into account all relevant environmental and social risks and impacts of the project, including:
>
> (a) Environmental risks and impacts, including:
>
> (i) those defined by the EHSGs;
>
> (ii) those related to community safety (including dam safety and safe use of pesticides);
>
> (iii) those related to climate change and other transboundary or global risks and impacts;
>
> (iv) any material threat to the protection, conservation, maintenance, and restoration of natural habitats and biodiversity; and
>
> (v) those related to ecosystem services and the use of living natural resources, such as fisheries and forests; and
>
> (b) Social risks and impacts, including:
>
> (i) threats to human security through the escalation of personal, communal, or interstate conflict, crime, or violence;
>
> (ii) risks that project impacts fall disproportionately on individuals and groups who, because of their particular circumstances, may be disadvantaged or vulnerable;
>
> (iii) any prejudice or discrimination toward individuals or groups in providing access to development resources and project benefits, particularly in the case of those who may be disadvantaged or vulnerable;
>
> (iv) negative economic and social impacts relating to the involuntary taking of land or restrictions on land use;
> (v) risks or impacts associated with land and natural resource tenure and use, including (as relevant) potential project impacts on local land use patterns and tenurial arrangements, land access and availability, food security and land values, and any corresponding risks related to conflict or contestation over land and natural resources;
>
> (vi) impacts on the health, safety, and well-being of workers and project-affected communities; and
>
> (vii) risks to cultural heritage

4.1.2 GENERAL METHODOLOGY

The potential receptors in the project area of influence were identified in the baseline studies.

The risks and impacts are now assessed based on a number of criteria.

For each aspect, the impacts are defined and classified according to whether they are:

- Temporary impacts during construction. These impacts are likely to appear during the project construction/implementation phase, and to disappear once the construction phase is completed (e.g. construction noise);

- Permanent impacts during construction. These impacts are likely to appear during the construction phase, and to continue once the construction phase is completed (e.g. destruction of habitat located in the project footprint);
- Impacts during operation. 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 assessed through a risk matrix (Table 4-1 below) based on the sensitivity of the receptor (ranging from low to major) and the severity of the impact (ranging from not significant to major). This matrix applies both to negative and positive impacts.

Table 4-1: Risk Matrix

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

4.1.3 Specific Methodologies

4.1.3.1 Social Impacts Assessment

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: 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: Aims 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 is to measure the evolution of conditions of access to health services.

- Impacts on cultural heritage: For the Rodrigues airport 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.

Assessment of social impacts

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.

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?

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.

Magnitude of social impact

The matrix of magnitude is used to cross the receptor sensitivity and the severity of the impact.

4.1.3.2 Landscape and Visual Impact Assessment

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 (ZTV) or Zone of Visual Influence (ZVI).

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.

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, taking 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, color, 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 Ste Marie Hill clearance and runway construction only. No built form was modelized into GIS. Some buildings of visual importance might have further significant visual impact: the water tower, the Air Traffic Control tower and the fuel farm.

Human perception and visibility

Several 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.

4.2 Temporary Impacts during Construction

4.2.1 Physical environment

4.2.1.1 Marine physical environment: shores, currents, turbidity and sedimentation

As approximately 3.5 ha of the new runway is to be built at sea (Locations A and B), it is anticipated that the seabed will be disturbed; a sediment plume will be generated by both the works at sea and water rejection into the sea from the backfilled areas. 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.

- Impact Phy-Mar-W-Temp-1: Increase in turbidity

→ Impact before mitigation

First, 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.
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 4-2: 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/m^2	0.35[-]	0.0001 $kg/m^2/s$	0.2 N/m^2

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 Baie Topaze 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 Baie du Nord 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**.

- Impact Phy-Mar-W-Temp-2: Modification of the seabed

→ Impact before mitigation

The turbid plume also affects the seabed. Change in its composition might be detectable after the fine sediment has settled down. 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 Baie du Nord 9 km away from the first release point. Though the thickness is less than 1 mm. Sediment deposits in the entrance of Baie 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**.

- Impact Phy-Mar-W-Temp-3: Dredging in front of the boathouse

→ 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 seabed.

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**.

- Impact Phy-Mar-W-Temp-4: WTP discharge

→ Impact before mitigation

Water supply requirements during construction phase will logically lead to an increase in wastewater discharges. If discharges are made into the marine environment, it is necessary to know the extent of the plume. This area will then be used by the team in charge of marine biodiversity to determine its impact on marine flora and fauna.

Method used to assess the impact:

The extent, intensity and persistence of wastewater treatment plant (WTP) discharge plume 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 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 gradient density. The model used for the dispersion of WTP plume use the same grid as the current model and reuse the hydrodynamics results as input for the dispersion.

Hypothesis considered will be the same as those used for the Phy-Mar-Op-3 impact, which corresponds to the operation of the WTP at the operational stage. It is therefore assumed that WTP discharges during the construction phase will be lower than during the operational phase:

- 1 discharge located in the vicinity of the WWTP, near the boathouse;
- An average flow of 21.5 m3/d. This flow is smoothed over 24 hours. This implies the presence of a storage tank to act as a buffer

- The discharge will have a BOD5 concentration of 250mg/l. This is the maximum concentration permitted for discharge into the sea according to local regulations
- 14.5 days simulations to include one neap tide and one spring tide cycle;
- An unfavourable wind condition in terms of plume dilution: a light wind of 5.5m/s

The modelling shows that the concentration of BOD5 due to the WTP is between 1 and 2mg/l around the discharge. It is less than 1mg/l over the rest of the area. These concentrations are anecdotal due to the very low flow of the discharge. Indeed, a flow of 21.5m3/d corresponds to an average flow of 0.25l/s. This value is minimal compared to the volume of water into which the water is discharged, approximately 20m3 (volume of water included in the model mesh).

The main receptor affected by this action may be the seawater quality.

The impact severity is not significant Considering the receptor sensitivity assessed as high, **the impact magnitude is low**

- Impact Phy-Mar-W-Temp-5: Desalination plant discharge

→ Impact before mitigation

Water supply needs require the potabilization of water. The desalination process is studied in this impact study. This process makes it possible to supply drinking water by pumping salt water and discharging brine. In the event of discharge into the sea, the discharge of brine may have a significant impact on marine fauna and flora. This area will then be used by the team in charge of marine biodiversity to determine its impact on marine flora and fauna.

Method used to assess the impact:

The extent, intensity, and persistence of the discharge plume from the desalination plant are determined by numerical modelling with the Delft3D suite. This module simulates in 3 dimensions the propagation of the brine plume (heavier than the ambient water) according to the tidal and wind conditions encountered on site.

The characteristics of the brine discharge (flow rate and salinity) are deduced from the consumption of drinking water and from our experience with other installations. Thus, for a consumption of 21m3/d, rounded to 30m3/d, the daily flow rate discharged is equal to 120m3/d. By integrating a buffer tank, the smoothed hourly flow is equal to 5m3/h.

Modelling hypotheses are listed below:

- 1 discharge located in the vicinity of the desalination plant, near the boathouse;
- Ambient salinity : 35ppm
- Salinity of discharge: 40ppm
- Average flow of 5m3/h;
- 14.5 days simulations to include one neap tide and one spring tide cycle;
- Non-concomitance of the discharge with a 3 days delay;
- An unfavorable wind condition in terms of plume dilution: a light wind of 5.5m/s

The main receptor affected by this action may be the seawater quality.

The impact severity is not significant Considering the receptor sensitivity assessed as high, **the impact magnitude is low**

4.2.1.2 Hydrology

No temporary impact.

4.2.1.3 Geotechnics and Hydrogeology of the karstic system

- Earthworks in the new proposed runway area

The extent of earthworks has been presented in section 1.2.2.2 and the borrow areas/quarries presented in section 1.2.10, being the cut of Ste Marie Hill and Mont Travers, which is required to accommodate both the new runway and the ancillary facilities.

The cut material has been validated to be reused as engineering fill for the runway, and the Consulting Engineer GIBB (Mauritius) Lrd is in the process of running the model to balance cut and fill.

All unsuitable material would be as far as possible be spread under the Project footprint and topsoil reused in the graded strips for grass planting. Surplus of material is not expected to be carted away from the Project area which itself is about 1.2 million m2.

The cut will be undertaken hydraulically/mechanically; there shall be no blasting. The impacts towards the closest caverns to the project area: Grotte Fougère, Petit Lac, Cabris, Bouteille and Gastonia will be minimum.

The earthworks will generate vibrations

- Phy-Kar-W-Temp-1: Vibrations

→ 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**.

- Phy-Kar-W-Temp-2: Mass haul - Hauling equipment movement inducing vibration and noise pollutions

→ 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. The site levels 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 the 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**.

- Phy-Kar-W-Temp-3: Erosion/Groundwater ingress

→ 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 cut and embankment areas of the project.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

- Phy-Kar-W-Temp-4: Excavation Noise

→ Impact before mitigation

Conventional excavation techniques used during works phase will induce noise.

The impact severity is high. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium**.

- Phy-Kar-W-Temp-5: Cut and fill impacts – transport

The volumes of cut and fill required for the new runway and ancillary facilities will be high

→ Impact before mitigation

The transport associated thereto will be high:

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 high to major. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium the impact magnitude is high to major**.

4.2.1.4 Water resource and waste water management

- Impact Phy-Wat-W-Temp-1: impact of water resource due to work water supply

→ 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**.

- Impact Phy-Wat-W-Temp-2: impact of works on water resource due to impact on karstic groundwater

→ 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 Cavern 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 Cavern Bouteille desalination plant could be affected to.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

- Impact Phy-**Wat-W-Temp-**3: **impact of works waste water**

→ Impact before mitigation

The construction activities and processes and the workers living on the site during the works will generate wastewater which, if discharged into the natural environment without treatment, would cause unacceptable pollution. However, the existing water treatment system is not large and adequate enough to take this into account.

The impact severity is major. Considering the receptor sensitivity assessed as high, **the impact magnitude is major**.

- Impact Phy-Wat-W-Temp-4: Risks of accidental pollution

→ Impact before mitigation

Potential sources of accidental contamination are presented in section Geotechnics and Hydrogeology of the karstic system.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

- Impact Phy-Wat-W-Temp-5: Risks associated with the desalination plant

→ Impact before mitigation

The following are assumptions given that the location, type and specifications of the desalination plant are not clearly known to date.

Construction and operation activities could result in a variety of coastal zone impacts including impacts 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). The most significant of these impacts are to water quality, which subsequently has adverse impacts on marine life and ecosystems

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

4.2.2 Biological environment

4.2.2.1 Terrestrial habitats and flora

None.

4.2.2.2 Terrestrial fauna

- 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.

The impact severity is low. Considering the receptor sensitivity assessed as high, **the impact magnitude is low**.

4.2.2.3 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 at sea (runway and boat house) as well as release into the marine environment of pollutants (direct and indirect discharges into the lagoon) are the primary potential source of these potential impacts.

- Impact BioM-Hab-W-Temp-1: Effects of suspended matter and water turbidity

→ Impact before mitigation

Although all organisms are sensitive to high loads of suspended solids, whether direct impacts (degradation of branchial epithelia) or indirect (reduction of light penetration and therefore of photosynthesis), the hydrological measurements acquired during the April 2023 campaign, carried out under normal conditions at the end of the wet season (no heavy rain during the campaign), revealed very high turbidity values within and near Topaz Bay. We can therefore deduce a certain adaptation of ecosystems, in particular seaweed and seagrass beds, to high values of chronic turbidity. These values were maximum at the West side of the new runway.

Only the small fringing reef of the Mapou plain, whose benthic populations are composed mainly of corals of the Acropora muricata species, is moderately sensitive to an increase in the level of turbidity during the work phase. Indeed, although studies show a capacity for resistance to siltation in certain species of corals (Williams, 2001), this ability cannot be generalized to all species, in particular the genus Acropora, which are very sensitive to it. In addition, it is very likely that the mechanisms put in place weaken the organisms by monopolizing a significant part of their energy. In addition, by reducing the quality of available light (water turbidity), siltation leads to a reduction in the photosynthesis of zooxanthellae and consequently a reduction in the energy resources of the coral (Ogden, 1983). Organisms that can be satisfied with low light (non-coral sessile fauna: sponges, ascidians, gorgonians) can then be favoured (Williams, 2001).

Based on the latest marine biodiversity survey undertaken in April 2023, the following assessment is made

The exposure level (impact severity) of the fringing reef dominated by Acropora muricata of the Plaine Mapou can be considered as is major before reduction and its overall ecological sensitivity (receptor sensitivity) is assessed as medium. We can therefore consider that **the impact magnitude is high**

- Impact BioM-Hab-W-Temp-2: Effects of siltation and modification of the seabed

→ Impact before mitigation

According to the dispersion model, the fine sediment layer decanted from the pumping water from the airstrip formworks should concern only the entrance to Topaz Bay, characterized by a muddy substrate where only a few burrowing organisms (crustaceans and lugworms) were observed and considered to be of non-significant ecological sensitivity.

However, the model shows a limited deposit (>1mm) at the level of the fringing reef of the Mapou plain.

The impact severity is low, considering that the fringing reef is already exposed to a silting phenomenon (receptor sensitivity assessed as low), provides a **low impact magnitude.**

- Impact BioM-Hab-W-Temp-3: Effects of wastewater treatment plant and desalination plant discharge

→ Impact before mitigation

Although the discharge water from a wastewater treatment plant and the brine from a desalination plant can have very significant impacts on biological populations, the very low discharge volumes from the facilities envisaged under this project and the rapid dilution of the plumes within a radius of a few tens of meters tend to minimize this risk of impact. Indeed, the communities located within a radius of 1km around the supposed discharge point of the facilities (near the new boatway) have a very low ecological sensitivity

The impact severity within a radius of a few tens of meters can be estimated as is high, but the sensitivity of the ecosystems concerned is estimated as very low, In this context, the magnitude of the impact can be estimated as **low**

4.2.2.4 Marine species

- Impact BioM-Spe-W-Temp -1: Impact on sea turtles

→ Impact before mitigation

Still on the basis of the hypothesis of work carried out on land (therefore without risk of collision with the megafauna in the marine environment), the main pressures likely to disturb sea turtles, both in feeding and in reproduction, are noise and light pollutions, mainly at night.

In the event of carrying out certain stages of construction at night, the proximity (less than 500m) of the egg-laying site of the Crabs Island must be the subject of specific measures in order to avoid any temporary or permanent abandonment by female turtle populations.

The great particularity of sea turtles lies in their exceptional sense of direction. During their lifetime, these species frequent very different environments (growth and development areas, feeding sites, egg-laying beaches), sometimes several thousand kilometres apart, which they reach cyclically during major migrations.

This sense of orientation is related to a multifactorial coupling involving several senses, including sight, particularly during impregnation with site fidelity (homing) and orientation during juvenile emergence and the first course towards the ocean (Claro and Bardonnet, 2011). Disturbance of these senses by coastal developments, nocturnal frequentation of egg-laying sites by visitors or domestic animals can profoundly frighten and disorient turtles, both during emergence, egg-laying climbs and in a few observation situations. tens of meters offshore, during their active search for spawning sites

Thus, if the severity of the impact is to be defined as medium, sea turtles can be considered as highly sensitive to light disturbances (receptor sensitivity). The impact magnitude will therefore depend on whether or not the night work phases are carried out; it is arbitrary set as **medium.**

- Impact BioM-Spe-W-Temp -2: Impact on marine mammals

→ Impact before mitigation

The potential impacts of the project on marine mammals are similar to those of marine turtles. Only the Indo-Pacific bottlenose dolphin is likely to be affected, as it is a coastal and sedentary species, possibly isolated from other populations. Acoustic impacts may affect this species, but it is more commonly found in coastal waters along the outer slope of the lagoon and only occasionally enters Baie Topaze, with no long-term residency proven in the area. Research on this species at the Mascarene scale is ongoing.

Marine mammals were assessed as being of low sensitivity due to their low attendance at the study site which is too shallow (impact severity is low). Thus, although they can also be disturbed by noise and light pollution, especially at night, the impact magnitude on marine mammals can be considered as **low**

4.2.3 TRANSPORT NETWORK, ELECTRICITY SUPPLY AND WASTE MANAGEMENT

4.2.3.1 Transport network

- Impact Trspt-W-Temp-1: Impact on the transport network

→ Impact before mitigation

Road

Following discussions with the Client, it was communicated to the Consultant that that amongst the several materials to be imported, an estimate of the main ones for the permanent works are:

- Bitumen: 10,000T
- Cement: 12,000T
- Reinforcement bars:1,000T

For naturally occurring materials as well as crushed materials, it is understood that the materials will be sourced mainly from the excavation/demolition of Mt Travers and Ste Marie area. The runway levels will be designed taking into consideration the optimisation of cut and fill volumes i.e. balancing of earthworks.

Materials to be imported will be mainly cement, bitumen and others for building works. Thus no trips originating outside of the site will be applicable and not considered in the traffic impact modelling

The Client has furthermore estimated that a labour work force of about 450 will be required. The Project duration is 27 months and 24 months defects liability period. It is expected that about 70% of the labour will be local, Mauritius and Rodrigues and 30 % expatriates.

During the works phase, the road network will be affected by:

The imported volumes from the port (23,000 tonnes) result in a relatively low average heavy traffic (3 trucks/day/direction), which is equivalent to 6 trucks/day/two directions, given the following assumptions:

- Average payload of a truck = 20 ≈ 25 tonnes
- Duration of transport for the imported materials = 20 months (out of 27 months of work) x 25 days/month = 500 days.

In terms of transportation for the workers, who will total 450 individuals, with at least 70% - 80% being Mauritians, it is proposed to implement a daily pickup system using shuttle buses as a replacement for collective transportation. This will require either 12 buses with 30 seats or 7 buses with 50 seats per day to transport the workers from a designated pickup point to the construction site. The pickup point location is yet to be defined.

The impact of the above trips on the baseline traffic is being modelled in the VISUM and VISSIM simulation program and will be finalized and the conclusions provided by the 15 April 2023.

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**.

4.2.3.2 Electricity supply

- Impact Elec-W-Temp-1: Impact on electricity supply

→ 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**.

4.2.3.3 Solid waste management

- Impact Sol-Wst-W-Temp-1: Impact on the solid waste management

→ Impact before mitigation

The construction phase will generate the following types of solid waste during construction stage

- demolition waste;
- construction waste, and
- general waste

This waste will have to be managed on site and/or carted away to an approved site, considering the options available in Rodrigues (refer to section 2.5.4)

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

4.2.4 SOCIO-ECONOMIC ENVIRONMENT

4.2.4.1 Impacts on demographics and social dynamics

- 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

→ 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**.

- 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

→ 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**.

- 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

→ Impact before mitigation

Recruiting workers for the construction of the Plaine Corail airport may cause social tensions if the hiring conditions are not clearly communicated to the local people who are expecting employment opportunities. The communities in the affected area are sensitive about being included in recruitment measures, and conflicts and rejection may arise. Therefore, it is essential to consider the inhabitants of the towns in the project's perimeter to minimize social tensions among the communities towards the project.

The impact severity is low. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

- 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

→ 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**.

→ 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 the ESMP report)
- Communication plan for the integration of external workers.

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**

4.2.4.2 Impacts on the health and safety of the communities

- 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

→ Impact before mitigation

The construction of airport infrastructures requires the use of specific construction equipment and vehicles that increase the risk of accidents on main roads. The nearby village communities, people who use the area, and their cattle are all at risk, with children being particularly vulnerable. This impact is considered significant due to the unique vulnerability of the affected population.

Note : The risks and impacts associated with traffic may need to be further assessed once the contractor has been appointed and the number of trips to transport equipment, the types of vehicles that will be used and the exact route, have been confirmed. Any additional mitigation measures will need to be reflected in the traffic management plan to be prepared by the contractor.

The impact severity is major. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

- 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

→ Impact before mitigation

Construction work and traffic can generate a large amount of dust that can cause respiratory problems for people living in the surrounding areas. The nearby villages are most vulnerable to this impact, although some residents of Plaine Corail do not consider it to be significant.

This low-magnitude adverse impact 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**.

4.2.4.3 Impacts on the health and safety of workers

- Impact SE-Wor-W-Temp-1: Increased risk of accidents and illnesses

Source of the impact: Demanding nature of the construction work

→ Impact before mitigation

The construction of airport infrastructures involves hiring workers for difficult, demanding, or dangerous tasks, which increases the risk of work-related accidents and illnesses. The impact is significant and affects workers from nearby communities, making it an important issue.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

4.2.5 AIR QUALITY AND NOISE

4.2.5.1 Air quality

- Impact Air-W-Temp-1: Alteration of air quality due to construction activities

→ Impact before mitigation

The construction phase of the airport project could potentially generate dust and air pollution due to earthworks, infrastructure construction, and demolition activities. The transportation of supplies by road could also contribute to increased emissions. The sensitivity to dust and air pollution in the area is high, with several households located within 1000m of the work area. The impact on air quality cannot be quantified at this stage, but it is expected to result in increased levels of pollutants such as CO, HC, NOx, and particulate matter, as well as reduced visibility in the immediate vicinity of the construction site.

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**.

4.2.5.2 Noise

- Impact Noi-W-Temp-1: nuisance caused by noise due du construction activities

→ Impact before mitigation

During the construction phase, the project plans to create a quarry at Mont Travers to transport materials for the future runway. In addition to the noise from the quarry, trucks will be used to transport the materials. The houses in the surrounding area are likely to be impacted.

Short -term measurements were carried out in March 2023 to determine the current noise environment.

- PR5: LAeq 30min= 61.0 dB(A); L50= 50.5 dB(A).
- PR6: LAeq 30 min= 50.5 dB(A); L50 =45.0 dB(A).

Due to the meteorological conditions (strong and gusty wind), the L50 is more representative of the actual noise level. Currently, the main sources of noise are aircraft arrivals and departures and the environment.

The expected heavy vehicle traffic is not known, so we were not able to model the impact of the construction site on the surrounding dwellings.

Noise levels prescribed in the legislation must not be exceeded at the houses during works.

It is recommended that measurements be taken during the works to check that these levels are respected

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**.

4.2.6 HERITAGE RESOURCES AND VISUAL ENVIRONMENT

4.2.6.1 Palaeontology

None.

4.2.6.2 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 adverse or 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.

- Impact Vis-W-Temp-1: alteration of the living environment

→ 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.**

- Impact Vis-W-Temp-2: increasing pressure on island landscape

→ 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 completely defined. 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**.

4.3 PERMANENT AND IRREVERSIBLE IMPACTS DURING CONSTRUCTION PHASE

4.3.1 PHYSICAL ENVIRONMENT

4.3.1.1 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.

- Impact Phy-Mar-W-Def-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 interspersed with a few sandy beaches.

The impact severity is low. Considering the receptor sensitivity assessed as medium, **the impact magnitude is low**.

- Impact Phy-Mar-W-Def-2

→ 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.

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**.

- Impact Phy-Mar-W-Def-3: Modification of the sediment transit

→ 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 deposit 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 4-3 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 4-3: 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 Baie Topaze. 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.

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**.

- Impact Phy-Mar-W-Def-4: Modification of the bathymetry due to the dredging to access jetty facilities

→ 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**.

- Impact Phy-Mar-W-Def-5: Remains of suspended particulate matter and sediment

→ 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**.

4.3.1.2 Hydrology

- Impact Phy-Hyd-W-Def-1: Transfer of sediments to the lagoon

→ 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**.

4.3.1.3 Geotechnics and Hydrogeology

- Impact Phy-Kar-W-Def-1: Caverns collapse

→ 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**.

- Impact Phy-Kar-W-Def-2: Damage to caves

→ 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**.

- Impact Phy-Kar-W-Def-3: Groundwater flow disturbances

→ 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**.

- Impact Phy-Kar-W-Def-4: Pollution of groundwater

→ 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 4.2.1.4 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**.

- Impact Phy-Kar-W-Def-5: Cut and fill balance impacts

→ Impact before mitigation

The potential impacts of import of fill material are associated with the material extraction on the quarries site: Ste Marie Hill and Mont Topaze .

The permanent potential impacts of material are:

- at the extraction site: biodiversity destruction, water flows disturbance, slopes modification and associated risks, on site pollution (extraction works), landscape impacts,

at the works area: import of pollutants or alien invasive species seeds risk.

The potential impacts of excess of material are associated to its final point of disposal/reuse (within the project footprint as understood): 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 severity is medium. Considering the receptor sensitivity assessed as medium, **the impact magnitude is medium**.

4.3.1.4 Water resource and waste water management

- Impact Phy-Wat-W-Def-1: Demolition of Bangelique reservoir

→ 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 reservior is no longer in use.

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

- Impact Phy-Wat-W-Def-2: impact of works on water resource supply

→ Impact before mitigation

The temporary impacts identified on the groundwater resource (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 rate.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

4.3.2 BIOLOGICAL ENVIRONMENT

4.3.2.1 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, 77 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.

- Impact BioT-Hab-W-Def-1: Impact on Grazing lands on basaltic resurgences

→ 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	5.9	1.5 (25%)

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**.

- Impact BioT-Hab-W-Def-2: Impact on Grazing lands on calcarenic substratum

→ 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	67.1	35,3 (53%)

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**.

- Impact BioT-Hab-W-Def-3: Impact on Coastal vegetation dominated by Ipomoea pes caprae

→ 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	10,9	1,5 (14%)

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**.

- Impact BioT-Hab-W-Def-4: Impact on Anthropized areas

→ 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	73,2	11,9 (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 low, **the impact magnitude is low**.

- Impact BioT-Hab-W-Def-5: Impact on Grazing lands on Dry forest

→ 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	16,7	0 (endemic species in the initial footprint)

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**.

- Impact BioT-Hab-W-Def-6: Impact on grazing lands on riparian vegetation

→ 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	1,1	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**.

- Impact BioT-Hab-W-Def-7: Impact on grazing lands on estuarine habitat

→ 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	8,2	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**.

- Impact BioT-Hab-W-Def-8: Impact on grazing lands on calcarenic dry lawns of anthropogenic origin

→ 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	2,2	1.5 (70%)

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.**

- Impact BioT-Hab-W-Def-9: Impact on coastal grasslands dominated by secondarized thickets (Lantana camara)

→ Impact before mitigation

The different areas which are concerned by the project are detailed in the table 4-4 below.

Table 4-4: Coastal grasslands Figures

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)	24,6	13,9 (56%)

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is medium. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

- Impact BioT-Hab-W-Def-10: Impact on secondarized thickets (Leucaena leucocephala)

→ Impact before mitigation

The different areas which are concerned by the project are detailed in the table 4-5 below.

Table 4-5: Secondarized thickets figures

Items	Area/number of specimens inside the area of influence (ha)	Area/number of specimens inside the project footprint (ha)
Secondarized thickets (Leucaena leucocephala)	23,7	11,4 (48%)

The impact is the loss of semi-natural vegetation and some ecosystem functions.

The impact severity is medium. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

4.3.2.2 Terrestrial flora

A total of 2 specimens of major sensitivity, 42 specimens of high sensitivity and 4 specimens of medium sensitivity are expected to be destroyed by the project: see table below.

Amongst low sensitivity species, one requires 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 (155 individuals out of 293 censored in total within the area of influence). The total population in Rodrigues is estimated at between 500 and 1000 individuals and the species are present in almost all valleys of the island along the coast.

Table 4-6. Number of native flora specimens destroyed by the project

Flora species	Sensitivity				Total
	Major	High	Medium	Low	
Foetidia rodriguesiana	2				2
Diospyros diversifolia		1			1
Adiantum rhizophorum		1			1
Terminalia bentzoe subsp. rodriguesensis		1			1
Pandanus heterocarpus		39			39
Nephrolepis biserrata			3		3
Phyllanthus dumentosus			1		1
Elaeodendron orientale				155	155
Total	**2**	**42**	**4**	**155**	**203**

Direct destruction of these species implies an overall impact magnitude assessed to high level.

Detailed impact sensitivity and magnitude are exposed below.

- Impact BioT-Flo-W-Def-1: Impact on native species with a major sensitivity

→ Impact before mitigation

The species and the number of specimens inside the project is detailed in the table 4-7 below.

Table 4-7: Native species of major sensitivity and figures

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the initial / final project footprint	Comments
Foetidia rodriguesiana	3	**2 / 2**	50 to 100 specimens in the wild or ex-situ collections
Hyophorbe verschaffeltii	43	**7 / 0**	Impacted specimens are known to be of domestic origin
Latania verschaffeltii	10	0 / 0	/
Polyscias rodriguesiana	7	0 / 0	/

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**.

- Impact BioT-Flo-W-Def-2: Impact on native species with a high sensitivity

→ Impact before mitigation

The species and the number of specimens inside the project is detailed in the table 4-8 below.

Table 4-8: Native species of high sensitivity and figures

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the initial / final project footprint	Comments
Diospyros diversifolia	1	**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. The main threats to them are development, grazing, low regeneration.
Terminalia bentzoe subsp. Rodriguesensis	28	**1 / (1)**	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. The main threats to them are development, grazing, hybridization with T.b. bentzoe from Mauritius.
Antirhea bifurcata	1	**1 / 0**	Has become very rare in Rodrigues
Adiantum rhizophorum	1	**1 / 1**	Ferns locally protected

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the initial / final project footprint	Comments
Sarcanthemum coronopus	37	**1 / 0**	/
Phyllanthus dumentosus	2	**1 / 1**	It has become very rare. The information obtained from wildlife indicates that the species is locally common (> 1000 plants). The main threat to them is the development of Port Mathurin.
Mathurina penduliflora	5	**0 / 0**	/
Pleurostylia putamen	17	**0 / 0**	/
Pandanus heterocarpus	69	**25 / 39**	/
Zanthoxylum paniculatum	1	0	/
Clerodendrum laciniatum	3	0	/
Fernelia buxifolia	2	**1 / 0**	/

The impact is the loss of native trees of a major sensitivity for the island of Rodrigues.

The impact severity is high. Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

- Impact BioT-Flo-W-Def-3: Impact on native species with a medium sensitivity

→ Impact before mitigation

The species and the number of specimens inside the project is detailed in the table 4-9 below.

Table 4-9: Native species of medium sensitivity and figures

Sub items	Area/number of specimens inside the area of influence	Area/number of specimens inside the initial / final project footprint	Comments
Phyllanthus dumentosus	2	**1 / 1**	It has become very rare. The information obtained from wildlife indicates that the species is locally common (> 1000 plants). The main threat to them is the development of Port Mathurin
Camptocarpus sphenophyllus	-	-	/
Secamone rodriguesiana	2	**-**	/
Nephrolepis biserrata	5*	**1 / 3***	Ferns locally protected
Phymatosorus scolopendria	2*	**1 / 1***	Ferns locally protected

*refers to non-exhaustive counts

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**.

- Impact BioT-Flo-W-Def-4: Impact on native species with a low sensitivity

→ Impact before mitigation

The species and the number of specimens inside the project is detailed in the table 4-10 below.

Table 4-10: Native species of low sensitivity and figures

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: 8 species (in red, species expected to be impacted by the project)	*Dodonaea viscosa, Dracaena reflexa, Elaeodendron orientale, Ficus reflexa, Ficus rubra, Premna serratifolia, Thespesia populnea, Cynanchum viminale*	293*	155*	Some of these species will be massively destroyed by the project and are locally protected (Eleodendron orientale). 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.

*refers to non-exhaustive counts

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**.

4.3.2.3 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 based on the specialist report. 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.

- Impact BioT-Fau-W-Def-1: Impact on *Pteropus rodricensis (Chiroptera)*

→ 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 ha but will not be challenged by the project.

The impact is the loss of semi-natural vegetation and some ecosystem functions.

Regarding the risk of collision with aircraft, moving the runway further south takes it away from the reserve and reduces the risk.

The impact severity is low. Considering the receptor sensitivity assessed as high, the impact magnitude is low.

- Impact BioT-Fau-W-Def-2: Impact on Tropidophora ssp & Omphalotropis ssp (Gastropoda)

→ Impact before mitigation

For this species, the number of specimens inside the area of influence is relatively small and subservient to the Reserve (considered as null inside the project footprint). The impact could be the loss of native gasteropoda individuals and their foraging habitat. However, only empty shells were found on the project footprint.

The impact severity is low. Considering the receptor sensitivity assessed as major, **the impact magnitude is medium**.

- Impact BioT-Fau-W-Def-3: Impact on Lygodactylus lugubris (Reptilia)

→ 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).

The impact severity is low. Considering the receptor sensitivity assessed as low, **the impact magnitude is low**.

4.3.2.4 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 (hydro-sedimentary 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.

- Impact BioM-Hab-W-Def-1: Effect of alteration of the local bathymetry and shoreline

→ Impact before mitigation

Although the vast majority of the project footprint is located on land, extensions will also be carried out on the maritime domain (intertidal zone).

The impacts concern the permanent cover of 1.4ha of sublittoral rocks dominated by Ochrophyta, 0,8ha of algae bed dominated by Rhodophyta and 0.10ha of muddy bay, these three habitats being of very low ecological sensitivity. To these definitively covered surfaces can be added the 50m wide buffers, which represent 5.7ha of mixed algae bed and muddy bay, subject to temporary pressures (risk of mechanical damage during the works).

The impact severity is major but the sensitivity of the ecosystem is assessed as very low. The magnitude of the impact before reduction is therefore **medium**.

- Impact BioM-Hab-W-Def-2: Effect of modification of the sediment transit

→ 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 was constructed and exploited to identify deposit/erosion areas and sediment movement pattern in general

The results of the sediment deposition and erosion model around the sea dykes of the new airstrip show a main effect at the east end of the airstrip, marked mainly by erosion that can reach several centimetres. However, this erosion will probably not take place, given the hard nature of the substrate in the places considered (sublittoral rock).

At the other end of the airstrip, the bathymetric modifications will be more erratic (mixture of erosion and deposition) and less extensive (more or less a few centimetres in height). They will concern a soft sandy-muddy substrate, dominated by an assemblage of Rhodophyta of very low ecological sensitivity. It is also likely that the algal cover naturally attenuates sedimentary movements at this place.

Due to the very low sensitivity of the ecosystems concerned and the not significant impact severity, the impact magnitude can be considered Negligible.

4.3.2.5 Marine species

The main potential impact on marine species in the marine works phase is the destruction of marine species.

- Impact BioM-Spe-W-Def-1: marine turtles

→ Impact before mitigation

As with the estimation of temporary impacts, the level of exposure of sea turtles to noise and light pollution will depend on the final design of the project, which remains to be defined. However, it will depend on whether or not the night work phase is carried out. In the extreme and unlikely case of high intensity nocturnal nuisances (sound and light), prolonged over a long period (extension of the works within the framework of administrative derogations), the nesting site of the Crabs Island could be permanently abandoned (maybe not definitively, but over several years). Further assessments may be required, once the construction methodology has been defined. The contractor will be required to address any additional impacts associated with the construction approach as part of the contractors management plans.

If the severity of the impact is to be defined, sea turtles can be considered as highly sensitive to light disturbances. The impact magnitude will therefore depend on whether or not the night work phases are carried out

- Impact BioM-Spe-W-Def-2: marine mammals

→ Impact before mitigation

Marine mammals were assessed as being of low sensitivity due to their low attendance at the study site (too shallow depths). Thus, although they can also be disturbed by noise and light pollution, especially at night, the impact magnitude on marine mammals can be considered as Low.

4.3.3 TRANSPORT NETWORK, ELECTRICITY SUPPLY AND WASTE MANAGEMENT

No permanent and irreversible impacts during Construction Phase.

4.3.4 SOCIO-ECONOMIC ENVIRONMENT

4.3.4.1 Impacts on demographics and social dynamics

- 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

→ 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 organization 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**.

- 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

→ 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**.

4.3.4.2 Impacts on land

- 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

→ 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**.

4.3.4.3 Impacts on agriculture and livestock

- 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

→ 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**.

- Impact SE-Agri-W-Def-2: Loss of perennial crops

Source of the impact: Construction of the runway and airport infrastructures

→ 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**.

4.3.4.4 Impacts on fishing

- 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

→ 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. Additionally, this will impact the income generating activities of women of the village called Dans Coco, who buy fish at the fish landing station to transform and sell it in the city. The displacement of the fisheries to a locality that is less accessible and more costly to reach will disbalance their livelihood. The number of affected women will have to be defined in the Livelihood Restoration Plan.

The impact severity is major. Considering the receptor sensitivity assessed as major, **the impact magnitude is major**.

- Impact SE-Fish-W-Def-2: Loss of fishing infrastructures

Source of the impact: Construction of the runway and airport infrastructures

→ 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**.

- 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

→ 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**.

4.3.4.5 Impacts on community mobility

- 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

→ 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.**

4.3.5 Air quality and noise

None.

4.3.6 Heritage resources and visual environment

4.3.6.1 Palaeontology

Impacts and measures on palaeontology are associated and therefore addressed in the karst chapter 5.2.1.3 Geotechnics and Hydrogeology.

4.3.6.2 Landscape and visual environment

- Impact Vis-W-Def-1: alteration of the living environment

→ 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**.

- Impact Vis-W-Def-2: increasing pressure on island landscape

→ 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**.

4.4 IMPACTS DURING OPERATION PHASE

The project aims to enable Rodrigues Island to develop tourism and aerial cargo. Tourism development might have significant impacts on the environment.

However, this ESIA only aims to address the impacts of the infrastructure. Thus, the socio-economic development and changes that could be expected due to the 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.

4.4.1 PHYSICAL ENVIRONMENT

4.4.1.1 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.

- Impact Phy-Mar-Op-1: Accidental spillage

→ 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**.

- Impact Phy-Mar-Op-2: Uncontrolled waste water discharges

→ 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**.

- Impact Phy-Mar-Op-3: WTP discharge

→ Impact before mitigation

Water supply needs during operation phase will logically lead to an increase in wastewater discharges. If discharges are made into the marine environment, it is necessary to know the extent of the plume. This area will then be used by the team in charge of marine biodiversity to determine its impact on marine flora and fauna.

Method used to assess the impact:

The modelling assumptions are the same as those used for the impact Phy-Mar-W-Temp-4, with the same results .

The main receptor affected by this action may be the seawater quality.

The impact severity is not significant. Considering the receptor sensitivity assessed as high, **the impact magnitude is** low

- Impact Phy- Mar-Op-4: Desalination plant discharge

→ Impact before mitigation

Water supply requirements during operation phase require the potabilization of water. The desalination process is studied in this impact study. This process makes it possible to supply drinking water by pumping salt water and discharging brine. In the event of discharge into the sea, the discharge of brine may have a significant impact on marine fauna and flora. This area will then be used by the team in charge of marine biodiversity to determine its impact on marine flora and fauna.

Method used to assess the impact:

The modelling assumptions are the same as those used for the impact Phy-Mar-W-Temp-5, with the same results.

The main receptor affected by this action may be the seawater quality.

The impact severity is not significant. Considering the receptor sensitivity assessed as high, **the impact magnitude is** low.

- Impact Phy- Mar-Op-5: Stormwater drainage

→ Impact before mitigation

The implementation of the new runway will alter stormwater runoff and may increase freshwater input to some coastal areas. The magnitude of these potential freshwater plumes needs to be modelled to estimate their impact on marine life. This area will then be used by the team in charge of marine biodiversity to determine its impact on marine flora and fauna.

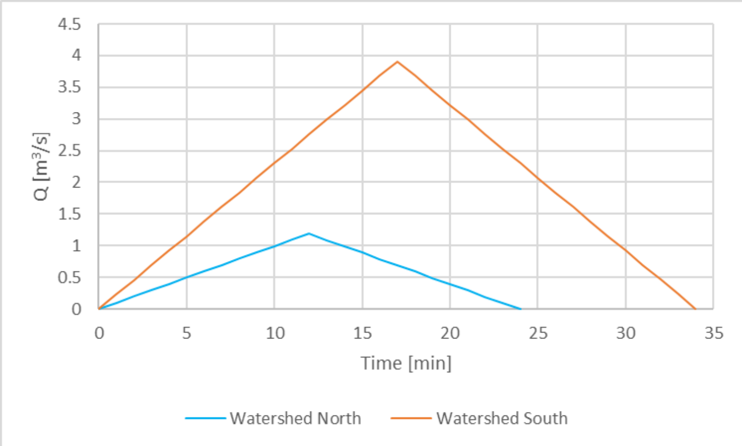
Method used to assess the impact:

The extent, intensity and persistence of storm water drainage plume are determined by numerical modelling of hydrodynamics with the Delft3D suite. This module simulates in 3 dimensions the propagation of the freshwater plume (lighter than the ambient water) in function of the tidal and wind conditions encountered on site.

The characteristics of the freshwater discharge (flow rate and duration) are calculated from the precipitation assumptions in our possession. The 2-year return period is used to identify the frequent impact of the development on the salinity of the water.

The modelled hydrographs are shown below

Figure 4-1: Hydrographs imposed on watersheds



Modelling assumptions are listed below:

- 2 discharges:
- 1 discharge located in the north of the new runway, near the boathouse;
- 1 discharge located in the south of the new runway.
- Ambient salinity: 35ppm
- Flow and duration extracted from previous hydrographs
- Two simulations, one incorporating a discharge during the flood and the other during the ebb;
- 4 days simulations;
- An unfavourable wind condition in terms of plume dilution: a light wind of 5.5m/s ((A strong wind allows a strong dilution of the plume, thus strongly limiting its impact. Medium wind conditions and not the strong winds that can be associated with a cyclone are therefore chosen in order to remain in an unfavourable situation, limiting the dilution of the plume and increasing its concentration).

The plumes resulting from the discharges to the north and south are relatively small and remain close to the point of discharge. The freshwater plume does not reach the various islands in the vicinity. The discharge to the south, with the highest flows, generates the most extensive plume. Its location in a relatively confined area following the construction of the new runway contributes to limiting its dilution and thus increasing the concentration of freshwater. The discharge to the north, which is more exposed to currents and has lower flows, generates a very small plume.

The main receptor affected by this action may be the seawater salinity.

The impact severity is medium. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium** .

4.4.1.2 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 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.

- Impact Phy-Hyd-Op-1: Stormwater management

→ 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**.

- Impact Phy-Hyd-Op-2: Flooding of issues downstream of airport facilities

→ 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**.

- Impact Phy-Hyd-Op-3: Transfer of pollution to the natural environment

→ 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**.

- Impact Phy-Hyd-Op-4: Transfer of sediments to the lagoon

→ 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**.

4.4.1.3 Geotechnics and Hydrogeology

- Impact Phy-Kar-Op-1: Collapse / Erosion

→ 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.
- Phy-Kar-Op-2: Access to caves

→ 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**.

→ Phy-Kar-Op-3: Pollution of groundwater

→ Impact before mitigation

Potential impacts on groundwater contamination have been addressed in sections 5.1.1.3 Geotechnics and Hydrogeology of the karstic system, 5.1.1.4 Water resource and wastewater management, 5.2.1.3 Geotechnics and Hydrogeology and 5.2.1.4 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**.

4.4.1.4 Water resource and domestic wastewater

- Impacts Phy-Wat-Op-1 and Phy-Wat-Op-2 associated to stormwater drainage

→ 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**.

- Impact Phy-Wat-Op-3 associated to the waste water management

→ Impact before mitigation

This project of a new runway, at the Preliminary Design stage, includes a new sewer network associated with a Wastewater 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**.

- Impact Phy-Wat-Op-4 : Water supply management

→ 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**.

4.4.2 Biological environment

4.4.2.1 Terrestrial biodiversity

None.

4.4.2.2 Marine habitats

- Impact BioM-Hab-Op-1: Effect of accidental spillage

→ 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.

Without being able to really estimate the risk of occurrence of a major accident during the operation phase of the airport, without specific measures, this accident would have a major intensity (spill in the marine environment). Despite the absence of sensitive ecosystems within a radius of 1km around the footprint of the future airstrip, hydrocarbons, by nature lighter than water, can spread over very large areas, in the form of fine impermeable pellicles on the surface of the ocean and reach the most sensitive ecosystems, located approximately 1 km from the study site.

In this context, the impact severity is major and the ecological sensitivity medium, resulting in a High impact magnitude

- Impact BioM-Hab-Op-2: Effects of wastewater treatment plant and desalination plant discharge

→ Impact before mitigation

In the absence of technical data on the load capacities and abatement levels of the primary treatment of the Sewer Treatment Plant (septic tank), no dispersion model specific to this permanent installation could be provided.

Thus, in order to estimate the severity of the impact generated during the operating phase by the two facilities:

- The Sewer Treatment Plant
- The Potable Water Supply

We started from the hypothesis of a conservation of the technical characteristics of the WWTP and the desalination plant deployed during the works phases.

In the probable hypothesis of a significant extension of these facilities in the medium term, in order to meet the operating needs of the new airstrip in the long term, a specific impact study will have to be programmed, on the basis of the already made biological inventories

Although the discharge water from a wastewater treatment plant and the brine from a desalination plant can have very significant impacts on biological populations, the very low discharge volumes from the facilities envisaged under this project and the rapid dilution of the plumes within a radius of a few tens of meters tend to minimize this risk of impact. Indeed, the communities located within a radius of 1km around the supposed discharge point of the facilities (near the new boathouse) have a very low ecological sensitivity.

The severity of the impact within a radius of a few tens of meters can be estimated as high, but the sensitivity of the ecosystems concerned is estimated as very low. In this context, **the magnitude of the impact can be estimated as Low**.

- Impact BioM-Hab-Op-3: Effects of stormwater drainage

→ Impact before mitigation

The implementation of the new airstrip will alter stormwater runoff and may increase freshwater input to some coastal areas. The magnitude of these potential freshwater plumes has been modelled to estimate their impact on marine life. The extent, intensity and persistence of stormwater drainage plume are determined by hydrodynamic and quality numerical models under main hydrodynamic condition (SETEC, 2023).

It should be noted that stormwater runoff also occurs today, before the construction of the new airstrip. However, this will generate a waterproofing which will result in an increase in the phenomenon of runoff. It can therefore be considered that the severity of the stormwater impact only concerns the part that would have been infiltrated by the ground without the airstrip, which represents a lesser severity than that of the model.

It is also important to specify that runoff water will pass through settling ponds and will be treated for the recovery of hydrocarbons leached on the impermeable surfaces of the airstrip ("Specialist Report for Water Management"). The water discharged into the sea will therefore be depolluted, on the assumption that the stormwater treatment facilities will operate optimally.

The stormwater drainage discharge points, located at both ends of the new airstrip, will produce desalinated plumes in stormy weather subject to the general current. Their small surface area and their confinement close to the coast are in favour of a low severity impact. In addition, the habitats located in front of the discharge points (Algae bed dominated by Rhodophyta - D1 and Sublittoral rocks dominated by Ochrophyta - D2) have a very low ecological sensitivity, in particular to haline anomalies, these ecosystems being located in intertidal zone. **The magnitude of the impact can be considered Low**.

4.4.2.3 Marine species

- Impact BioM-Spe-Op-1: marine turtles

→ Impact before mitigation

As with the estimation of temporary impacts, the level of exposure of sea turtles to noise and light pollution will depend on the final design of the project. The impact on marine species may therefore need to be reassessed once the design has been finalized as part of the finalization of the ESIA. In the extreme and unlikely case of high intensity nocturnal nuisances (sound and light), prolonged over a long, the nesting site of the Crabs Island could be permanently abandoned (maybe not definitively, but over several years).

If the severity of the impact is to be defined, sea turtles can be considered as highly sensitive to light disturbances. The impact magnitude will therefore depend on night activity of the airport

- Impact BioM-Spe-Op-2: marine mammals

→ Impact before mitigation

Marine mammals were assessed as being of low sensitivity due to their low attendance at the study site (too shallow depths). Thus, although they can also be disturbed by noise and light pollution, especially at night, the impact magnitude on marine mammals can be considered as Low.

4.4.3 TRANSPORT NETWORK, ELECTRICITY SUPPLY AND WASTE MANAGEMENT

4.4.3.1 Transport network

- Trspt-Op-1: Impact on the transport network

→ 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**.

4.4.3.2 Electricity supply

- Impact Elect-Op-1: Impact on electricity supply

→ 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**.

4.4.3.3 Solid waste management

- Impact Sol-Wst-Op-1: Impact on the solid waste

→ 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**.

4.4.4 Socio-economic environment

4.4.4.1 Impacts on power, governance and civil society

Source of the impact: Launching local development initiatives

4.4.4.2 Impacts on land

- 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

→ 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**.

- Impact SE-Land-Op-2: Evolution of land management procedures

Source of the impact: Involuntary displacement of the populations affected by the project

→ 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**.

4.4.4.3 Impacts on agriculture and livestock

- Impact SE-Agri-Op-2: Need to regenerate the farmland

Source of the impact: Involuntary displacement of the populations affected by the project.

→ 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**.

-
- Impact SE-Agri-Op-3: Decrease in livestock breeding activity

Source of the impact: Involuntary displacement of the populations affected by the project.

→ 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**.

4.4.4.4 Impacts on the living environment and landscape

- Impact SE-Liv-Op-1: Noise and sound pollution

Source of the impact: Construction of the runway and airport infrastructures

→ 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**.

4.4.4.5 Induced impacts

The project will have induced impacts which are the result of potential impacts identified during project implementation. The expansion of the airport runway will impact communities engaged in agriculture and livestock breeding. Displacement of these populations will lead to changes in their farming practices, which can be mitigated through support measures by relevant regional commissions. The proposed policy of sustainable development through ecological preservation initiatives will shape the agricultural landscape of the island. To cope with potential pressure on pasture surfaces, agro-ecology techniques are 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.

4.4.5 AIR QUALITY AND NOISE

4.4.5.1 Air quality

- Impact Air-Op-1: Deterioration of air quality due to increased airport capacity

→ Impact before mitigation

Emissions of pollutant: aircrafts. 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.

Results are as follows for horizon 2046

Air traffic emission	Fuel burnt	NOx	CO2, Sox, H2O,	CO, HC, acetaldehide Acrolein, 16-PAH, 7-PAH, Styrene, 1.3 butadinene, formaldehyde, propianaldehyde, toluene, benzene, ethylbenzene, xylene	PM total
2046 initial (without project) from 2022 baseline	+83%	+83%	+83%	+83%	+83%
2046 with project from 2046 initial	-9%	+151%	-9%	-99%	-50%

Emissions of pollutants: road traffic. The emissions due to road traffic have been calculated from the road traffic data provided on the roads shown in the map below.

The emissions have been calculated for these scenarios :

- Commissioning horizon (2026)
  o Without the project (initial configuration) and with the project (project configuration)
- Commissioning horizon + 20 years (2046)
  o Without the project (initial configuration) and with the project (project configuration)

The road traffic is not increasing that much. We can observe an increase of the vehicules.km driven of 0.1% on 2026 and 2046.

The calculations show that there is an increase of pollutant emissions of 0.2% for all pollutants except for the benzene, nickel and arsenic for which no change is noted. The project has no significant impact on air quality emissions.

Modelled air ambient concentrations. the modelling presented in the specialist report show that :

- For the nitrogen dioxide, the WHO Annual Air Quality Guideline is respected in all the area and for all the different cases. The impact of the project is an increase of 0.02 µg/m³ on the maximum concentration in 2026 and about 0.01 µg/m³ in 2046. We can easily say that the project has no impact on the concentration of nitrogen dioxide.
- For the particulate matters PM10, the concentrations modelled in the area of 500 meters around the roads are superior to the WHO Annual Air Quality Guidelines for the particles: Indeed, the background concentrations included in the calculation are already superior to those guidelines. The concentrations modelled are close to the background concentration included in the calculations (19.5 µg/m³).
- For the particulate matters PM 2.5, ³. the concentrations modelled are close to the background concentration included in the calculations (10.2 µg/m³)

Indicator Pollution-Population (IPP). In 2026 and 2046, the higher IPP is located in the zone 5: it's the zone with the higher number of inhabitants. The zone 11 where the airport is located, has a low IPP compared to the zones 5, 8, 9 and 12 (refer zone presented in the baseline section)

The modelling shows that there is no change between the initial configuration and the project configuration, in 2026 and 2046.

The project as described will not have any impact on the health of population, linked to the emissions of the road traffic.

The air quality is assessed overall and takes into account emissions of pollutants from both aircrafts and road traffic.

The impact severity is high (NOx). Considering the receptor sensitivity assessed as high, **the impact magnitude is high**.

4.4.5.2 Noise

- Impact Noi-Op-1: Noise impact due to increased airport capacity

→ 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 accommodates small ATR72 aircraft with 2545 operations in 2046; in the long term, A321 NEOs and B737-900Ms will land, with approximately 1153 operations in 2046.

The A321 NEOs and B737-900Ms capacities are more than two times superior to ATR72 aircraft, therefore the project configuration enables the air traffic to be reduced. However, the turbojet engine increase the noise emission. It should be noted that the new runway's angle impacts the approaches and departures paths, which enable a significant reduction of the noise level population's exposure.

In summary, with the project configuration, higher but less frequent noise levels are estimated. Moreover, the population's exposure is reduced because of new runway's angle.

The sensitive building pre-primary school Le Caneton is less exposed to aircraft noise in this configuration with LAmax < 65 dB(A).

Thus, the impact severity is medium. Considering the receptor sensitivity assessed as high, **the impact magnitude is medium**.

4.4.6 HERITAGE RESOURCES AND VISUAL ENVIRONMENT

4.4.6.1 Palaeontology

None.

4.4.6.2 Landscape and visual environment

- Impact Vis-Op-1: alteration of the living environment

→ 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.

Take-off, 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 brings 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**.

- Impact Vis-Op-2: alteration to landform outside the airport
  - 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 increases 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**.

- Impact Vis-Op-3: alteration to the island forest cover
- 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**.

5 MITIGATION MEASURES

5.1 TEMPORARY IMPACTS DURING CONSTRUCTION

5.1.1 PHYSICAL ENVIRONMENT

5.1.1.1 Marine physical environment: shores, currents, turbidity and sedimentation

impact Phy-Mar-W-Temp-1: Increase in turbidity

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 discharge in the vicinity of the new runway extension into the sea, using a representative local climate (wave, wind and water level). Several locations 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).

In order to determine shutdown and warning thresholds, median value of turbidity in Baie Topaze 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 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 Baie Topaze.

Phy- Mar-Av-3

The extent of the plume is mitigated by selecting an adequate timetable. Discharges should 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**.

Impact Phy-Mar-W-Temp-2: Modification of the seabed

The previous 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**

Impact Phy-Mar-W-Temp-3: Dredging in front of the boathouse

The previous 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 curtains are especially needed to control the suspended solids generated by the dredging. They will be placed around the dredging site.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **high magnitude**.

Impact Phy-Mar-W-Temp-4: WTP discharge

The impact magnitude is low and no mitigation measures are applied for construction phase. Mitigation measures are provided for operation phase.

Impact Phy-Mar-W-Temp-5: Desalination plant discharge

The impact magnitude is low and no mitigation measures are applied for construction phase. Mitigation measures are provided for operation phase.

Summary

Table 5-1: 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	
Phy-Mar-W-Temp-4	WTP treated water discharge	Adverse	Low	None	-	Low
Phy-Mar-W-Temp-5	Desalination plant diluted brine discharge	Adverse	Low	None	-	Low

5.1.1.2 Hydrology

No temporary impact.

5.1.1.3 Geotechnics and Hydrogeology of the karstic system

Phy-Kar-W-Temp-1: Vibrations

Reduce speed of trucks' movement to an acceptable level 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.**

Phy-Kar-W-Temp-2: Mass haul - Hauling equipment movement inducing vibration and noise pollutions

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**.

Phy-Kar-W-Temp-3: Erosion/Groundwater ingress

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, 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**.

Phy-Kar-W-Temp-4: Excavation Noise

The following mitigations may be used to reduce noise impact generated by the excavator activity:
work during the day (fixed hours within the day), avoid work during the night, and inform local authorities and communities about 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**.

Phy-Kar-W-Temp-5: Cut and fill balance impacts

In case of import material need, the closest extraction site would have to be chosen, considering 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 mitigated impact. Thus, the mitigated impact could be of **negligible magnitude to high magnitude**.

Summary

Table 5-2: 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 - excavation works to be done during dry season	
Phy-Kar-W-Temp-4	Excavation Noise	Adverse	High	Phy-Kar-Mit-7	Mitigation - No use of explosive charge, decreasing noise impact	Medium
				Phy-Kar-Mit-8	Mitigation -no use of open blasting operations	
				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 engines in case not in 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

5.1.1.4 Water resource and wastewater management

Impact Phy-Wat-W-Temp-1: impact of water resource due to work water supply

It is proposed to install a desalination plant for the works supply, producing water for the works needs including drinking water for the workers. This plant should pump water from the sea via a borehole 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**

Impact Phy-Wat-W-Temp-2: impact of works on water resource due to impact on karstic groundwater

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 the works begin. 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 sea 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 m³/day must be maintained. An alternative can be found and discussed with the Rodrigues Regional Assembly and the Rodrigues Public Utilities Corporation within the framework of the water supply improvement programme in Rodrigues.

(Phy-Wat-Comp-2)

The proposed measures result in a not significant severity mitigated impact. Thus, the residual impact is of **negligible magnitude**

Impact Phy-Wat-W-Temp-3: impact of works wastewater

It is proposed to provide a temporary wastewater treatment plant dedicated to the construction site. (Phy-Wat-Av-3)

The proposed measures result in a not significant severity mitigated impact. Thus, the residual impact is of **negligible magnitude**

Impact Phy-Wat-W-Temp-4: Risks of accidental pollution

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 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.**

Impact Phy-Wat-W-Temp-5: Risks associated with the desalination plant

The mitigation measures are in the form of best engineering design /selection of appropriate seawater reverse osmosis (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 favored, through the installation of an evapo-concentrator-condenser-crystallizer instead of rejecting the diluted brine in the natural environment
- Coupling with solar energy panels for a mix of energy consumption.

Once the location of the desalination plant has been confirmed, a detailed impact assessment will be undertaken, and mitigations included as part of the contractors 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.**

Summary

Table 5-3: 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 Refer to BRL 2022 Water resources strategy action plan to estimate the volume of water requirement to replace.	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

5.1.2 BIOLOGICAL ENVIRONMENT

5.1.2.1 Terrestrial habitats and flora

None.

5.1.2.2 Terrestrial fauna

Impact BioT-Fau-W-Temp-1: Impacts on *Pteropus rodricensis (Chiroptera)*

No measure is necessary.

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Summary

Table 5-4: 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

5.1.2.3 Marine habitats

Impact BioM-Hab-W-Temp-1: Effects of suspended matter and water turbidity

In addition to the reduction measures proposed in the "Marine Impact Specialist Report" (Phy-Mar-Mit1 to 4), the effect of which should significantly reduce the severity of the impact by confining the water loaded with inorganic suspended matter (by the effect of currents and water containment devices), the map of global ecological sensitivity reveals the presence of ecosystems highly resistant to turbidity and siltation within a radius of 1km around the footprint of the project. This ecological characteristic provides reduction measures with a relatively wide scope of implementation (particularly relating to the spreading and settling of formwork pumping water).

Assuming the application of Phy-Mar-Mit1 to 5 measures and in a context of very low sensitivity (not significant) of the ecosystems located within a radius of 1km around the footprint, only an attenuated residual plume (high impact severity) should reach the fringing reef dominated by Acropora muricata (medium ecological sensitivity). The residual impact magnitude after mitigation can therefore be estimated as **medium.**

Feasibility and sizing of compensatory measures. Developing a compensation measure in favor of the fringing reef of Pointe Mapou must above all consider this dynamic context of the marine and coastal environment of the southern sector of Rodrigues Island.

The study of marine habitats also revealed a study site largely dominated by soft substrates (more than 90% of the total surface) and a trend towards degradation of all sampled fringing reefs, some of which had already been totally dead for several years. This context is not in favor of transplanting endangered corals, any attempt to move all or part of the Pointe Mapou reef would then be limited by:

- The very poor state of health of the colonies to be moved (diseases, necrosis, biofouling, etc.), which would cause very high mortality within the transplants and potentially within the host site (cross-contamination),
- The absence of a host site with both available hard sublittoral substrates and favorable abiotic conditions for coral development (low turbidity, stable salinity and temperature) within a sufficiently small area for the operation to be technically feasible.

Thus, despite the persistence of a temporary impact on water quality (turbidity) during the construction phase, it is proposed to focus the compensation measures towards reducing the synergistic impact, by participating in improving the general abiotic conditions of the study site. These measures relate to:

- The revegetation of the riparian forests and the coasts of Topaz Bay by native species adapted to the climate of the south of the island and to the recurrent water stresses;
- Support for the development of mangroves with Rhizophora mucronata by planting propagules (viviparous seedlings), collected on site, directly through the sediment.

In the event of a choice in favor of compensation measures carried out on the watershed, as proposed above, a feasibility study must be carried out in order to determine:

- The cadaster and territorial division of the natural spaces surrounding Topaz Bay;
- The most relevant species combining robustness, adaptation to climate change, growth and nativity ("Specialist Report for Terrestrial Biodiversity");
- The nurseries likely to produce the necessary plants;

- The companies potentially carrying the planting, maintenance and replacement of dead plants project over a period to be determined of 2 to 5 years;
- The production, maintenance and labor costs.

Particular attention should also be paid to the proper implementation of the Phy-Mar-Mit-1 to 5 reduction measures, guaranteeing a limitation of the impact of the turbid plume on the coastal water mass during the construction phase.

These compensation measures are also consistent with the Plaine Corail airport extension project, which will have the indirect effect of increasing pressure on land use in the south of Rodrigues Island.

Impact BioM-Hab-W-Temp-2: Effects of siltation and modification of the seabed

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.

Impact BioM-Hab-W-Temp-3: Effects of wastewater treatment plant and desalination plant discharge

Although the discharge water from a wastewater treatment plant and the brine from a desalination plant can have very significant impacts on biological populations, the very low discharge volumes from the facilities envisaged under this project and the rapid dilution of the plumes within a radius of a few tens of meters tend to minimize this risk of impact. Indeed, the communities located within a radius of 1km around the supposed discharge point of the facilities (near the new boathouse) have a very low ecological sensitivity.

Hence, no mitigation measure is proposed. The residual impact is of **low magnitude.**

Summary

Table 5-5: 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	Effects of suspended matter and water turbidity on ecosystems	Adverse	High	None	Apply measures to reduce water turbidity (Phy-Mar-Mit-1 to 5)	Medium
BioM-Hab-W-Temp-2	Effects of siltation and modification of the seabed on ecosystems	Adverse	Low	None	Apply measures to reduce water turbidity (Phy-Mar-Mit-1 to 5)	Low
BioM-Hab-W-Temp-3	Effects of WWTP and desalination plant discharge on ecosystems	Adverse	Low	None	Low volumes discharged and low sensitivity of adjacent ecosystems	Low

5.1.2.4 Marine species

Impact BioM-Spe-W-Temp -1: Impact on marine turtles

Impact BioM-Spe-W-Temp -2: Impact on marine mammals

Two types of measures can be proposed which, if taken early in the decision-making process related to the development of the site, do not represent a significant additional cost

BioM-Mit-1. First (BioM-Mit-1), the type and orientation of lighting can significantly reduce the impact of artificial light on wildlife. Thus, by judiciously positioning the lights, they can be concealed on the sea side and avoid any nuisance beyond the limits of the concession to be secured.

BioM-Mit-2. The second (BioM-Mit-2) type of measurement concerns the choice of the type of lamp. Lamps with a broad spectrum or emitting strongly in the blue (mercury vapor, blue LEDs) should be avoided in favour of lamps with yellow, amber to red light (sodium vapor, yellow LEDs) (Tab. 15). Indeed, sea turtles are extremely sensitive to blue and green lights, but much less to yellow, orange and red lights

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Summary

Table 5-6: 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	Marine turtles	Adverse	(to define) Medium	BioM-Mit/-1	Type and orientation of lighting can reduce the impact of artificial light on wildlife	Low
BioM-Spe-W-Temp-2	Marine mammals	Adverse	Low	BioM-Mit/-2	Lamps with a broad spectrum or white light should be avoided in favour of lamps with yellow, amber to red light	Low

5.1.3 TRANSPORT NETWORK, ELECTRICITY SUPPLY AND WASTE MANAGEMENT

5.1.3.1 Transport network

Impact Trspt-W-Temp-1: Impact on the transport network

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**.

5.1.3.2 Electricity supply

5.1.3.2.1 Impact Elec-W-Temp-1: Impact on electricity supply

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**.

5.1.3.3 Solid waste management

Impact Sol-Wst-W-Temp-1: Impact on the solid waste management

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**.

Summary

Table 5-7: 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

5.1.4 Socio-economic environment

5.1.4.1 Impacts on demographics and social dynamics

Impact SE-Demo-W-Temp-1: Increase of the population of Plaine Corail and its surroundings.

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**.

Impact SE-Demo-W-Temp-2: Evolutions of internal relations and in relation to foreign influx

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 the ESMP Report)

Implement an influx management plan that includes appropriate communication from outside workers on local methods of operation and customs. (Measure SE-Mit-6)

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**.

Impact SE-Demo-W-Temp-3: Social tensions arising from hiring conditions

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**.

Summary

Table 5-8: 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

5.1.4.2 Impacts on power, governance and civil society

Impact SE-Gov-W-Temp-1: Risk of tension between the displaced community and the host community (cumulative impact)

To mitigate this impact, it is proposed to:

Implement a communication plan (including complaint management/ grievance mechanism) 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**.

Summary

Table 5-9: 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

5.1.4.3 Impacts on land

Impact SE-Land-W-Temp-1: Increase in social tensions in relation to the land resource (cumulative impact)

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 the ESMP report)

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**.

Impact SE-Land-W-Temp-2: Evolution of land management procedures (cumulative impact)

To mitigate this impact, it is proposed to:

- Implement an internal support plan (RAP) 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 the ESMP report)
- 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**.

Summary

Table 5-10: 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.	

5.1.4.4 Impacts on agriculture and livestock

Impact SE-Agri-W-Temp-1: Decrease in income from agriculture during the adjustment period (cumulative impact)

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 World Bank Environmental and Social 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**.

Impact SE-Agri-W-Temp-2: Decrease in livestock breeding activity (cumulative impact)

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**.

Impact SE-Agri-W-Temp-3: Change of livestock breeding practices due to the reduction in available pasture land (cumulative impact)

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 the ESMP report
- 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 the ESMP report)

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**.

Impact SE-Agri-W-Temp-4: Increase in the rehabilitation time of agricultural surfaces (cumulative impact)

- 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 the ESMP report)
- 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 the ESMP report)

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**.

Summary

Table 5-11: 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.	

5.1.4.5 Impacts on the local economic context

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)

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 World Bank Environmental and Social standards. (Measure SE-Mit-10 – see the ESMP report)
- 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**.

Impact SE-Eco-W-Temp-3: Increase in local production prices (cumulative impact)

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 the ESMP report)

Create a favourable economic framework to enable households to balance income from income-generating activities. (Measure SE-Mit-15 – see the ESMP report)

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**.

Impact SE-Eco-W-Temp-5: Increase in household incomes (cumulative impact)

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 ESMP report)

Implement a regular communication plan with local communities. (Measure SE-Mit-7 – see the ESMP report)

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**.

Impact SE-Eco-W-Temp-6: Necessary adaptation to the new local economic landscape (cumulative impact)

To mitigate this impact, it is proposed to:

Implement a regular communication plan with local communities. (Measure SE-Mit-14 – see the ESMP report)

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 the ESMP report)

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.**

Impact SE-Eco-W-Temp-7: Collaborative partnership or operational opportunities between local communities (indirect impact)

To promote this impact, it is proposed to:

Implement a regular communication plan with local communities. (Measure SE-Mit-15 – see the ESMP report

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 the ESMP report)

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**.

Impact SE-Eco-W-Temp-8: Reinforcement of professional skills (cumulative impact)

To promote this impact, it is proposed to:

- Implement a regular communication plan with local communities. (Measure SE-Mit-7 – see the ESMP report)
- 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 the ESMP report)
- Identify opportunities for economic development from local initiatives to provide training and coaching plans to reinforce professional skills. (Measure SE-Mit-15 – see the ESMP report)

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**.

Summary

Table 5-12: 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 the 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.	

5.1.4.6 Impacts on the health and safety of the communities

Impact SE-Safe-W-Temp-1: Increased risk of accidents due to traffic

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**.

Impact SE-Safe-W-Temp-2: Respiratory discomfort of the inhabitants of the towns closest to the building area

None.

Summary

Table 5-13: 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

5.1.4.7 Impacts on the health and safety of workers

Impact SE-Wor-W-Temp-1: Increased risk of accidents and illnesses

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 nuisances 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.

Note : The contractor will be required to prepare and submit a Construction Occupational Health and Safety Plan prior to construction.

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

Summary

Table 5-14: 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	

5.1.5 AIR QUALITY AND NOISE

5.1.5.1 Air quality

Impact Air-W-Temp-1: Alteration of air quality due to construction activities

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**.

Summary

Table 5-15: 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	

5.1.5.2 Noise

Impact Noi-W-Temp-1: nuisance caused by noise due du construction activities

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**.

Summary

Table 5-16: 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	Machinery and equipment must be regularly maintained in accordance with the manufacturer's requirements.	Low

5.1.6 HERITAGE RESOURCES AND VISUAL ENVIRONMENT

5.1.6.1 Palaeontology

None.

5.1.6.2 Landscape and visual environment

Impact Vis-W-Temp-1: alteration of the living environment

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 5.3.6.2.
- 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**.

Impact Vis-W-Temp-2: increasing pressure on island landscape

Three mitigation measures will help to minimize the landscape and visual impacts of construction activities:

- Favour 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**.

Summary

Table 5-17: 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	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	

5.2 PERMANENT AND IRREVERSIBLE IMPACTS DURING CONSTRUCTION PHASE

5.2.1 PHYSICAL ENVIRONMENT

5.2.1.1 Marine physical environment: shores, currents, turbidity and sedimentation

Impact Phy-Mar-W-Def-1

As the impact magnitude is low, no mitigation measure is necessary.

Impact Phy-Mar-W-Def-2

As the impact magnitude is negligible, no mitigation measure is necessary.

Impact Phy-Mar-W-Def-3

As the impact magnitude is negligible, no mitigation measure is necessary.

Impact Phy-Mar-W-Def-4

As the impact magnitude is low, no mitigation measure is necessary.

Impact Phy-Mar-W-Def-5

As the impact magnitude is low, no mitigation measure is necessary.

Summary

Table 5-18: Permanent Impact during Construction - 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

5.2.1.2 Hydrology

Impact Phy-Hyd-W-Def-1: Transfer of sediments to the lagoon

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**.

Summary

Table 5-19: Permanent Impact during Construction - 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

5.2.1.3 Geotechnics and Hydrogeology

Impact Phy-Kar-W-Def-1: Caverns collapse

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 south-eastern 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**.

Impact Phy-Kar-W-Def-2: Damage to caves

Caverns entries need to be secured, for example, by installing a fence around the entrance openings. Some specialists in karst and environmental palaeontology 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**.

Impact Phy-Kar-W-Def-3: Groundwater flow disturbances

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**.

Impact Phy-Kar-W-Def-4: Pollution of groundwater

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.**

Impact Phy-Kar-W-Def-5: Cut and fill balance impacts

As regard import material, a detailed method statement will have to be prepared by the contractor to minimize impacts on the environment and to be approved by the client and/or his representative.

In case of excess of fill or unsuitable material, it will be forbidden to export same, and it will be required that everything is reused on site (backfilling, shaping, landscaping, etc)

The proposed measures result in a low mitigated impact.

Summary

Table 5-20: 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	

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
					or contaminated construction material), close to the project site, in order to reduce pollution induced by traffic from storage activity	
				Phy-Wat-Comp-5	Relocation of the intake of Caverne Bouteille (replacement by seawater).	
Phy-Kar-W-Def-5	Cut and fill balance: impacts of material extraction and use	Adverse	Medium	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	

5.2.1.4 Water resource and waste water management

Impact Phy-Wat-W-Def-1: Demolition of Bangelique reservoir

No measure is proposed as the tank is not used anymore.

Impact Phy-Wat-W-Def-2: impact of works on water resource supply

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 analysis 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**.

Summary

Table 5-21: 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 Bangelique 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	

5.2.2 BIOLOGICAL ENVIRONMENT

5.2.2.1 Terrestrial habitat

Impact BioT-Hab-W-Def-1: Impact on Grazing lands on basaltic resurgences

No measure is recommended.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact BioT-Hab-W-Def-2: Impact on Grazing lands on calcarenic substratum

No measure is recommended.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact BioT-Hab-W-Def-3: Impact on Coastal vegetation dominated by Ipomoea pes caprae

No measure is recommended.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact BioT-Hab-W-Def-4: Impact on Anthropized areas

No measure is recommended.

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact BioT-Hab-W-Def-5: Impact on Grazing lands on Dry forest

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 initial project footprint by locally adapting the project boundaries. A total of 19 trees have been easily avoided, as shown by the table 5-22 below.

Table 5-22: Remarkable species to be avoided

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.

Avoidance measure (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 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.

Reduction measure (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 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 (at least, Diospyros, Terminalia, Foetidia, Antirhea): reduction measure 2 and reduction measure 4).

A complementary list of species is proposed (table 5-23 below), in regard of the impacts of the project on endemic flora.

Table 5-23: Proposed species to be replanted

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.

Reduction measure (BioT-Mit-4): 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).

Table 5-24: Remarkable species to be transplanted

Targeted species	Number of specimen targeted for transplantation
Adiantum rhizophorum	1
Diospyros diversifolia	1*
Elaeodendron orientale	155
Foetidia rodriguesiana	2
Nephrolepis biserrata	3
Pandanus heterocarpus	39
Phyllanthus dumentosus	1
Terminalia bentzoe subsp. rodriguesensis	1*

* not directly within the project footprint but close enough to compromise its in situ survival over time

Transplantation operations (Source: 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.

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.

Reduction measure (BioT-Mit-5): 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.

Table 5-25: Genetic conservation – Targeted species

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	**VU**	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**	155		2 to 5
Pandanus heterocarpus Balf. f.	Vacoa parasol	Pandanaceae	Endemic	**NT**	39		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.).

Table 5-26: Seeds to be collected from the following species

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%

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 grazing 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 Foundation, Agricultural and Forestry Services, Regional Assembly.

<u>Offset measure BioT-Comp-7:</u> Ecological restoration 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, amongst others. 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.). 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.

Taking into account 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 5-27: Ecological restoration - 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-endemic	Tree
Aloe lomatophylloides Balf. f.	Ananas marron	Asphodelaceae	Endemic 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	Indigenous	Herbaceous
Carissa spinarum L.	Bois amer	Apocynaceae	Indigenous	Bush
Carissa xylopicron	Bois de ronde	Apocynaceae	Indigenous	Bush
Cassytha filiformis L.	Liane foutafout	Lauraceae	Indigenous	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-endemic	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-endemic	Bush
Dombeya rodriguesiana F. Friedmann	Mahot / Bois Julien	Malvaceae	Endemic ROD	Bush
Doricera trilocularis	Bois chauve-souris	Rubiaceae	Endemic 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	Endemic 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
Hibiscus liliiflorus Cav.	Augerine	Malvaceae	Sub-endemic	Tree
Hibiscus tiliaceus L.	Var	Malvaceae	Indigenous	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	Indigenous	Herbaceous
Latania loddigesii Mart.	Latanier bleu	Arecaceae	Endemic MAU	Palm
Latania verschaffeltii Lem.	Latanier jaune	Arecaceae	Endemic	Palm

Scientific name	French name	Family	Status	Type
Lycium mascarenense A.M. Venter et A.J. Scott	Souveraine de mer	Solanaceae	Indigenous	Bush
Mathurina penduliflora Balf. f.	Bois gandine	Passifloraceae	Endemic	Bush
Mucuna gigantea (Willd.) DC.		Fabaceae	Indigenous	Liane
Nephrolepis acutifolia (Desv.) Christ		Nephrolepidaceae	Indigenous	Herbaceous
Nephrolepis biserrata (Sw.) Schott	Fougère rivière	Nephrolepidaceae	Indigenous	Herbaceous
Obetia ficifolia (Poir.) Gaudich.	Bois d'ortie	Urticaceae	Sub-endemic	Tree
Pandanus heterocarpus Balf. f.	Vacoa parasol	Pandanaceae	Endemic	Tree
Pemphis acidula J.R. Forst. et G. Forst.	Bois matelot	Lythraceae	Indigenous	Bush
Phyllanthus casticum Soy.-Will.	Bois de demoiselle	Phyllanthaceae	Indigenous	Bush
Phyllanthus dumentosus Poir.		Phyllanthaceae	Indigenous	Bush
Pisonia grandis R. Br.	Bois mapou	Nyctaginaceae	Indigenous	Tree
Pittosporum balfourii Cuf.	Bois bécasse	Pittosporaceae	Endemic 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	Endemic ROD	Tree
Premna serratifolia L.	Bois sureau	Lamiaceae	Sub-endemic	Tree
Ramosmania rodriguesii Tirveng.		Rubiaceae	Indigenous (Endemic 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-endemic	Tree
Scutia myrtina (Burm. f.) Kurz	Bois de sinte	Rhamnaceae	Indigenous	Bush
Secamone rodriguesiana F.Friedmann		Apocynaceae	Endemic	Liane
Securinega durissima J.F. Gmel.	Bois dur	Phyllanthaceae	Indigenous	Tree
Tephrosia purpurea (L.) Pers.	Lentille marronne	Fabaceae	Indigenous	Herbaceous
Terminalia bentzoe (L.) G.Forst.. subsp. rodriguesensis Wickens	Bois benjoin	Combretaceae	Endemic	Tree
Thespesia populnea (L.) Sol. ex Corrêa	Sainte Marie	Malvaceae	Indigenous	Tree
Thespesia populneoides (Roxb.) Kostel.	Porché	Malvaceae	Indigenous	Tree

Scientific name	French name	Family	Status	Type
Tournefortia argentea L.f.	Veloutier argenté	Boraginaceae	Indigenous	Tree
Turraea lacinata (Balf. f.) Harms	Bois balai	Meliaceae	Endemic ROD	Tree
Vepris lanceolata (Lam.) G. Don	Patte poule	Rutaceae	Indigenous	Tree
Zanthoxylum heterophyllum (Lam.) Sm.	Bois de poivre	Rutaceae	Sub-endemic	Tree
Zanthoxylum paniculatum Balf. f.	Bois pasner	Rutaceae	Endemic	Tree
Zoysia matrella (L.) Merr.	Herbe pique-fesses	Poaceae	Indigenous	Herbaceous

Impact BioT-Hab-W-Def-6: Impact on grazing lands on riparian vegetation

No measure is recommended.

The proposed measures result in a not significant severity mitigated impact. Thus, the residual impact is of **negligible magnitude**.

Impact BioT-Hab-W-Def-7: Impact on grazing lands on estuarine habitat

No measure is recommended.

The proposed measures result in a not significant severity mitigated impact. Thus, the residual impact is of **negligible magnitude**.

Impact BioT-Hab-W-Def-8: Impact on grazing lands on calcarenic dry lawns of anthropogenic origin

No measure is recommended.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **negligible magnitude**.

Impact BioT-Hab-W-Def-9: Impact on coastal grasslands dominated by secondarized thickets (Lantana camara)

No measure is recommended.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact BioT-Hab-W-Def-10: Impact on secondarized thickets (Leucaena leucocephala)

No measure is recommended.

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **negligible magnitude**.

Summary

Table 5-28: 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	High	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 (done)	
				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 restoration 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-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	Low	None	None	Low
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	Low	None	None	Low

5.2.2.2 Terrestrial flora

A total of 2 specimens of major sensitivity, 42 specimens of high sensitivity and 4 specimens of medium sensitivity are expected to be destroyed by the project: see table 5-29 below.

Amongst low sensitivity species, one 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 (155 individuals out of 293 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.

Table 5-29. Number of native flora specimens destroyed by the project

Flora species	Sensitivity				Total
	Major	High	Medium	Low	
Foetidia rodriguesiana	2				2
Diospyros diversifolia		1			1
Adiantum rhizophorum		1			1
Terminalia bentzoe subsp. rodriguesensis		1			1
Pandanus heterocarpus		39			39
Nephrolepis biserrata			3		3
Phyllanthus dumentosus			1		1
Elaeodendron orientale				155	155
Total	**2**	**42**	**4**	**155**	**203**

Direct destruction of these species implies an overall impact magnitude assessed to high level.

Detailed impact sensitivity and magnitude are exposed below.

Impact BioT-Flo-W-Def-1: Impact on native species with a major sensitivity

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

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact BioT-Flo-W-Def-2: Impact on native species with a high sensitivity **.**

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

The proposed measures result in a high severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact BioT-Flo-W-Def-3: Impact on native species with a medium sensitivity

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

The proposed measures result in a medium severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact BioT-Flo-W-Def-4: Impact on native species with a low sensitivity

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

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Summary

Table 5-30: 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-1	Impact on native species with a major sensitivity	Adverse	High	BioT-Av-1	Avoid remarkable trees located at the edge of the project	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-2	Impact on native species with a high sensitivity	Adverse	High	BioT-Av-1	Avoid remarkable trees located at the edge of the project	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-3	Impact on native species	Adverse	Medium	BioT-Av-1	Avoid remarkable trees located at the edge of the project	Low
				BioT-Av-2	Moving the control tower out of the nature reserve	

Impact ID	Impact name	Direction	Impact magnitude mitigation	Measure ID	Avoidance / Mitigation / Compensation / Improvement Measures	Residual / improved impact magnitude
	with a medium sensitivity			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-4	Impact on native species with a low sensitivity	Adverse	Low	BioT-Av-1	Avoid remarkable trees located at the edge of the project	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	

5.2.2.3 Terrestrial fauna

Impact BioT-Fau-W-Def-1: Impact on *Pteropus rodricensis (Chiroptera)*

No measure is necessary.

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact BioT-Fau-W-Def-2: Impact on *Tropidophora ssp & Omphalotropis ssp (Gastropoda*)

Reduction measure BioT-Mit-8: Collect arthropods from the T*ropiphodora* genus before and during earthworks

This measure consists in collecting living individuals of *Tropiphodora & Omphalotropis* within the project footprint boundaries.

As a precaution, given the issue, 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 medium severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact BioT-Fau-W-Def-3: Impact on *Lygodactylus lugubris* (Reptilia)

No measure is necessary.

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Summary

Table 5-31: 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 ssp & Omphalotropis ssp *(Gastropoda)*	Adverse	Medium	BioT-Mit-8	Collect arthropods from the Tropiphodora genus before and during earthwork	Low
BioT-Fau-W-Def-3	Impact on *Lygodactylus lugubris (Reptilia)*	Adverse	Low	None	None	Low

5.2.2.4 Marine habitats

Impact BioM-Hab-W-Def-1: Effect of alteration of the local bathymetry and shoreline

As the magnitude is medium, a mitigation measure is proposed.

Avoidance measure (BioM-Av-1): Avoid sparse coral heads located at the edge of the project

A few coral heads were observed on the sublittoral rocks, near the formworks. These coral heads may be avoided (BioM-Av-1) during the works phase or moved a few dozen meters beyond the footprint of the dikes before the start of the works.

These few coral heads avoided, the magnitude of the impact can be qualified as Low .

Impact BioM-Hab-W-Def-2: Effect of modification of the sediment transit

No mitigation measure is proposed.

The proposed measures result in a not significant severity mitigated impact. Thus, the residual impact is of **negligible magnitude**.

Summary

Table 5-32: 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	Effect of alteration of the shoreline on ecosystems	Adverse	Medium	BioM-Av-1	Avoid or move sparse coral heads located at the edge of the project	Low
BioM-Hab-W-Def-2	Effect of modification of the sediment transit on ecosystems	Adverse	Negligible	none	-	Negligible

5.2.2.5 Marine species

Impact BioM-Spe-W-Def-1: impact on marine turtles

No mitigation measure is proposed.

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact BioM-Spe-W-Def-2: impact on marine mammals

No mitigation measure is proposed.

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Summary

Table 5-33: 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 marine turtles	Adverse	Low	none	-	Low
BioM-Spe-W-Def-2	Impact on marine mammals	Adverse	Low	none	-	Low

5.2.3 TRANSPORT NETWORK, ELECTRICITY SUPPLY AND WASTE MANAGEMENT

5.2.4 SOCIO-ECONOMIC ENVIRONMENT

5.2.4.1 Impacts on demographics and social dynamics

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

To mitigate this impact, it is proposed to:

- Update the Resettlement Action Plan (RAP) that respects the commitments to relocate and restore livelihoods and complies with World Bank Environmental and Social Standard (ESS 5 . (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 World Bank ESS 5.
- 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 based on 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 permitting 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 based on 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 the ESMP report)

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**.

Impact SE-Demo-W-Def-2: Involuntary economic and physical displacement of the active and non-resident population affected by the project

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 World Bank Environmental and Social standards. (Measure SE-Comp-1 – see the ESMP report)
- 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 the ESMP report)

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**.

Summary

Table 5-34: 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.	

5.2.4.2 Impacts on land

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

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 World Bank Environmental and Social standards. (Measure SE-Comp-1 – see the ESMP report)
- Propose, to the extent possible, replacement farmland permitting displaced populations to have sustainable livelihoods. (Measure SE-Comp-2 – see the ESMP report)
- 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 the ESMP report)

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**.

Summary

Table 5-35: 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.	

5.2.4.3 Impacts on agriculture and livestock

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

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 World Bank Environmental and Social standards. (Measure SE-Comp-1)
- Propose, to the extent possible, replacement farmland permitting displaced populations to have sustainable livelihoods. (Measure SE-Comp-2 – see the ESMP report)
- 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 the ESMP report)

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**.

Impact SE-Agri-W-Def-2: Loss of perennial crops

Source of the impact: Construction of the runway and airport infrastructures

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 World Bank Environmental and Social standards. (Measure SE-Comp-1 – see ESMP report)

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**.

Summary

Table 5-36: 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.	

5.2.4.4 Impacts on fishing

Impact SE-Fish-W-Def-1: Loss of direct access to the fishermen landing sites

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 World Bank Environmental and Social standards. (Measure SE-Comp-1 – see the ESMP report)
- 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 remains a sensitive element for locals.

The proposed measures result in a major severity mitigated impact. Thus, the residual impact is of **medium magnitude**.

Impact SE-Fish-W-Def-2: Loss of fishing infrastructures

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 World Bank Environmental and Social standards. (Measure SE-Comp-1 – see the ESMP report)
- 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 the ESMP report)

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**.

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

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 World Bank Environmental and Social standards. (Measure SE-Comp-1 – see the ESMP report)

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 the ESMP report)

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**.

Summary

Table 5-37: 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.	

5.2.4.5 Impacts on community mobility

Impact SE-Mob-W-Def-1: Resettlement of displaced people from the main road line

None.

Summary

Table 5-38: 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

5.2.5 AIR QUALITY AND NOISE

None.

5.2.6 HERITAGE RESOURCES AND VISUAL ENVIRONMENT

5.2.6.1 Palaeontology

Impacts and measures on palaeontology are associated and therefore addressed in the karst chapter 5.2.1.3 Geotechnics and Hydrogeology.

5.2.6.2 Landscape and visual environment

Impact Vis-W-Def-1: alteration of the living environment

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 5.3.6.2.

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**.

Impact Vis-W-Def-2: increasing pressure on island landscape

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**.

Summary

Table 5-39: 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 neighbouring 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	

5.3 IMPACTS DURING OPERATION PHASE

5.3.1 PHYSICAL ENVIRONMENT

5.3.1.1 Marine physical environment: shores, currents, turbidity and sedimentation

Impact Phy-Mar-Op-1: Accidental spillage

Mitigation measures to reduce adverse impact 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**.

Impact Phy-Mar-Op-2: Uncontrolled waste water discharges

As the impact magnitude is low, no mitigation measure is necessary.

Impact Phy-Mar-Op-3: WTP discharge

Two mitigation measures are proposed:

Phy-Mar-Mit-8

The discharge should be located in such a way as to favour local dilution of the effluent, i.e. close to the strongest currents, while remaining as far away as possible from the issues.

A specific hydrodynamic study will be carried out to optimise the position of the WWTP discharge point using a representative local climate (wind and water level). Several locations for each discharge could be tested to choose the configuration that minimises the extent of the plume and/or does not reach sensitive areas such as corals.

The chosen solution will need to be modelled over a sufficiently long period of time to estimate the cumulative effects of the discharge.

Phy-Mar-Mit-9

The sizing of the outfall should consider the dilution of the effluent. Thus, the selected discharge structure should allow for optimal initial dilution (near field). The following aspects can be studied:

- outfall diameter and outlet velocity as a function of flow rate
- depth of the outfall

The proposed measures result in a not significant impact. Thus, the residual impact is of low magnitude

Impact Phy- Mar-Op-4: Desalination plant discharge

Two mitigation measures are proposed:

Phy-Mar-Mit-10

The discharge should be located in such a way as to favour local dilution of the effluent, i.e. close to the strongest currents, while remaining as far away as possible from the issues.

A specific hydrodynamic study should be carried out to optimise the position of the discharge point and the desalination plant using a representative local climate (wind and water level). Several locations for each discharge could be tested in order to choose the configuration that minimises the extent of the plume and/or does not reach sensitive areas such as corals.

The chosen solution will need to be modelled over a sufficiently long period of time in order to estimate the cumulative effects of the discharge.

Phy-Mar-Mit-11

The design of the outfall should consider the dilution of the effluent. Thus, the selected discharge structure should allow for optimal initial dilution (near field). The following aspects can be studied

- outfall diameter and outlet velocity as a function of flow rate
- depth of the outfall;
- installation of a diffuser.

The installation of a diffuser is essential here, as the denser brine tends to spread over the bottom, and the diffuser selected should allow for a discharge towards the surface to increase dilution

The proposed measures result in a not significant impact. Thus, the residual impact is of low magnitude

Impact Phy- Mar-Op-5: Stormwater drainage

Ther following mitigation measure is proposed:

Phy-Mar-Mit-12

As the impact of the northern discharge is low, the southern discharge should be optimised. This discharge, which drains a larger area, should be relocated to an area open to the currents to facilitate dilution.

It could also be divided into two separate discharges in order to distribute the freshwater and avoid too large a discharge in one area. The following locations D-2a and D-2b as shown below can be proposed:

Figure 5-1: Proposed location of the southern outlets of the stormwater drainage system

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**

Summary

Table 5-40: 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 wastewater discharges	Adverse	Low	None	-	-
Phy-Mar-Op-3	WTP discharge	Adverse	Low	Phy-Mar-Mit-8	Location of the outfall	Low
				Phy-Mar-Mit-9	Outfall sizing	
Phy-Mar-Op-4	Desalination plant discharge	Adverse	Low	Phy-Mar-Mit-10	Location of the outfall	Low
				Phy-Mar-Mit-11	Outfall sizing (diffuser)	
Phy-Mar-Op-5	Stormwater drainage	Adverse	Medium	Phy-Mar-Mit-12	Relocation of southern discharges	Low

5.3.1.2 Hydrology

Impact Phy-Hyd-Op-1: Stormwater management

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**.

Impact Phy-Hyd-Op-2: Flooding of issues downstream of airport facilities

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**.

Impact Phy-Hyd-Op-3: Transfer of pollution to the natural environment

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, parking 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, firefighting, 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 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.

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact Phy-Hyd-Op-4: Transfer of sediments to the lagoon

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**.

Summary

Table 5-41: 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

5.3.1.3 Geotechnics and Hydrogeology

Impact Phy-Kar-Op-1: Collapse / Erosion

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**.

Phy-Kar-Op-2: Access to caves

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**.

Phy-Kar-Op-3: Pollution of groundwater

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**.

Summary

Table 5-42: 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 to be used for drinking water supply downstream of airport infrastructure	

5.3.1.4 Water resource and domestic waste water

Impacts Phy-Wat-Op-1 and Phy-Wat-Op-2 associated to stormwater drainage

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**.

Impact Phy-Wat-Op-3 associated to the waste water management

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**.

Impact Phy-Wat-Op-4 : Water supply management

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**.

Summary

Table 5-43: 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

5.3.2 Biological environment

5.3.2.1 Terrestrial biodiversity

None.

5.3.2.2 Marine habitats

Impact BioM-Hab-Op-1: effect of accidental spillage

The "Marine Impact Specialist Report" recommends two mitigation measures: (Phy-Mar-Mit-6) Prevent spills and accidents by training personnel to avoid spills and (Phy-Mar-Mit-7) Implement rapid pollutant containment and treatment methodologies and spill clean-up protocols

After the implementation of the spill risk reduction measures Phy-Mar-Mit-6 and 7, the severity of the impact can be estimated as low. Thus, the residual impact is of Low magnitude .

Impact BioM-Hab-Op-2: Effects of wastewater treatment plant and desalination plant discharge

No mitigation measure is proposed.

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact BioM-Hab-Op-3: Effects of stormwater drainage on ecosystems

No mitigation measure is proposed.

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

5.3.2.3 Marine species

Impact BioM-Spe-Op -1: Impact on marine turtles

Mitigation measure BioM-Mit-1: Appropriate choice of orientation and type of lamp

Mitigation measure BioM-Mit-2: Appropriate choice of lamp diffusion spectrum

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Impact BioM-Spe-Op -2: Impact on marine mammals

No mitigation measure is proposed as there is clow attendance of marine mammals at the study site (too shallow depths).

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

Summary

Table 5-44: 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	High	none	Apply measures to reduce accidental impact (Phy-Mar-Mit-6 and 7)	Low
BioM-Hab-Op-2	Modification of the physical functioning of habitats	Adverse	Low	none	-	Low
BioM-Hab-Op-3	Effects of stormwater drainage on ecosystems	Adverse	Low	None	-	Low

Table 5-45: Impact during Operation - 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-Op-1	Marine turtles	Adverse	Low	BioM-Mit/-1	Appropriate choice of orientation and type of lamp	Low
				BioM-Mit/-2	Appropriate choice of lamp diffusion spectrum	
BioM-Spe-Op-2	Marine mammals	Adverse	Low	None	Low attendance of marine mammals at the study site (too shallow depths).	Low

5.3.3 TRANSPORT NETWORK, ELECTRICITY SUPPLY AND WASTE MANAGEMENT

5.3.3.1 Transport network

Trspt-Op-1: Impact on the transport network

The road network around the airport will be restored through the construction of a new road as part of the airport upgrade during construction.

The proposed measures result in a low severity mitigated impact. Thus, the residual impact is of **low magnitude**.

5.3.3.2 Electricity supply

Impact Elect-Op-1: Impact on electricity supply

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**.

5.3.3.3 Solid waste management

Impact Sol-Wst-Op-1: Impact on the solid waste

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**.

5.3.3.4 Summary

Table 5-46: 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

5.3.4 SOCIO-ECONOMIC ENVIRONMENT

5.3.4.1 Impacts on land

Impact SE-Land-Op-1: Increase of social tensions in relation to the land resource

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 the ESMP report)

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**.

Impact SE-Land-Op-2: Evolution of land management procedures

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 the ESMP report)
- Implement integrated technical support measures to facilitate specific adaptation to new agricultural management and pasture parcels. (Measure SE-Mit-9 – see the ESMP report)

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**.

Summary

Table 5-47: 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.	

5.3.4.2 Impacts on agriculture and livestock

Impact SE-Agri-Op-2: Need to regenerate the farmland

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 the ESMP report)
- 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 the ESMP report)

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**.

Impact SE-Agri-Op-3: Decrease in livestock breeding activity

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 the ESMP report)
- 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 the ESMP report)

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**.

Summary

Table 5-48: 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-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.	

5.3.4.3 Impacts on the living environment and landscape

Impact SE-Liv-Op-1: Noise and sound pollution

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**.

Summary

Table 5-49: 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

5.3.5 AIR QUALITY AND NOISE

5.3.5.1 Air quality

Impact Air-Op-1: Deterioration of air quality due to increased airport capacity

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 (Auxiliary Power Unit) and GPU (Ground Power Unit),
- 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 see the ESMP report). 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**.

Summary

Table 5-50: 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	

5.3.5.2 Noise

Impact Noi-Op-1: Noise impact due to increased airport capacity

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 equipment, 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 establishment 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.

Summary

Table 5-51: 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 equipment	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	

5.3.6 HERITAGE RESOURCES AND VISUAL ENVIRONMENT

5.3.6.1 Palaeontology

None.

5.3.6.2 Landscape and visual environment

Impact Vis-Op-1: alteration of the living environment

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 neighbouring 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 efficient.

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. It should also 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**.

Impact Vis-Op-2: alteration to landform outside the airport

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 endowments 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**.

Impact Vis-Op-3: alteration to the island forest cover

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 island's forest cover expands.

The proposed measures result in a not significant severity mitigated impact. Thus, the residual impact is of **negligible magnitude**.

Summary

Table 5-52: 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 neighbouring 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.	

6 CUMULATIVE IMPACTS

6.1 INTRODUCTION

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 on which the assessment will focus.
- 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.

6.2 METHODOLOGY

The Rapid Cumulative Impact Assessment (RCIA) approach outlined in IFC’s Good Practice Handbook: Cumulative Impact Assessment and Management, 2013[12]. One of the key principles of cumulative impact assessment using this approach is to focus on VECs, both for setting context of temporal and spatial boundaries to be considered and in assessing the significance of cumulative impacts.

[12]https://www.ifc.org/wps/wcm/connect/58fb524c-3f82-462b-918f-0ca1af135334/IFC_GoodPracticeHandbook_CumulativeImpactAssessment.pdf?MOD=AJPERES&CVID=kbnYgI5

The IFC good practice handbook outlines the following six steps to undertaking RCIA (Figure 6-1):

- Determine spatial and temporal boundaries;
- Identify VECs in consultation with effected communities and stakeholders;
- Identify all developments affecting VECs;
- Determine present condition of VECs;
- Assess cumulative impacts and evaluate their significance over predicted future conditions;
- Design and implement (a) adequate strategies, plans, and procedures to manage cumulative impacts, (b) appropriate monitoring indicators, and (c) effective supervision mechanisms.

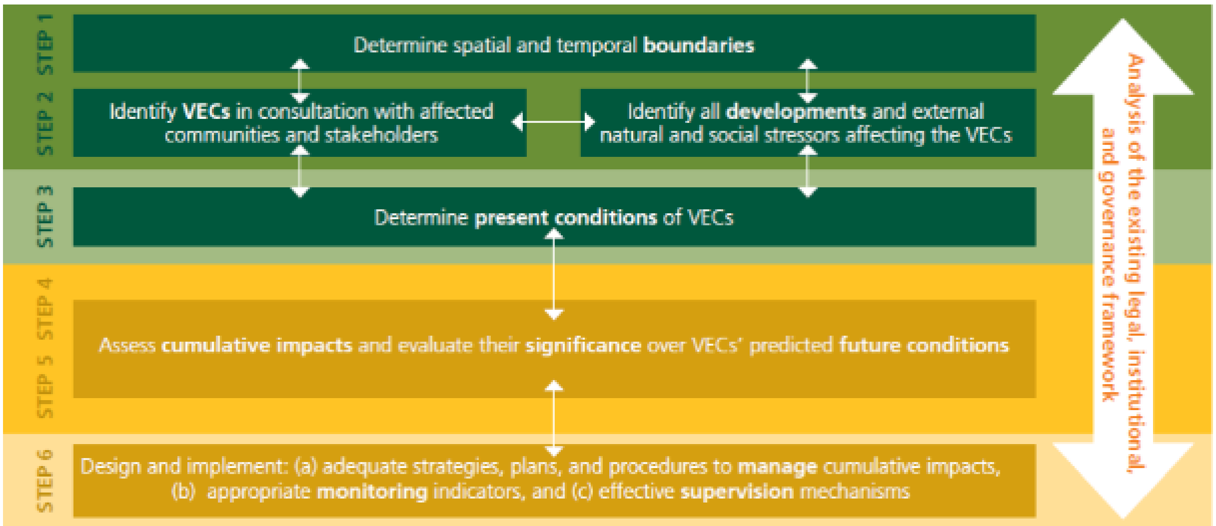


Figure 6-1: Six Steps for RCIA

6.2.1 LIMITATIONS AND ASSUMPTIONS

This chapter is expected to undergo further refinement in the future, as new information becomes available regarding the updated sustainable development plan. This refinement will be carried out through ongoing discussions with the RRA and stakeholders, regarding the main VEC and development plans. By taking this approach, this chapter will be able to align more closely with the latest sustainability standards and better meet the needs of stakeholders.

6.2.2 SPATIAL AND TEMPORAL BOUNDARIES

6.2.2.1 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.

6.2.2.2 Temporal Boundary

The timeframe for the airport expansion and increase in flight rotations has set the temporal boundary for the project. This expansion is expected to significantly improve air connectivity on the island and create new opportunities for business and tourism in Rodrigues, ultimately leading to a boost in economic development. This positive impact on the economy is expected to have far-reaching benefits for the local community and the region as a whole.

6.2.3 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 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
    - Terrestrial geology and geotechnics
    - Marine and shores geology and marine turbidity
    - Hydrology
    - Hydrogeology
    - Water resource and wastewater 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
- Air quality and noise
- Heritage and Landscape

6.3 ASSESSMENT OF CUMULATIVE IMPACTS ON VECS

The cumulative and indirect impact study considers components of the environmental, physical and human environment that could be impacted by the increase in the volume of passengers transported to the Island.

This section is essentially based on the Socio-Economic Study for Rodrigues on Construction of a New Runway at Plaine Corail Airport prepared by Deloitte Mauritius in 2019 (further named as Deloitte's report). The elements included in the report have been further discussed during the field mission that took place from the 13th to the 26th of March 2023 to ensure that the assumptions and analysis provided in Deloitte's report have been integrated to sectoral policies and development strategies and plans.

It should be noted that the evolution of considered components is not likely to depend solely on the Airport extension project and will be linked to other policy decisions and projects. Therefore, these indirect and cumulative impacts assessment do not result in precise mitigation measures, but rather general recommendations.

6.3.1 TOURISM SECTOR

Tourism is a key sector for economic growth in Rodrigues since it generates direct and indirect employment and incomes. To a large extent, the population depends on tourism activities and is well aware of the value of the island and crafts that have developed over the years. A study commissioned for the period October 2016 – June 2017 suggests that the contribution of the tourism sector to the economy was more than MUR 1.2 billion. As indicated in the figure below, passenger arrivals in Rodrigues have in general witnessed steady growth over the last 25 years. With the new runway, the growth trend in passenger traffic is likely to experience a further boost, so that the tourism target of 120,000 by the year 2030 should be achievable.

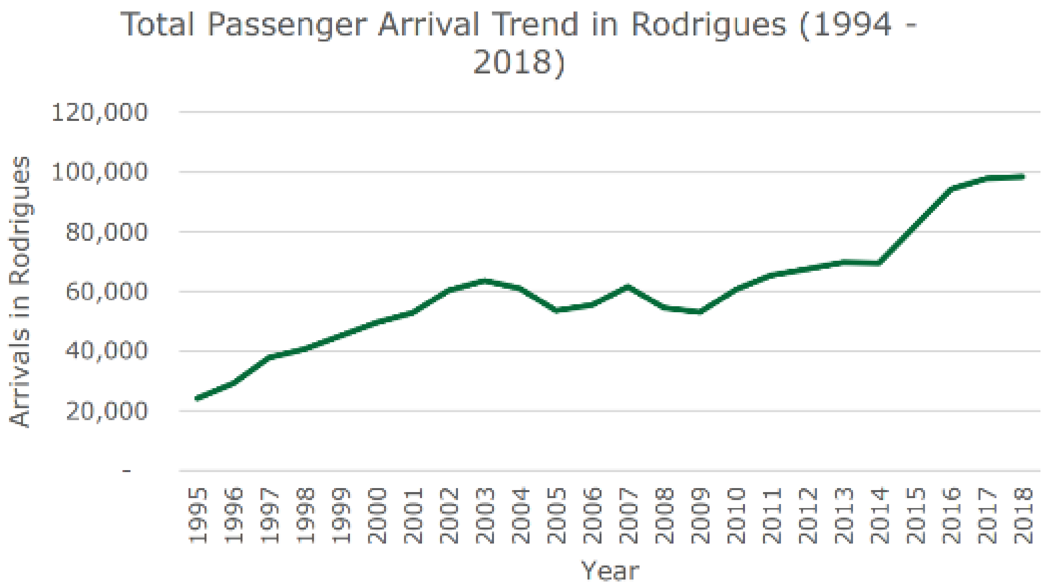


Figure 6-2 - Rodrigues airport passenger arrivals evolution

6.3.1.1 Current state of tourism capacity in Rodrigues

In Rodrigues, the number of tourist arrivals was 52,043 in 2012 and peaked to 76,264 for 2018. Various studies on the potential for tourism development in Rodrigues have pointed to a figure of 100,000 tourists by 2025.

According to statistics,

- Tourists stay on average 4 to 5 days in Rodrigues;
- 40% of tourists stay in hotels and around 40% in lodgings and guest houses;
- A tourist spends an average of MUR 2,500 per day in Rodrigues;
- The majority of tourists (69%) come from Mauritius, Reunion Island (14%) and France (12%).

The peak months are January, April, July/August, and November/December. These normally coincide with school vacations and end of year festivities. The remaining off-peak and low seasons do not mean that the hotels are out of business; on the contrary, operations are maintained at a fair occupancy rate and this also serves as a breathing space to the management for equally important maintenance/repair works.

Regarding accommodation, some 900 rooms are available distributed as follows:

Table 6-1 – Rodrigues' accommodation capacities by types (Deloitte report, 2019)

Accommodation	Quantity
Hotels	246
Tourist residences	311
Guest houses	262
Bed and breakfast	66
Cottage	14
Total	**899**

Proposed tourism activities in Rodrigues include leisure, sports and cultural tours.

It should be noted that currently, limited statistic is available in Rodrigues, which hampers a successful and sound appraisal of tourism development measures. For a reliable and timely analysis of tourism performance in Rodrigues, tourism data compilation in Rodrigues shall be better organized and rendered public. The same statistical model applied successfully in Mauritius should be set up in Rodrigues, for the dissemination of reliable information that in turn should help the RRA and private sector institutions to better plan, organize and develop tourism on the island with a sense of direction.

Three trends of tourism development have been identified by Deloitte in its report:

- A downside scenario, where Rodrigues experiences sub-par growth on tourism arrivals and ends up with 100,000 tourists by the year 2030;
- A baseline scenario, which is based on the current policy target of 120,000 tourists by the year 2030, with a room capacity of 1,300 by 2030;
- An upside scenario, where the RRA triggers an aggressive marketing campaign on the international market and attains 174,000 tourists by the year 2030, with a room capacity of 2,000 by 2030.

The expected consequences of tourism development in Rodrigues regard mostly employment (and relevant training) and the construction of additional accommodation.

6.3.1.2 Expected sub-sectors development

According to Deloitte's Report, several sub-sectors of tourism will witness an important development when the Airport maximizes arrivals capacity. It is foreseen that various sub-sectors of tourism in Rodrigues will grow exponentially in the years ahead provided that a sound business model for tourism is crafted in the interest of the local economy, the environment and the people, altogether in an organized and positive frame of mind, characteristic of the people of Rodrigues. Those sub-sectors that are likely to stand out in the 2030 economic panorama of Rodrigues through entrepreneurship, innovation and creativity are:

- Higher value-added handicraft sector;

- Professional tour guide services;
- Airbnb network services;
- Bio-food specialization;
- Dairy production;
- Gastronomy;
- Culinary arts;
- Local flavoured liquor production;
- Sports Tourism;
- Spa and wellness Tourism;
- Cultural Tourism;
- Music and entertainment industry;
- Arts and Crafts;
- Local Fashion industry;
- Perfume industry;
- Mini shopping mall development;
- Rural Tourism/Agricultural Tourism;
- Real Estate Development.

6.3.1.3 Expected employment creation in the tourism sector

Under the baseline scenario, which is of 120,000 tourist arrivals per year, it is expected that a minimum of approximately 2,600 to a maximum of 3,000 direct jobs would be generated by 2030 in the sub-sectors and activities mentioned in the previous section.

In terms of the propensity and interest of Rodrigues' women to work in the tourism and hospitality sector, it is estimated that 60% of employment in hotels and related services would be women, that is, a range of 1,600 to 1,800 women directly engaged in the sector in Rodrigues by 2030 under the baseline scenario. Indirect employment in tourism has been calculated at a rate of 1:3, considering inter-sectoral linkages prominently displayed in tourism because of its multidisciplinary nature. Total tourism employment (direct and indirect) in Rodrigues would therefore be around 10,400 by 2030 under this scenario. These forecasts are summarized in the table 6-2 below.

Table 6-2 - Projections of the job market development after the Rodrigues airport extension (Deloitte report, 2019)

Employment type	Downside scenario	Baseline scenario	Upside scenario
Number of direct jobs	2,120	2,600	4,000
Female (60%)	1,272	1,560	2,400
Male (40%)	848	1,040	1,600
Number of indirect jobs	6,360	7,800	12,000
Female (50%)	3,180	3,900	6,000
Men (50%)	3,180	3,900	6,000

The creation of direct and indirect jobs by the project is having a positive impact on the surrounding communities, leading to an increase in household incomes. The project has the potential to create job opportunities for the local population, including women, during the various phases of project management.

This is especially true during the works phase, where there may be significant demand for labour. As a result, households in surrounding towns can benefit from increased income security, which is a significant socio-economic issue for the project area. This positive impact is not limited to one specific community but rather concerns all communities related to the project. Overall, the increase in household incomes due to job creation represents a considerable benefit of the project for the surrounding communities.

The job creation is likely to result in a necessary adaptation to the new local economic landscape, potentially leading to the emergence of various companies and creating an interesting economic dynamic in the airport area. However, this impact could be considered adverse to a lesser extent if specific support is not provided to harmonize future economic developments. While this potential impact may be classified as low-magnitude, it is still an issue that needs to be taken into consideration. Without proper planning and support, the changes in the local economic landscape may not benefit to all members of the community equally. Therefore, it is essential to ensure that all economic developments resulting from job creation are managed effectively and sustainably, taking into account the needs of all stakeholders involved.

The presence of a favourable economic and social environment can lead to the formation of skill groupings and the creation of partnerships between different communities. This impact allows for the establishment and maintenance of a positive socio-economic network within communities, which can be of considerable importance for the sustainable development of the area. Collaborative partnerships and operational opportunities between local communities can enhance the effectiveness of economic and social programmes and promote a more cohesive community.

The availability of new job opportunities during the various phases of the project presents a strong potential for the reinforcement of professional skills in the area. This is particularly true for younger generations who will have the opportunity to access certain professions that were previously unavailable in the area and receive specific training to respond to the demand. This impact represents a highly positive opportunity for the local people and will complement the existing skills palette of the community. Additionally, this positive impact extends beyond the airport project area and can benefit to the citizens of Rodrigues more generally. The reinforcement of professional skills is an essential component of sustainable economic development, and the creation of job opportunities can serve as a catalyst for this process.

6.3.1.4 Evaluation of the needs arising from tourism development

The first need regards proper training of economic operators. The development of tourism and the subsequent employment needs will require to enhance the capacity building and training of the island through continuous learning and customized retraining programmes. This will allow to maintain the competitiveness of the Rodrigues destination. The number of additional training structures to be developed is not defined at this stage, but there are mentions of the opening of the Vatel Hotel School in Rodrigues and restoring Mauritius Institute of Training and Development Programmes.

Additionally, tourism development will likely require the construction of additional accommodation. It has been estimated that to accommodate 100,000 – 120,000 tourists from 2025 – 2030, Rodrigues should aim at offering approximately 1,100 – 1,300 rooms, compared to 900 available at present.

Finally, as mentioned earlier in this section, to support the development of tourism in Rodrigues requires to implement and maintain a solid database of statistics on tourism activities, employment, accommodations and so forth.

6.3.1.5 Tourism infrastructure development

The development of the airport, its capacity and tourism in Rodrigues will lead to the development of several infrastructures to support the future dynamics on the island.

The key development considered at this stage is the project of “Airport City”. This project consists in building and operating a complex including hotel, mall, conference centers and other structures that will provide “unprecedented prospects for business ventures and employment, while propelling the airport and the country into the future”. Such solution would notably allow to welcome companies retreats and team building activities, and facilitate transits in Rodrigues with a hotel in immediate proximity. Although the Airport City project is at its inception, it is supposed to take place near the village of Plaine Corail, and data collected during the field mission suggest that a forage area initially selected for livestock breeders was eventually cancelled to welcome the Airport City project. The impact of such project will have to be closely analysed when more information is available, notably in relation to the pressure on local communities and livestock breeders.

6.3.1.6 Indirect expected impacts from tourism development

The increased visibility of Rodrigues as a tourism destination should create opportunities to develop other economic sectors on the island. For instance, more tourists will require the development of the banking sector and therefore more people will work in the financial services industry. Moreover, more tourist arrivals will increase the demand for food, which will stimulate the manufacturing sector. Additionally, increased tourism will require the promotion of the ICT (Information and Communications Technology) sector to facilitate access to tourism products information, allowing both residents and tourists to access to the Internet and benefits of the digital economy. Finally, the increased presence of visitors (domestic and foreign) on the island would fuel the demand for goods and services. Consequently, a significant increase in imports and exports of such goods and services is expected because of more demanding and informed travellers.

6.3.2 POSSIBLE DEMOGRAPHIC EVOLUTIONS AND EMPLOYMENT PERSPECTIVES

The Project will probably result in demographic changes through migration and remigration in Rodrigues, beyond the construction phase and the arrival of migrant workers. This would represent an opportunity for the dynamism of the local employment and economy.

6.3.2.1 Demography

The development of the Project will improve Rodrigues’ economic attractivity and could likely reverse the migration trend that has been in place for years. Over the years, difficult socioeconomic conditions in Rodrigues have led to numerous inhabitants moving to Mauritius or abroad for tertiary education or to find a job. It is expected that the Project development will strengthen Rodrigues’ tourism, manufacturing and primary sectors and new job opportunities will open up in these sectors. Rodriguans who moved abroad would come back to take a job in one of these sectors. Such situation has occurred with the development of Rodrigues’ IT sector when those who migrated are coming back to the country to take a job in the new emerging industry.

This expected return of Rodriguans represents a significant opportunity to add value to the local economy. Indeed, the remigration is expected to have positive impact on Rodrigues’ economy since individuals coming back will further consolidate the private sector as more business opportunities will develop. The education, wealth and experience accumulated abroad by these individuals will contribute to the improvement of socioeconomic conditions and quality of services offered. It is expected that tourism, agriculture and industry are most likely to benefit from the migration movement as more jobs will be available in these sectors.

The benefit from such new economic development is expected to take place after a period of at least one year of the operation of the new runway. Nevertheless, new opportunities of getting employed and starting a business will be highly anticipated, it is expected that on a yearly basis, at least two out of ten Rodriguans who migrated abroad for economic reasons will return to the island with the development of the private sector. Additionally, those who were likely to leave the island to look for a job abroad will decrease with the new jobs available in Rodrigues. Therefore, whereas the net immigration movement for Rodrigues Island has been negative over past decades, the operation of the new runway is most likely to reverse this trend and lead to a positive net migration in the region.

6.3.2.2 Employment

An analysis of employment figures in Rodrigues indicates a change in the pattern of employment in the economy with a contraction of the primary sector (from 6,200 to 4,800 jobs), an expansion of both the manufacturing (from 3,000 to 3,300 jobs) and tertiary sector (from 8,800 to 10,800 jobs).

Table 6-3: Employment by Industrial Sector and Sex 2015-2018

Type of employment	2015			2018		
	Man	Women	Total	Men	Women	Total
Primary	3400	2800	6200	2800	2000	4800
Secondary	2100	900	3000	2600	700	3300
Manufacturing	700	800	1500	500	700	1200
Tertiary	5700	3100	8800	5800	5000	10800
wholesale and retail trade; repair of motor vehicles and motorcycles	1100	900	2000	1000	1100	2100
Accommodation and food service activities	500	500	1000	600	800	1400
Public administration and defence; compulsory social security	1700	700	2400	1800	700	2500
Total	11200	6800	18000	11200	7700	18900

This trend is likely to continue with the construction and operation of the new runway since this project will increase the need for workers in the secondary sector, opportunities in the tertiary sector, and less will to work in the primary sector such as livestock breeding and fisheries. Based on the assumptions that the operation of the new runway will increase the yearly flow of tourists from 75,000 to 120,000, it is assumed that 7,052 direct jobs and 16,964 indirect jobs may potentially be created in the economy.

These new employment sectors are likely to be spread as follows as indicated in table 6-4 below:

Table 6-4 - Employment's projections by Industrial Sector and Sex (Deloitte report)

Job created	Direct		Indirect		Total
	Men	Women	Men	Women	
Food crops	444	444	888	888	2664
Fisheries	1600	400	3600	900	6500
Livestock	780	420	1404	756	3360
Agro-processing	13	52	26	104	195
Tourism	1040	1560	3120	4680	10400

Airport development	199	100	398	200	897
Total	4076	2976	9436	7528	24016

6.3.3 POWER, GOVERNANCE AND CIVIL SOCIETY

The involuntary displacement of Sainte Marie inhabitants, livestock breeders, and fishermen as a result of the project poses a risk of tension between the displaced and host communities. This could result in tensions related to lifestyle adaptation, space management, and governance during the integration of these communities into new areas. Without the necessary support measures, these potentially sensitive communities could feel a sense of injustice. Therefore, it is crucial to ensure that appropriate support measures are implemented to mitigate any potential tensions that may arise between the displaced and host communities.

6.3.4 PRESSURE ON THE ISLAND'S RESOURCES AND SERVICES

This section presents an assessment of the of the current state of service provision and evaluation of possible scenarios of increased demand, with respect to the island resources and services.

6.3.4.1 Land resource

Displacing populations involuntarily for a project can have far-reaching impacts, especially when it comes to land use resources. One of the most significant risks is the potential for social tensions to arise between the communities that are displaced and those in the proposed relocation areas. These tensions can be particularly acute when it comes to resources like agriculture and pastures.

One of the key challenges is adapting to the use of space, as relocating the affected communities will require them to adjust to new surroundings and interact with existing village communities. This is particularly important for agricultural land, as livestock breeding is the main activity of the inhabitants in the area. The impact of this displacement will be felt most acutely by those in the towns that are approached for relocation, as well as the Sainte Marie villagers and the Bangélique area livestock breeders.

6.3.4.2 Water supply

For several years now, Rodrigues has been facing difficulties to access water sufficiently. According to the government, Rodrigues current capacity for water production is at 6,000m^3 per day, whereas the actual demand is at 12,000 m^3 per day. This impacts particularly agriculture and livestock breeding, and the population has shown concern that tourists will receive prioritized access to water over local communities. The increase of tourism on the island thanks to the airport extension will likely increase water scarcity.

To deal with this constraint, the RRA is planning several investments amounting to MUR 1 billion through the Rodrigues Public Utilities Corporation (RPUC). These will essentially take the form of a loan from the Mauritius Investment Corporation (MIC). For instance, the RRA currently plans to build a desalination plant with a capacity of 3,500m^3 per day in Pointe Caverne. Additionally, other investment will be made later to increase the capacity of dams and hill reservoirs. These additional water infrastructure works will have impacts on the environment, namely:

- The additional desalination plants may have an impact on the marine biodiversity related to the intake facilities and the release of brine; the latter can be mitigated by adapted dilution practices or a zero liquid discharge technology.

- The additional dams and hill reservoirs will have an impact on the terrestrial biodiversity, with respect to the location of their implementation, which will need to be mitigated.

Additionally, the RRA now requires hotel promoters to include desalination plants to cover a large amount of their water needs, as it has already been done in several hotels on the island. But this requires capacity building to ensure good practice for the raw water intake and brine discharge and also for operation and maintenance requirements.

The increase in water supply needs may also impact the groundwater quality in the sense that the groundwater pumped from boreholes located near or on the coast might suffer an incoming of sea water if the pumping flow rate is increased too much or without control to meet the increasing demand for water supply.

These strategies allow to deal with water scarcity, but it remains unclear whether it will be sufficient to address Rodrigues' needs.

Overall, the positive impact of the project will be in boosting the development and modernisation of the water supply infrastructure in order to cope with the resulting need generated by tourism development. Table 6-5 below indicates the current supply network of Rodrigues.

Table 6-5 – Rodrigues' water supply network

Water facility	Daily capacity	Status
Surface water collection	4400 m3	Active
Caverne Bouteille desalination plant	100 m3	Active
Songe Desalination plant	500 m3	Active
Pointe Coton desalination plant	500 m3	Active
Pointe Venus desalination plant	500 m3	Active
Pointe Caverne desalination plant	3500 m3	Planned

6.3.4.3 Wastewater management

The river ecosystems and the lagoon ecosystem must be protected by a sanitation programme to be developed at household level and considering the current sludge management (that consists in a sewage dumping at Roche Bon Dieu site just beside Grenade where the new WTP has been constructed very recently; it is supposed to work with a capacity of 500 m^3/day very soon). SIDPR Environment and Biodiversity chapter is precising environmental requirements to mitigate the potential impact. Such additional WTP will need to be implemented over the island namely for the new tourist accommodation which will be created.

Sanitation policy is the blind angle of the current water policy in Rodrigues. A sewer network is impossible to set up in Rodrigues due to the severe constraints like the number of settlements dispersed in the space and to the profile of the valleys. Their topographical constraints (slopes, length, altitude) are an obstacle which necessitate an important consumption of energy for lift pumps. In addition, a sewer network requires a constant flow of liquid (wastewater is polluted water) to work properly. It is not possible in Rodrigues even with an improved situation after investments for water production and distribution.

As the highest population density is 400 inhabitants per square kilometre, it is time to set up a comprehensive sanitation programme to protect the environment and the water resources in the aquifers and river basins. The priority is to equip all the households with septic tanks and to manage the wastewater and other waste like hydrocarbons and oils. A detailed inventory is necessary as a preliminary step to assess the importance of this challenge. The sewage management must be reorganized with a proper branch of the RPUC, and its performances have to be evaluated collectively by the sanitation branch staff with the users and authorities to better organize the WTP management at Grenade.

Overall, the positive impact of the project will be in boosting the development of the wastewater management infrastructure in order to cope with the resulting need generated by tourism development.

6.3.4.4 Stormwater management

The construction of additional accommodation and other infrastructure works linked with the additional flow of tourists and eventual remigration will modify the land use namely in terms of existing infiltration areas and bare land which might then be occupied. As a result, this will modify the stormwater natural drainage paths which will have to be mitigated accordingly in order to manage and prevent flooding in these areas, but also in the surrounding areas. The mitigation measures shall include adequate landscaping and green design in order to have an adapted stormwater management plan, while considering the rainfall trend in connection with the climate change.

Overall, the positive impact of the project will be in boosting the development of the stormwater management infrastructure in order to cope with the resulting need generated by the development works.

6.3.4.5 Solid waste management

The extension of the airport will allow a larger influx of tourists, which will inevitably result in increased waste generation, creating potential direct and indirect impacts on the environment. At this stage however, there is no estimation of waste generation induced by increasing tourism in Rodrigues.

An increase in solid wastes may have an indirect potential impact on the aquatic ecosystems (surface water, groundwater and sea water). In fact, solid waste degradation produces lixiviation (polluted effluents) namely when subject to rainfall, which might impact the water resources in the environment. Therefore, a good waste management plan is necessary to handle the increase in solid wastes.

Rodrigues has avoided widespread solid waste pollution that typifies many other islands. Port Mathurin is relatively free of solid waste. A network of public recycling baskets has been installed at select public areas across the island. Rodrigues has already implemented a policy of plastic prohibition.

However, the efficient collection and processing of recyclable materials is currently not undertaken, in part due to the anticipated completion of an integrated material recycling centre at Roche Bon Dieu. Existing recyclables are deposited in a haphazard and uncontrolled manner adjacent to the planned facility. The Roche Bon Dieu landfill site presents a significant pollution point-source and lacks effective management towards preventing contaminant dispersion through air, vehicular traffic and subsurface movement.

Roche Bon Dieu waste dump needs to be closed and a new facility at Pointe au Sel opened and managed according to best practice.

Overall, the positive impact of the project will be in boosting the development of the solid waste management plan and infrastructure in order to cope with the resulting need generated by tourism development.

6.3.4.6 Education and training

The development of tourism in Rodrigues will increase the need for qualified staff in food, leisure and hotel sectors. This requires the strengthening of the education system, especially in vocational training.

As at March 2018, the education sector in Rodrigues consisted of 34 Pre-primary schools, 17 primary schools and 8 secondary schools. This system performs well and is equal, with an enrolment rate close to 100% and similar between men and women. Seven schools were offering pre-vocational education in Rodrigues. Students in the prevocational stream can join the Mauritius Institute of Training and Development (MITD) centres.

Regarding vocational training, Le Chou Multi-Purpose Training Centre (LCMTC) became operational in 1994 to promote technical and vocational education and training (TVET) in Rodrigues. The LCMTC offers vocational courses through the various modes of training, namely full-time mode, part-time mode and the apprenticeship scheme. The centre is presently operating at full capacity, with a total of 245 students. Based on feedback received from stakeholders and from the LCMTC in Rodrigues, training would be needed in the following areas: Hospitality and Tourism, Automotive Electricity and Electronics, Carpentry and Joinery Works, Refrigeration and Air Conditioning, Fabrication and Installation of Aluminium and uPVC Openings, Information Technology, Machine maintenance, Hairdressing and Beauty care, Garment-Making, Communication, and Consumer Electronics.

It should be noted that the LCMTC runs at full capacity and already requires additional staffing and equipment. Although this is seen in the automotive mechanics and electronics and building construction courses, such shortage is expected to occur as soon as the influx of tourists will grow.

An analysis of unemployment statistics stresses the need for better access to vocational training. Indeed, unemployed registrants are mostly individuals who failed primary education (up to 65). Moreover, regarding previous work experience, 684 registrants had, in the past, worked or were qualified to work as craft & related trade workers. These figures suggest that there is a need for more prevocational training courses to ensure that those young men and women who have not been able to pass at SC (School Certificate) level should be encouraged and given the opportunity to enrol in courses offered at the MITD and the The “Lycee Agricole” of Saint Gabriel.

6.3.4.7 Health

Currently, there are 2 Area Health Centres and 14 Community Health Centres in Rodrigues, and the main hospital is located in Creve Coeur. This allows to provide health services within less than one hour walk, in line with World Health Organization standards. It should be noted that the capacity of health infrastructure is limited for intensive care and complex surgical issues shall be transferred to Mauritius. The capacity of health infrastructure services is defined as follows:

- 150 beds at Creve Coeur hospital;
- 27 medical practitioners;
- 3 ambulances.

The current capacity of health infrastructure should increase in a near future, which should help to face demographic changes induced by the operation of the Project. Although the current capacity is sufficient for the inhabitants and tourist influx, it would eventually be limited given the expected influx of tourism and remigration that would result from the opening of the new runway. The new Master plan for infrastructure development includes new infrastructural development at Queen Elizabeth Hospital, the reorganization of La Ferme and Mont Lubin Area Health Centres, the strengthening of laboratory facilities and the development of telemedicine facility. Additionally, the introduction of an urgency service (SAMU) is of particular relevance to deal with tourists’ accidents and health issues.

Additionally, an indirect impact of the new runway is to facilitate the evacuation and repatriation of patients from and to Mauritius and medical practitioners will be able to visit Rodrigues more regularly, which will increase the quality and coverage of health services provided in the island.

6.3.5 FOOD PRODUCTION AND SUPPLY

6.3.5.1 Agriculture

One of the main features of the agricultural sector in Rodrigues is the decrease in area planted over the 2011-2017 period, which mostly results from climate change. The water scarcity prevailing in Rodrigues refrains from the extension of agriculture in the island. In 2017, Rodrigues had 336,7 ha of agricultural land.

Nevertheless, RRA is designing policies and aiming at strengthening the agricultural sector, which is expected to contribute to meet the increasing demand for food from tourists, migrants and Rodriguans coming to the island. These include:

- The rehabilitation of abandoned agricultural lands, from 520 ha and up to 1500 ha by 2030;
- Measures for increased water production such as the construction of additional water desalination plants and the rehabilitation of existing infrastructure collecting rainwater (rainwater harvesting).
- Improvement of training in modern agricultural production techniques, as trainings given each year to young persons at the Lycée Agricole de St Gabriel;
- The development of a land suitability map in collaboration with the FAO, which will improve land planning and productivity.

The capacity of Rodrigues to cope with the increasing demand for agricultural production mostly depends on the land rehabilitated and the access to water.

Improved agriculture activities will strengthen Rodrigues' food security, increase exports, reduce import bill and will also increase the availability of food crops for household consumption and for business developing in the wake of increased tourist arrivals.

The expansion of agricultural activities in Rodrigues will also provide more job opportunities. It is estimated that with each agricultural worker being employed for 200 days per year, the total amount of labour required for 520 ha would be 308 jobs created, 592 jobs created for 1000 ha or agricultural land and 888 jobs created for 1500 ha of agricultural land. For all hypotheses, indirect employment generated would be taken to be 2 times the number of direct employment.

The loss of farmland due to the project will have a significant impact, namely a decrease in income from agriculture during the adjustment period. This impact will be particularly felt by the relocated Sainte Marie villagers, as they will need to cultivate new parcels of land that have not been previously farmed. The soils in the area are shallow, and it will take time to rehabilitate them to the level of fertility that is currently present in the village parcels. As a result, agricultural harvests are expected to be lower during the first few years of cultivation, leading to a decline in agricultural incomes. While these incomes may not make up the majority of household incomes, they are still crucial for the social equilibrium of the affected communities. To mitigate this impact, measures should be taken to support the rehabilitation of the soils and provide alternative sources of income during the adjustment period.

6.3.5.2 Livestock breeding

Livestock farming is a common activity in Rodrigues, primarily for self-consumption. The island's inhabitants have a long-standing tradition of raising livestock, including large ruminants such as cattle, as well as small ruminants like goats and sheep, pigs and fowl. These animals are used both for export to Mauritius and for local consumption. Livestock production systems vary from extensive to semi-extensive for ruminants and local fowl, while pigs, broiler chickens, and layer chickens are raised using intensive methods.

The extension of the new runway represents an opportunity to increase production for both local consumption and export to Mauritius. The increase in tourism is expected to lead to a rise in meat consumption, which livestock breeders will have to cater for. It is estimated that exports could reach up to 8,000 heads of ruminants, with cattle remaining at 1,320 heads, and goat and sheep ruminants increasing from 5,425 heads to 6,680 heads. Local consumption is also projected to increase by 10%.

Additionally, the development of the airport is expected to increase the average weight of cattle from 300 kg to 400 kg, thanks to the longstanding efforts towards genetic improvements through the introduction of superior breeds, better animal health, and nutrition.

However, those positive figures do not consider the challenges met to develop livestock breeding when discussing with people practicing this activity. Water scarcity, the lack of land management policy for livestock breeding and the decrease in land availability (notably in favour of tourism and hotel construction) may challenge opportunities to produce and export more meat associated with the development of the airport. Additionally, the relocation of the Sainte Marie villagers and the Bangélique livestock breeders will likely lead to a direct impact on livestock activity, as most of livestock breeding in the area will be located in the vicinity of the proposed relocation area, in addition to the herds already present. This could lead to overgrazing of the area and an obligation for livestock breeders to restrict their herds if their methods do not adapt.

Another impact of the relocation of the Sainte Marie villagers and the Bangélique livestock breeders to proposed areas near the town of Plaine Corail, which is already used as pastureland by other breeders, is the fact that it could lead to a general change in the way cattle is managed. It is important to anticipate this impact and adapt practices accordingly, potentially through adequate breeding intensification. This issue is of utmost importance for livestock breeders, and measures must be taken to ensure that livestock breeding practices are sustainable and adapted to the new environment.

The decrease in livestock breeding activity can also have a negative impact on soil fertility and crop cultivation in the affected area. This is because the decrease in livestock activity results in a reduction in organic matter from animal origins, which limits the natural changes of cultivated soils and can extend the period necessary for the regeneration of soils for crops. This, in turn, leads to an increase in the rehabilitation time of agricultural surfaces. Soil fertility is an important issue for local communities where agricultural plants represent a significant part of the economic and social functioning. Therefore, measures must be taken to mitigate the impact of the decrease in livestock activity, including implementing measures to maintain soil fertility and reduce the rehabilitation time of agricultural surfaces.

6.3.5.3 **Fisheries**

Fishing activities for subsistence, commercial and recreational purposes is deeply rooted in the culture of the Rodriguan population. In addition to octopus, locally named “ourite”, which is the star product of Rodrigues, various species of fish are caught in the lagoon. Those of high commercial value represent the minor fraction of the total catch. Other marine animals like squids and shrimps are also fished.

Given that in-lagoon fishing is tightly linked to cultural practice and conservation to ensure proper management of the lagoon's resources, the development of the new runway is not expected to lead to an increase in fish caught in the lagoon.

However, the increased demand for fish resulting from tourism and demographic changes can be addressed through the development of off-lagoon fishing. With an increase in tourist arrivals and the availability of more cargo space from the larger aircrafts, choicest species of demersal fish caught off-lagoon together with other sea food (octopus, shrimps, etc.) can be available for consumption and for export chilled to Mauritius and other neighbouring islands on a practically daily basis. Indeed, off-lagoon fishing in waters surrounding Rodrigues remain untapped and represents a significant potential. The increase is estimated at 68% from 2,343 tons to 3,922 tons.

The development of off-lagoon fishing can lead to the following externalities:

- A higher supply of superior grade fish;
- The creation of a robust value chain for off lagoon industry which will stimulate local entrepreneurship among youth;
- An increase in employment and revenue for off-lagoon fishing activities;
- Increased revenue for fishermen fishing in the lagoon, since it is expected that some fishermen would shift to off-lagoon fishing;
- The process of shifting fishermen from lagoon to off-lagoon would further help in consolidating the conservation and management of the lagoon ecosystem;
- There would be a better price discovery for various grades of fish.

Expanding the fishing industry with the goal of exporting superior-grade fish has the potential to cause harm to the marine environment and ecosystems if it is not done in a sustainable manner. It is important to ensure that any expansion is carried out in a manner that takes into account the long-term health and sustainability of marine resources. This means implementing sustainable fishing practices that avoid overfishing and protect vulnerable marine species and habitats. Failure to do so could have significant negative impacts on the marine environment and the communities that rely on it for their livelihood.

6.3.6 IMPACTS DUE TO THE REDUCTION OF AGRICULTURE, LIVESTOCK AND FISHING ACTIVITIES

The reduction of agriculture, livestock, and fishing activities due to the project will have an impact on the income of households in the airport area. The agricultural and fishing activities are the primary sources of income for these households, and any decrease in these activities will have a ripple effect on their financial stability. It is a major socio-economic issue and will have a significant impact on the social and economic functioning of the local communities. Therefore, it is important to take appropriate measures to mitigate the impact on the livelihood of the affected households.

Another indirect impact to consider is the one that may occur on the local production prices. With the decrease in the amount of produced and marketed quantities, the prices of locally produced goods and services may increase. This increase in prices can benefit to the local producers, livestock breeders, and fishermen, as it may help to improve their incomes. However, it may also negatively affect the purchasing power of households who rely on these goods and services.

With the decrease in traditional livelihood, there could be an opportunity for other activities to emerge, generating sufficient incomes for households or creating opportunities for local entrepreneurship. For instance, the women's association could play a key role in driving new economic activities. This positive impact is not limited to the relocation areas of the Sainte Marie villagers but affects all communities in the airport area and its surroundings. It represents a considerable opportunity for all stakeholders and could be a significant driver of local development.

6.3.7 POSSIBLE INCREASE IN PRESSURE ON CRITICAL HABITAT

- **Assessment of the increase in pressure on critical habitats due to change in land use**

There might be a potential impact on critical habitats following the use of available land for the development of new infrastructure for the increasing population (remigration for example, in addition to tourists). Adequate mitigation includes the development of these new additional infrastructure works in a sustainable manner while integrating the critical habitats right from the preliminary masterplan work.

- **Assessment of the increase in pressure on critical habitat both marine and terrestrial, primarily associated with the tourism industry.**

Changes in land use and increased use of natural resources and rejection of waste (solid and liquid) may impact directly or indirectly on the ecosystems.

Likewise, touristic activities in and around environmentally sensitive areas may lead to tampering of critical habitats.

However, like for the Water Supply and Wastewater themes above, the overall positive impact will be in the boosting of the development of the water supply and wastewater management infrastructure to cope with the demand generated by tourism accommodation development and activities.

6.3.8 CUMULATIVE IMPACTS ASSOCIATED WITH AIR QUALITY AND NOISE

There will be more traffic on the island due to more tourists – therefore increase in air emissions from motor vehicles. It will be important to ensure that the motor vehicles used in the island be well maintained and recent enough to benefit from the latest anti-pollution technology to preserve the air quality. The modelling is currently in progress.

There will be more flights and bigger planes so there potentially be more noise. However, following the updated field work carried out in March 2023, the following observations were made.

- The noise measurements concern the pre-existing sound environment. In each of the sectors studied in the neighbourhood, there is a strong impact of the significant human activity.
- The measurements highlight more clearly a greater impact due to aircraft take-offs (on the west side of the airport (during day period and night period) while landings are less noticeable to the east of the site.
- 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 15 dB(A) lower than the permissible thresholds during the day and evening (not at night when there is no overflight).

Therefore, the project is not likely to impact the areas around the project area and further in terms of noise, since in addition to no flight at night, the flight paths do not fly across the island.

6.3.9 THE CARRYING CAPACITY OF THE ISLAND

As part of the Cumulative Impact Assessment 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 shortcomings 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.

The assessment of the carrying capacity of Rodrigues Island is ongoing and will be finalized once the Sustainable Development Plan for the island is completed. This plan will provide valuable information on the island's ecological, social and economic conditions, which will allow for a more accurate assessment of the island's carrying capacity. It is crucial to have a clear understanding of the island's carrying capacity to ensure that its natural resources are not depleted and that the island's development is sustainable in the long term. Once the Sustainable Development Plan is finalized, stakeholders can make informed decisions on how to manage the island's resources and support its development in a way that is both environmentally friendly and economically viable.

6.3.10 Cumulative and Synergistic Effects

Carbon footprint and climate change

Developed in the context of ecological transition incumbent on any organization, the carbon footprint (estimated in volumes of CO2) is a tool for measuring the impact of an entity (individual or collective) on the climate. It can be direct (transport, industry) or indirect, such as that generated by the manufacture and transport of worksite products. According to the December 2019 report by the NGO Transport & Environment, European maritime transport of goods and passengers generated more than 139 million tons of CO2 in 2018, much more than car transport. However, CO2 coupled with methane and nitrous oxide account for almost 95% of the Greenhouse Gases (GHGs) targeted by the Kyoto Protocol.

Given the global scale of the phenomenon, it is difficult to isolate the specific contribution of an activity or a territory to climate change. However, this process, which has been underway for several decades, has an increasingly distinct impact on all living organisms on land and at sea. Since 1998, the Rodrigues lagoon has successively suffered major environmental crises, more or less directly linked to climate change, all marine organisms (coral bleaching, reduction of seagrass beds, episodes of epizootics, imbalance in the sex ratio of sea turtle births, sensory disorientation of marine mammals, etc.).

In this context, the contribution of CO2 emissions related to the work and operation of this project to global climate change can be considered High and Permanent and represents a potential lever for action in favor of the environment.

Synergistic impact

Synergistic impact refers to the results of the combination of several factors or impacts that contribute to a given effect. Considered individually, these factors or impacts may be of little interest, whereas they take on a significant dimension when combined. Synergistic effects are considered at two levels: synergy between the repercussions specific to an intervention and synergy between the individual or combined repercussions of an intervention and the environment in which it is implemented (Environmental Dictionary, 2010).

In the case of this project, the cumulative effect of noise and light pollution and water turbidity contributes to the sensory disorientation of organisms, mainly sea turtles, and to the solicitation of additional energy resources by photosynthetic benthic organisms (corals, seagrasses), during their growth and the synchronization of their reproductive events.

In this sense, the synergistic impact of these different pressures on the organisms in the study area can be considered as Medium and Permanent.

6.4 SUMMARY OF IDENTIFIED CUMULATIVE IMPACTS

Table 6-6: Summary of identified cumulative impacts

Theme	Positive impacts	Negative impacts
Tourism	Economic growth	
	Employment creation and additional accommodation.	
	Job creation	
	Income increase for the communities	
	Potential to create collaborative partnerships and operational opportunities between local communities	
	Potential to reinforce the professional skills of the surrounding populations	
		Carrying capacity of the island difficult to assess and may be exceeded
		Increase in tourist arrival having potential to impact the fragile eco-system of the island (terrestrial and marine)
		Potential to deplete local resources and to have to rely on import of good and services
Demography	Reversing the migration trend	
	Strengthening manufacturing, and primary sectors	
	Remigration adding value to the local economy	
	Education, wealth, and experience accumulated abroad contributing to improving socioeconomic conditions and quality of services offered	
Power, governance and civil society		Involuntary displacement of inhabitants, livestock breeders, and fishermen may cause tension between communities
Land resource		Increase in social tensions in relation to the land resource
		Potential to deplete local resources and to have to rely on import of good and services
Water supply	Boosting of the development and modernisation of the water supply infrastructure in order to cope with the demand generated by tourism development	Risk of water scarcity in Rodrigues due to tourism development generating a bigger demand

Theme	Positive impacts	Negative impacts
Wastewater management	Boosting of the development of the wastewater management infrastructure in order to cope with the resulting need generated by tourism development	Increased wastewater generation to be managed to avoid ground and underground pollution
Stormwater management	Boosting of the development of the stormwater management infrastructure in order to cope with the resulting need generated by the development works	Potential modification of natural drainage paths and infiltration areas due to modification of land use and construction leading to further erosion
Solid waste management	Boosting of the development of the solid waste management plan and infrastructure in order to cope with the resulting need generated by tourism development	Increased solid waste generation to be managed to avoid littering and pollution
Education and training	strengthening of the education system	Need for additional staffing and equipment
		lack of access to vocational training
Health	Increase in the capacity of health infrastructure and services.	
	Improved quality and coverage of health services through telemedicine and regular visits from medical practitioners.	
	Facilitation of evacuation and repatriation of patients.	
		Exposure of local population to imported diseases, lack of preparedness from medical professionals
		Medical facilities in Rodrigues are limited ; risk of health facilities being overwhelmed
Food production and supply		
Agriculture	Rehabilitation of abandoned agricultural lands could increase the amount of agricultural land available for cultivation, which could lead to higher levels of agricultural production and increased food security.	Increased pressure on natural resources, particularly water resources, which could exacerbate existing water scarcity challenges in Rodrigues.
	Measures for increased water production could improve water availability for agricultural purposes, which could support expanded agricultural activities.	Increased use of chemical fertilizers and pesticides could have negative environmental impacts, including soil degradation and water pollution.
	Improved training in modern agricultural production techniques could increase the efficiency and productivity of agricultural operations, potentially leading to higher yields and greater profitability.	Depending on the types of crops grown, expanded agricultural activities could contribute to deforestation or other types of habitat destruction

Theme	Positive impacts	Negative impacts
	Development of a land suitability map could enable better land planning and management, which could lead to more sustainable agricultural practices and higher levels of productivity.	Possible overproduction or an oversupply of certain crops, which could depress prices and negatively impact the incomes of local farmers.
		Decrease in income from agriculture during the adjustment period
		Relocated Sainte Marie villagers will need to cultivate new parcels of land that have not been previously farmed
		Agricultural harvests are expected to be lower during the first few years of cultivation, leading to a decline in agricultural incomes
Livestock breeding	Livestock farming provides a source of income for the island's inhabitants through both local consumption and export to Mauritius.	Intensive methods used for raising some types of livestock can have negative environmental impacts, such as water pollution and soil degradation.
	The tradition of raising livestock has cultural significance and can be an important part of local identity.	If livestock farming is not managed properly, it can lead to overgrazing and deforestation
	Livestock farming can contribute to food security on the island.	Water scarcity and land management policy challenges may limit opportunities to produce and export more meat.
	Genetic improvements in cattle, better animal health and nutrition, expected to increase average weight of cattle from 300 kg to 400 kg.	
Off-Lagoon fisheries	Increase in availability of choices of demersal fish for consumption	
	Off-lagoon fishing represents significant potential for economic growth	
	Higher supply of superior grade fish	
	Creation of a robust value chain for off-lagoon industry which will stimulate local entrepreneurship among youth	
	Increase in employment and revenue for off-lagoon fishing activities	
	Increased revenue for fishermen fishing in the lagoon	
		Potential to deplete local resources and to have to rely on import of good and services
The reduction of traditional agriculture, livestock, and fishing activities	Creation of opportunities for new economic activities	It may have an impact on the income of households in the airport area, which could lead to a ripple effect on their financial stability and have a significant

Theme	Positive impacts	Negative impacts
		impact on the social and economic functioning of the local communities.
	Increase in local development initiatives	It may increase the prices of locally produced goods and services, which could negatively affect the purchasing power of households who rely on these goods and services
		It may have a negative impact on some households who rely on these traditional activities for their primary source of income.
Critical Habitat: Change in land use		Potential impact on critical habitats following the use of available land for the development of new infrastructure for the increasing population (remigration for example, in addition to tourists)
Critical Habitat: Marine	Like for Water Supply and Wastewater themes above, boosting of the development of the water supply and wastewater management infrastructure in order to cope with the demand generated by tourism accommodation development and activities	Potential impact on marine habitat due to discharges at sea with increased water usage and wastewater generation, tempering with marine habitats due to touristic activities, increased pressure on marine resources
Critical Habitat: Terrestrial		Potential impact on terrestrial habitat due to development of new hotels and tourism activities, tempering with terrestrial sensitive habitats due to touristic activities, increased pressure on terrestrial resources
Noise & Air Quality		No significant impact regarding Noise due to the new types of flights. Potential impact on air quality due to increased road traffic

7 ANALYSIS OF ALTERNATIVES

7.1 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, namely:

- ➔ 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.

7.2 The ''Doing-Nothing'' Option

The ''doing nothing'' option consists in maintaining the current arrangements for the foreseeable future.

The existing facilities are currently 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-stretched.

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.

7.3 ''No-Regret'' Option

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 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 judged 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.

7.4 Extension on the Sea to the West Option

At the end of the feasibility studies, it was decided to explore further the solution of seaward extension of the runway.

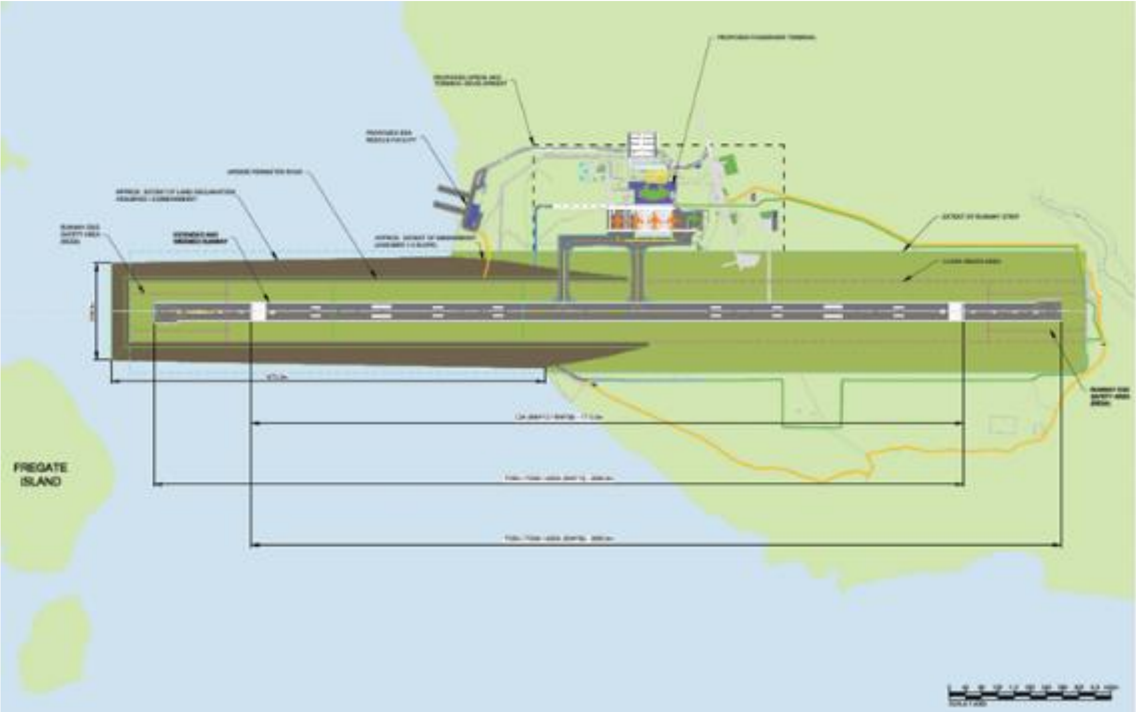
April 2016 - GIBB (Mauritius) Ltd (GIBB) was commissioned by the Rodrigues Regional Assembly (RRA) to develop the design for extending the runway into the sea based on 2 structural options, following the feasibility study of 2011 (Ecorys Report): a rubble mound structure with land infill as one option and an elevated reinforced concrete structure as the second option.

Geotechnical investigations at sea showed that the 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 both 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 m3 while the required fill for the embankment option was 4.0 million m3.

This option would have caused a dam effect on the inlet separating Frégate island from 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 7-1: seaward extension with embankment or stilts (GIBB, 2016)



7.5 PRELIMINARY DESIGN FOR A NEW RUNWAY

7.5.1 NEW RUNWAY OPTIONS

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) as illustrated in Figure 7-2 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 m3 of fill material, B needs to import 1 million m3 of fill material, C achieves the equilibrium or generates 10 % m3 excess, D needs 1.25 million m3 of fill material and F and G need to import 5.8 million m3 of fill material.

➔ Only one option, namely 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 defence 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 defence 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, 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.

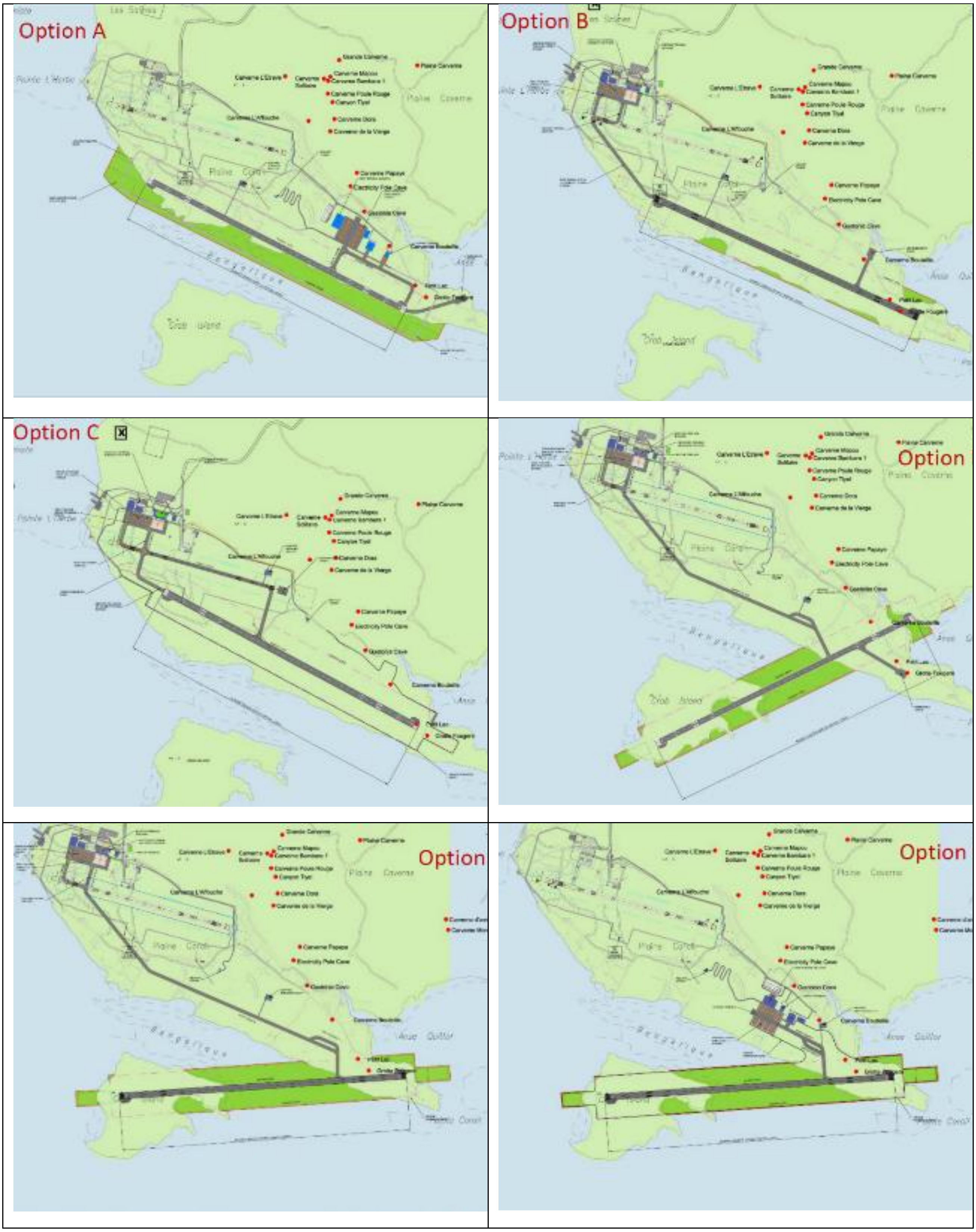


Figure 7-2: Options A to G under evaluation

Table 7-1 below summarizes the options and associated impacts.

Table 7-1: Summary Table of Options and Associated Impacts

Option	Cut and fill	Impact on Sainte Marie Hill	Impact on the sea	Impact on the existing infrastructures	Impact on airport operation during works	Scoring and Ranking
Criteria	+ if equilibrium - if import of fill x if excess of cut	+ if saved - if cut	+ if not impacted - if channel blocked or significantly impacted x if low impacted	+ if reused - if impacted x if not impacted	+ if operation not impacted - if operation disturbed	
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 Option C was chosen to be developed during the Preliminary Design.

7.5.2 Preliminary Design optimization and New Options

7.5.2.1 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, which were identified as sensitive areas which need to be avoided in the ESIA prepared in 2019The 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.

7.5.2.2 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 options 2 and 3 (Option 1 was rejected) 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.

As per the Design Consultant 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 m3, in order to allow for the slope for the Taxiway D.

Major difference is because 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 Option 3 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 preferred option at this stage - see table 6- 2 indicating the revised option C in red as the preferred option at this stage.

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 the environmental and social impact assessment and provision of mitigation measures are currently based on. As explained in the impacts assessment methodology, despite optimizing the Preliminary Design to avoid impacts to the karst system and caves, there is still a possibility that the open-air caves could be impacted on as the design of the runway advances.

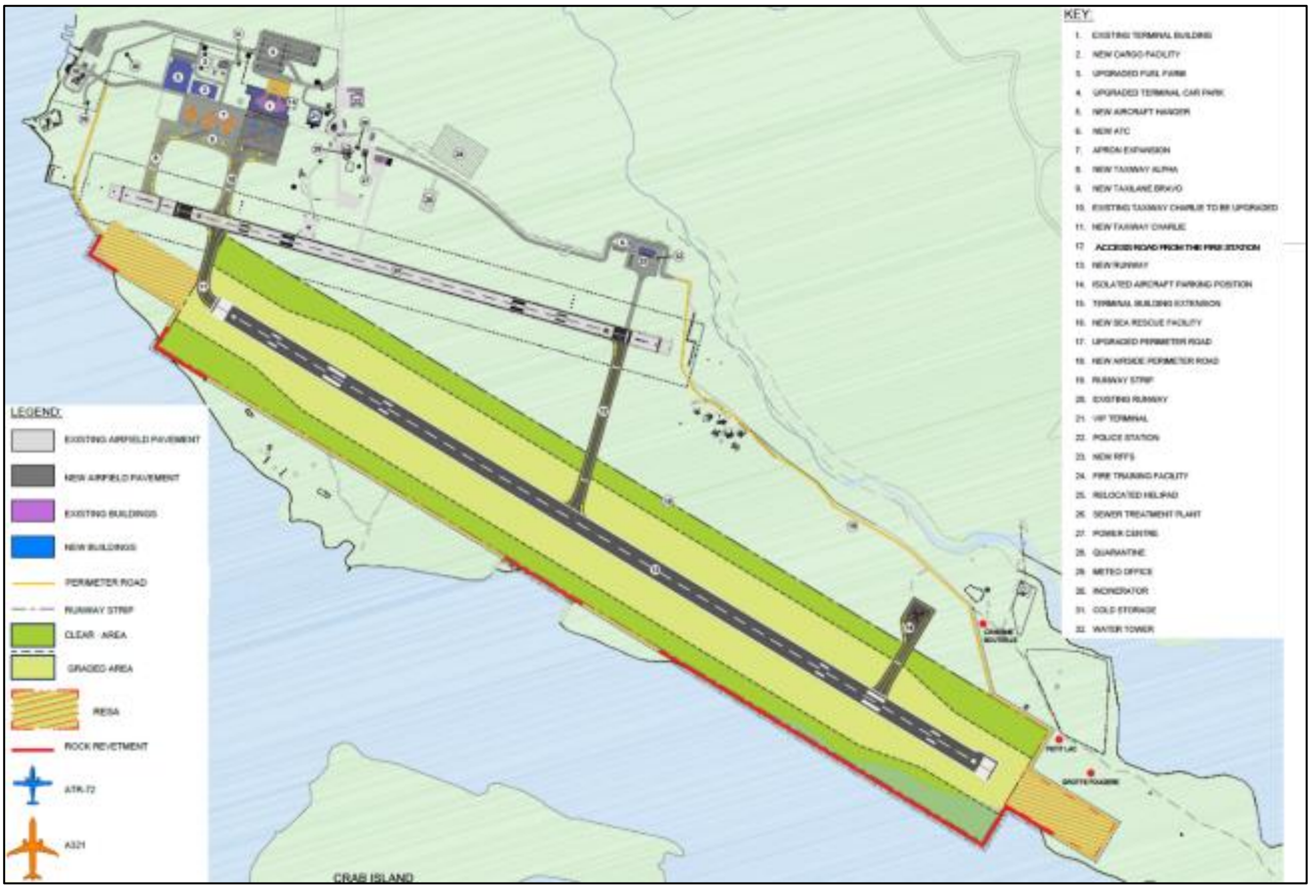
Table 7-2 below summarizes the options and associated impacts, with Option C optimized and referred to as option 3 in the consultant's literature.

Table 7-2: Summary Table of Options and Associated Impacts with Option C optimized and referred to as option 3

Option	Cut and fill	Impact on Sainte Marie Hill	Impact on the sea	Impact on the existing infrastructures	Impact on airport operation during works	Scoring and Ranking
Criteria	+ if equilibrium - if import of fill x if excess of cut	+ if saved - if cut	+ if not impacted - if channel blocked or significantly impacted x if low impacted	+ if reused - if impacted x if not impacted	+ if operation not impacted - if operation disturbed	
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 7-3: Preliminary Design Project – Option 3



7.6 OPTION 3 UPDATED 2023

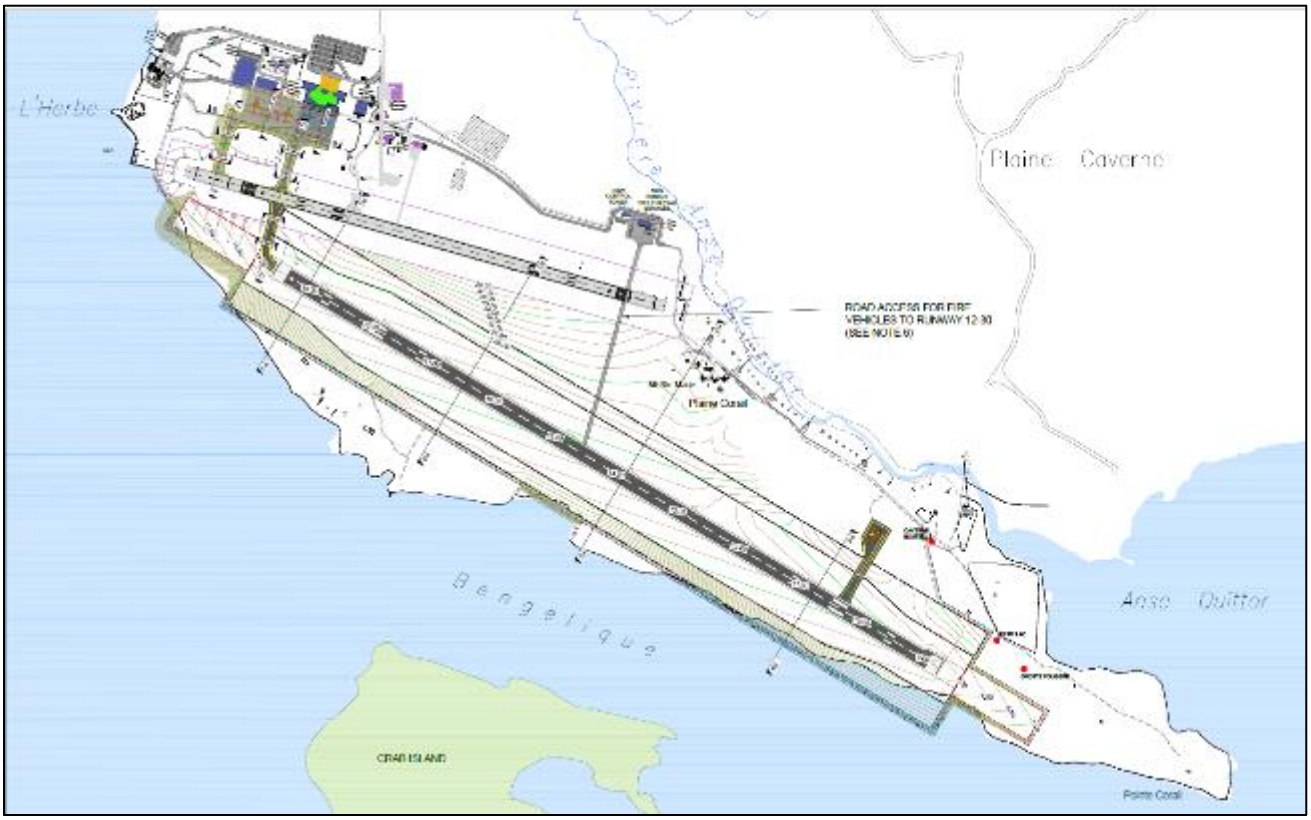
7.6.1 THE ATC AND RFFS AT MONT TRAVERS

The ATC and the RFFS which were first located within Anse Quitor Nature Reserve have been relocated outside the reserve based on the recommendations from the 2019 ESIA. These buildings are now located near Mont Travers (Figure 7-4).

Under this configuration Mont Travers must be cut. Mont Travers has already been used in the past as a borrow area for the extension of the existing runway. It is expected that likewise the aggregates from Mont Travers will be used for the backfilling of the new runway.

Cutting a geological feature which the more so is a named landmark may constitute a social impact. As regard the terrestrial impact, preliminary observations show that Mont Travers and its environs has little terrestrial biodiversity; the terrestrial biodiversity survey to be undertaken in April 2023 will confirm same.

Figure 7-4: Plaine Corail Airport current master layout plan 2023



8 REFERENCES

8.1 Physical environment

8.1.1 Climate and meteorological conditions

Current

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Marine shores geology

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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[13] 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:

[13] Laboratoire d'Etude en Géophysique et Océanographie spatiales

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[14] is compiled 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.

Seawater turbidity

Final SIDPR, Rodrigues Regional Assembly, July 2009

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(M. Bakalowicz 2002)
(Milanović, 2004)
(Williams, 2008).
(Evans, 2005
(ADP, December 2000).

8.1.5 HYDROGEOLOGY

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

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John Mylroie, Joan Mylroie and Greg Middleton. Rodrigues Island: carbonate deposition and karst processes as indicators of platform stability. Carbonates Evaporites, Springers.

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M. Bakalowicz. Cours DEA HHGG Université Paris-6. Hydrogéologie karstique. Caractéristiques et concepts. Méthodes d'exploration, d'exploitation et de gestion active. Déc. 2002.

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Enrique Fernandez y Ramon Peiro, 1995. Introducción a la geología kárstica. Federación Española de Espeleología. 205 p.

Water quality, vulnerability and contamination

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GARDELLA A. M.-A., 1979. The process of social formation on the island of Rodrigues (Indian Ocean). Department of Social Anthropology of London School of Economics and Political Science.

HARDMAN E.R., EDWARDS A.J. and RAFFIN J.S.J., 2014. The seine-net fishery of Rodrigues Island, western Indian Ocean: is it sustainable or in terminal decline? Newcastle University.

KAUSMAULLY Z. and CHINNEE D., 2018. Digest of statistics on Rodrigues 2017. Ministry of Finance and Economic Development of the Republic of Mauritius.

YVERGNIAUX Y., 2013. Management of the octopus fishery in Rodrigues. Program for the implementation of a regional fisheries strategy for the Eastern and Southern Africa – Indian Ocean Region. Smart Fish, Indian Ocean Commission.

8.4 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!

9 APPENDICES

9.1 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Airport of Rodrigues Ltd

Proposed Expansion of Rodrigues Airport

Environmental and Social Management Plan

Final Draft Report

Report Reference – 09053999

Prepared by

setec (Mauritius) Ltd

setec hydratec

Enviro-Consult Ltd

24 June 2023

Report Prepared by

NAME	ROLE	COMPANY
ENVIRONMENTAL CONSULTANT TEAM		
Frederic TRANQUILLE	Project Director / Senior Water Engineer	SETEC (Mauritius) Ltd
Nadia DABY SEESARAM	Project Manager / Senior Environmental Engineer	ENVIRO-CONSULT LTD
Fatou DIAGNE	Senior Water / Environmental Engineer	SETEC HYDRATEC
Nassiba BENAZZOUZ	Junior Water / Environmental Engineer	SETEC HYDRATEC

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LIST OF ACRONYMS

ARL	Airport of Rodrigues Ltd
AML	Airports of Mauritius Co Ltd
C-ESMP	Construction Environmental and Social Management Plan
CIA	Cumulative Impact Assessment
DLP	Defects Liability Period
EHS	Environment Health Safety
EHSG	Environmental, Health and Safety Guidelines
EPA	Environment Protection Act
E&S	Environmental & Social
ESA	Environmental Sensitive Area
ESIA	Environmental and Social Impact Assessment
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standard
ESS1	Assessment and Management of Environmental and Social Risks and Impacts
E&S	Environmental and Social
GIIP	Good International Industry Practice
GoM	Government of Mauritius
GRM	Grievance Redress Mechanism
ICAO	International Civil Aviation Organisation
IFC	International Finance Corporation
PIU	Project Implementation Unit
RAP	Resettlement Action Plan
RRA	Rodrigues Regional Assembly
SCP	Stakeholder Commitment Plan
SEP	Stakeholder Engagement Plan
SMP	Social Management Plan
WB	World Bank
World Bank ESF	World Bank Environmental and Social Framework
WTP	Wastewater Treatment Plant

1 INTRODUCTION

1.1 OVERVIEW

The project refers to the Expansion of Rodrigues airport located at Plaine Corail, in the south west of Rodrigues. Island.

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

The project to equip Rodrigues with a new and longer runway stems from a political will shared by the Rodrigues Regional Assembly (RRA) and the Government of Mauritius (GoM) 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.

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

ARL 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).

The ESIA report was prepared as an update of the initial ESIA 2019, with additional studies undertaken in 2023 to meet the requirements and integrating the latest airport design.

Within the scope of ESIA study, SETEC has prepared an ESIA Package containing the following documents:

- Environmental and Social Impact Assessment (ESIA) including specialist studies
- Stakeholder Engagement Plan (SEP)
- Resettlement Action Plan (RAP) Audit
- Environmental and Social Management Plan (ESMP)

1.2 PROJECT DETAILS

The proposed expansion of the Rodrigues airport will be conducted in two phases, of which only the activities under phase 1 are currently supported under this project.

The scope of works under phase 1, and for which the present Environment and Social Impact Assessment applies, is listed below:

Airport Infrastructure works

- New Runway 2100 m x 45 m wide with 2.5m shoulders on both sides (Total width 50m)
- Earthworks, Land Reclamation and Rock Revetment Works associated with the new runway
- Existing Runway to be downgraded to Taxiway
- Taxiway (15m wide with 5m shoulders)
- Aprons to accommodate 3No. A321 Neo type aircraft
- Isolated Apron
- Lighting (Airfield Ground Lighting, Approach Lights, Flood Light Masts)
- Precision approach path indicators

Communications, Navigation and Surveillance Systems for Air Traffic Management and Landing Procedures
Landside Car Park

Airport Buildings

- Air Traffic Control Facility (relocated at Mont Travers)
- Rescue and Fire Fighting Services (relocated at Mont Travers)
- Ancillary facilities
  - Power Centre
  - Quarantine building
  - Meteorological building
  - Solid Waste Management Facility / Incinerator
  - Airport Perimeter Road
  - New Passenger Car Park

Ancillary Utilities and Services

Surface Water Drainage
Potable Water Supply
Sewer Treatment Plant
Refrigerator cold storage

Facilities Associated with Construction

Temporary workers camp, site establishment, yard, etc
Desalination Plant - or atmospheric water generators - to supply potable water
Temporary Wastewater Treatment Plant
Strengthening of existing perimeter track road to be used as haulage route

Quarry/borrow area

- Ste Marie Hill (to be cut for the airport expansion - located within airport perimeter)
- Mont Travers (to be cut for the airport expansion)
- Mont Topaze (was considered as an alternative – it is most probably not required any further)

Demolition of vacated existing building within the airport expansion footprint

Phase 2 expansion of the airport shall be designed and assessed from an environmental and social point of view at a later stage. The activities under phase 2 are currently not supported under this project.

Strategic land, within the footprint of the existing airport, has already been earmarked and reserved for these future developments which include the following:

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

  - New cargo terminal building
  - New cargo apron
  - 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

1.3 PURPOSE AND SCOPE OF THE ESMP

The purpose of ESMP is to provide a general framework for the Environmental and Social Management System (ESMS) planned to be implemented within the scope of the Project, and to provide the necessary management tools to ensure compliance with the Project standards in achieving the environmental and social objectives set within the scope of ESIA.

Besides the legal and institutional requirements for the successful implementation of the relevant management plans, ESMP also determines the roles and responsibilities of the the Project Implementation Unit (PIU), ARL, other stakeholders 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 EHS policies, standards and legal regulations and to ensure that Project commitments are fulfilled,
- To determine the roles and responsibilities of PIU and contractors to ensure compliance with EHS requirements during the construction phase of the project,
- To ensure that construction activities are properly checked 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 sets out the approach planned by the Project, thus ARL and its consultants and contractors, to prevent or reduce the identified environmental and social impacts.

Environmental and social management plans within the ESMP, covering the construction and commissioning phases, have been prepared to be updated in line with the changing conditions as the Project progresses and the outputs regarding the stakeholder engagement process. In the Operation phase of the Project, if the conditions determined in the ESIA process differ, the risks and impacts arising from the Project will be re-evaluated. At this stage, a new ESMP may be prepared to manage the activities, adapted to the new conditions.

2 INSTITUTIONAL AND LEGAL FRAMEWORK

2.1 MAIN NATIONAL ENVIRONMENTAL STANDARDS UNDER THE ENVIRONMENT PROTECTION ACT 2002

A number of Standards have been promulgated as Regulations under the EPA2002 (as amended); the following standards deemed applicable to the proposed project include, but are not limited to, the following:

2.1.1 STANDARDS FOR AIR

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

Table 2-1 below reproduced the Second Schedule (Regulation 5): Ambient Air Quality Standards and Measurement Methods

Table 2-1: Environment Protection (Standards for Air) Regulations 1998 - Ambient Air Quality Standards

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 Analyzer, Colorimetry
Nitrogen Dioxide	200	24-hour	Sodium Arsenite, Chemiluminescence
Carbon Monoxide	25,000 10,000	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.			

The Ambient Air Quality limits allowed for under national laws are more stringent than the World Bank Group EHSG - WHO Ambient Air Quality Guidelines; hence the national laws shall apply to the project during construction and operation.

2.1.2 STANDARDS FOR NOISE

Control of Noise is regulated by the Environment Protection (Control of Noise) Regulations 2022 (Government Notice No. 251 of 2022).

Standards for noise emissions are set under the Environment Protection (Environmental Standards for Noise) Regulations 2022 (Government Notice No. 250 of 2022).

Table 2-2 below reproduces the Schedule (Regulation 3): Noise Exposure Limits

Table 2-2: Environment Protection (Environmental Standards for Noise) Regulations - Noise Exposure Limits

Noise Type	***Time***	***Noise Exposure Limits In dB(A) Leq***
Industrial Noise	07.00 - 21.00 hrs 21.00 - 07.00 hrs of following day	60 * 55 *
Neighbourhood Noise	7.00 - 18.00 hrs 18.00 - 21.00 hrs 21.00 – 07.00 hrs of following day	60 55 50
Power Station Noise In residential area	07.00 - 21.00 hrs 21.00 - 07.00 hrs of following day	60 55
Power Station Noise In any other area	At any time	70
*Apply a tonal character adjustment of +5 dB(A) to the measured value where the noise has a definite continuous note such as a whine or hiss		

Given that "neighbourhood noise'' does not apply to noise emissions from aircraft or traffic, these standards will apply to the project during construction and to the project during operation for noise sources other than aircraft or traffic. Noise emissions from aircraft or traffic during operations will comply with the World Bank Group General Environmental, Health and Safety Guidelines (EHSG).

2.1.3 EFFLUENT DISCHARGE STANDARDS

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

Table 2-3 below reproduces the Second Schedule (Regulation 4): Effluent discharge Standards.

Table 2-3: Environment Protection (Standards for effluent discharge) - Maximum permissible limit

Parameter	***Unit***	***Maximum permissible limit***	
		Land/Underground	***Surface water courses***
Total coliforms	MPN per 100 ml	-	<400
E. Coli	MPN per 100 ml mg/1	<1000	<200
Free Chlorine	mg/1	-	0.5
Total Suspended Solids (TSS)	mg/1	45	35
Reactive Phosphorus		10	1
Colour	-	Not objectionable	
Temperature	°C	40	
pH	-	5 – 9	
Chemical Oxygen Demand (COD)	mg/1	120	
Biochemical Oxygen Demand (BOD5)	mg/1	40	
Chloride	mg/1	750	
Sulphate	mg/1	750	
Sulphide	mg/1	0.002	
Ammoniacal Nitrogen	mg/1	1	
Nitrate as N	mg/1	10	
Total Kjeldahl Nitrogen (TKN)	mg/1	25	
Nitrite as N	mg/1	1	
Aluminium	mg/1	5	

Arsenic	mg/1	0.1
Berylium	mg/1	0.1
Boron	mg/1	0.75
Cadmium	mg/1	0.01
Cobalt	mg/1	0.05
Copper	mg/1	0.5
Iron	mg/1	2.0
Lead	mg/1	0.05
Lithium	mg/1	2.5
Manganese	mg/1	0.2
Mercury	mg/1	0.005
Molybdenum	mg/1	0.01
Nickel	mg/1	0.1
Selenium	mg/1	0.02
Sodium	mg/1	200
Total Chromium	mg/1	0.05
Vanadium	mg/1	0.1
Zinc	mg/1	2
Oil & Grease	mg/1	10
Total Pesticides	mg/1	0.025
Total organic halides	mg/1	1
Cyanide (as CN)	mg/1	0.1
Phenols	mg/1	0.5
Detergents (as LAS*)	mg/1	15
(* Linear Alkylate Sulphonate)		

Standards for discharge into the ocean are set under the Environment Protection (Standards for effluent discharge into the ocean) Regulations 2003.

Table 2-4 below reproduces the Schedule (Regulation 3): Effluent discharge Standards into the ocean being permissible limits or range for the corresponding parameters.

Table 2-4: Environment Protection (Standards for effluent discharge into the ocean) - Maximum permissible limit

Parameter	***Unit***	***Permissible limits***
Temperature	**°C**	**40**
PH	*-*	*5 – 9*
Floatables	*mm*	*6*
Biochemical Oxygen Demand (BOD5)	**mg/l**	**250**
Chemical Oxygen Demand (COD)	*mg/l*	*750*
Suspended Solids	*mg/l*	*300*
Cadmium	*µg/l*	**20**
Chromium (VI)	*µg/l*	*100*
Chromium, Total	*µg/l*	*500*
Cyanides (as CN-)	*µg/l*	*100*
Lead	*µg/l*	*2*
Nickel	*µg/l*	*2*
Zinc	*µg/l*	*2*
Total Mercury	*µg/l*	*10*
Arsenic	*µg/l*	*200*
Total pesticides	**mg/l**	**1**
Oil & Grease	*mg/l*	*20*

Standards of effluent for use in irrigation are set under the Environment Protection (Standards for effluent for use in irrigation) Regulations 2003.

It is understood that treated effluent will be reused for irrigation; hence these standards shall be applicable.

Table 2-5 below reproduces the Schedule (Regulation 3(1)): Effluent discharge Standards for use in irrigation being maximum limits for the corresponding parameters except where an upper and a lower limit are specified.

Table 2-5: Environment Protection (Standards for effluent for use in irrigation) - Maximum permissible limit

List	*Parameter*[1]	*Unit*	*Standards*
A	pH Colour	- -	5 – 9 not objectionable
B	Biochemical Oxygen Demand (BOD_5) Chemical Oxygen Demand (COD) Suspended Solids Chloride Sulphate Nitrate N Total Dissolved Solids Sodium Adsorption Ratio (SAR)	mg/l mg/l mg/l mg/l mg/l mg/l mg/l -	40 120 45 250 500 20 2000 <6
C	Aluminium Arsenic Beryllium Boron Cadmium Chromate chromium Cobalt Copper Fluorine Iron Lead Lithium Manganese Molybdenum Nickel Mercury Selenium Vanadium Zinc	mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l mg/l	5 0.10 0.10 0.75 0.01 0.10 0.05 0.20 1 5 2 2.5 0.2 0.01 0.20 0.02 0.02 0.10 2
D	Total Pesticides Oil & Grease Detergents)	mg/l mg/l mg/l	0.025 10 5
E	Faecal coliforms[2] Intestinal nematodes[2]	MPN per 100 ML Arithmetic mean no. of eggs per Litre	1000[3] ≤1

Notes: -
(a) [1]A 95% compliance limit will be accepted based on the series of samples taken in a year
(b) [2]Prohibited for crops to be eaten raw
(c) [3]200 faecal coliforms MPN/100 ml for public lawns such as hotel lawns, with which the public may have direct contact

2.1.4 DRINKING WATER STANDARDS

Drinking Water Standards are set under the Environment Protection (Drinking Water Standards) Regulations 1996.

Any water used for potable water supply shall meet these standards

Table 2-6 below reproduces the Second Schedule (Regulation 3): Drinking Water Standards being maximum limits for the corresponding parameters except where an upper and a lower limit are specified.

Table 2-6: Environment Protection (Drinking Water Standards) - Maximum permissible limit

Parameter	***Standards***
Microbial	
E. coli	must not be detectable in any l00ml 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 consecutive samples
Physico-chemical	
pH	6.5-8.5
Total dissolved solids	1000mg/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	0.01 mg/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	250mg/l
Nitrate	50 mg/l(as No3)
Nitrite	3 mg/1(as No2)
Pesticides	
Aldrin and Dieldrin	0.03 microgram/l
DDT	2 microgram/l
HCB	1 microgram/l
Methoxychlor	20 microgram/l
Heptachlor and Heptachlor Oxide	0.03 microgram/l

2.1.5 STANDARDS FOR HAZARDOUS WASTES

Standards for hazardous wastes are set under the Environment Protection (Standards for hazardous wastes) Regulations 2001.

Table 2-7 below provide a snapshot of the First Schedule (Regulation 2): Hazardous wastes indicating the anticipated hazardous waste streams applicable to the project.

Table 2-7: Environment Protection (Standards for hazardous wastes) - Hazardous wastes

	Waste stream	***Description of waste***
1.	Batteries and accumulators	Electrolyte from batteries and accumulators Lead batteries Mercury dry cells Ni-Cd batteries
2(a) (b) (c)	Electronic industry Coolants, foam/aerosol propellants Solvent and coolant recovery (still bottoms)	Chlorofluorocarbons Sludges or solid wastes containing solvents Solvents
3.	Human or animal health care and research related to such health care	- Waste from diagnosis, treatment or prevention of disease and natal care.
5.	Manufacture, formulation, supply and use of adhesive and sealants (including waterproofing products)	Adhesives and sealants sludges Waste adhesives and sealants

2.2 WORLD BANK GROUP ENVIRONMENT, HEALTH, AND SAFETY GUIDELINES

2.2.1 THE WORLD BANK GROUP GENERAL ENVIRONMENTAL, HEALTH AND SAFETY GUIDELINES (EHSG)

The Environmental, Health and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). They contain the performance levels and measures that are normally acceptable to the World Bank Group, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology.

The General EHS Guidelines contain the following information:

1. Environmental
   - 1.1 Air Emissions and Ambient Air Quality
   - 1.2 Energy Conservation
   - 1.3 Wastewater and Ambient Water Quality
   - 1.4 Water Conservation
   - 1.5 Hazardous Materials Management
   - 1.6 Waste Management
   - 1.7 Noise
   - 1.8 Contaminated Land
2. Occupational Health and Safety
   - 2.1 General Facility Design and Operation
   - 2.2 Communication and Training
   - 2.3 Physical Hazards
   - 2.4 Chemical Hazards
   - 2.5 Biological Hazards
   - 2.6 Radiological Hazards
   - 2.7 Personal Protective Equipment
   - 2.8 Special Hazard Environments
   - 2.9 Monitoring
3. Community Health and Safety
   - 3.1 Water Quality and Availability
   - 3.2 Structural Safety of Project Infrastructure
   - 3.3 Life and Fire Safety
   - 3.4 Traffic Safety
   - 3.5 Transport of Hazardous Materials
   - 3.6 Disease Prevention
4. Construction and Decommissioning
   - 4.1 Environment
   - 4.2 Occupational Health and Safety
   - 4.3 Community Health and Safety

3.7 Emergency Preparedness and Response

The following guidelines/standards are provided in the General EHSG:

Ambient Air Quality. Projects with significant sources of air emissions, and potential for significant impacts to ambient air quality, should prevent or minimize impacts by ensuring that · Emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines shown in table 2-8 below.

Table 2-8: WHO Ambient Air Quality Guidelines

	Averaging Period	*Guideline value in µg/m³*
Sulphur Dioxide SO_2	24- hour 10 minute	125 (Interim target-1) 50 (Interim target-2) 20 (guideline) 500 (guideline)
Nitrogen Dioxide NO_2	1-year 1-hour	40 (guideline) 200 (guideline)
Particulate Matter PM_{10}	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $PM_{2.5}$	1-year 24-hour	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone O_3	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Sanitary Wastewater. If sewage from the industrial facility is to be discharged to surface water, treatment is required to meet national or local standards for sanitary wastewater discharges or, in their absence, the indicative guideline values applicable to sanitary wastewater discharges shown in Table 2-9 below.

Table 2-9: 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] /100ml	400 [a]
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		

Noise Level Guidelines. Noise impacts should not exceed the levels presented in Table 2-10 or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site

Table 2-10: Noise Level Guidelines

	One Hour L_{Aeq} (dBA)	
Receptor	Day time 07:00 - 22:00	Night time 22:00 - 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

2.2.2 THE WORLD BANK GROUP EHSG FOR AIRPORTS PROJECTS

This EHS Guidelines for Airports apply to the operation of commercial airports. It provides a summary of EHS issues associated with airports which occur during the Operation phase, along with recommendations for their management. This document is organized according to the following sections:

1) Section one provides information about industry-specific impacts and management;
2) Section two describes performance indicators and monitoring; and
3) Section three concludes with references

Standards applicable are those provided in the General EHS Guidelines.

2.2.3 THE WORLD BANK GROUP EHSG FOR WASTE MANAGEMENT FACILITIES

The EHS Guidelines for Waste Management cover facilities or projects dedicated to the management of municipal solid waste and industrial waste, including waste collection and transport; waste receipt, unloading, processing, and storage; landfill disposal; physico-chemical and biological treatment; and incineration projects.

These Guidelines provide the following specific Standards:

- Air Emission Standards for Municipal Solid Waste Incinerators
- Air Emission Standards for Hazardous Waste Incinerators
- Air Emission Standards for Industrial Non-Hazardous Waste Incinerators
- Effluent Standards for Landfills

2.2.4 THE WORLD BANK GROUP EHSG FOR CONSTRUCTION MATERIAL EXTRACTION

This document includes information relevant to construction materials extraction activities such as aggregates, limestone, slates, sand, gravel, clay, gypsum, feldspar, silica sands, and quartzite, as well as to the extraction of dimension stone.

It addresses stand-alone projects and extraction activities supporting construction, civil works, and cement projects.

Although the construction materials extraction guidelines emphasize major and complex extraction schemes, the concepts are also applicable to small operations.

2.3 International Civil Aviation Organization Guidelines

Good International Industry Practices and Standards for Airports as set out by the International Civil Aviation Organization (ICAO) are relevant to the project.

ICAO has established five comprehensive Strategic Objectives, namely:

Safety. Enhance global civil aviation safety. This Strategic Objective is focused primarily on the State's regulatory oversight capabilities. The Global Aviation Safety Plan (GASP) outlines the key activities for the triennium.

Air Navigation Capacity and Efficiency. Increase the capacity and improve the efficiency of the global civil aviation system. Although functionally and organizationally interdependent with Safety, this Strategic Objective is focused primarily on upgrading the air navigation and aerodrome infrastructure and developing new procedures to optimize aviation system performance. The Global Air Navigation Capacity and Efficiency Plan (Global Plan) outlines the key activities for the triennium.

Security & Facilitation. Enhance global civil aviation security and facilitation. This Strategic Objective reflects the need for ICAO's leadership in aviation security, facilitation and related border security matters.

Economic Development of Air Transport. Foster the development of a sound and economically-viable civil aviation system. This Strategic Objective reflects the need for ICAO's leadership in harmonizing the air transport framework focused on economic policies and supporting activities.

Environmental Protection. Minimize the adverse environmental effects of civil aviation activities. This Strategic Objective fosters ICAO's leadership in all aviation-related environmental activities and is consistent with the ICAO and UN system environmental protection policies and practices.

2.4 Legal Gap Analysis

Table 2-11 below summarizes the Key Requirements under World Bank Standards, the national legislation and provides a gap analysis, to the extent possible.

Table 2-11: Legislative Gap Analysis

Key Requirements of WBG ESS	***Related Provisions in Mauritius Legal framework***	***Gap Analysis***
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	- Environmental Protection Act 2002 as amended (which refers to Environmental impact	ESS 1 has a greater focus on social risks in comparison to the national legislation which focuses on the environmental aspects. Notably, the EIA process does not contain specific provisions on the engagement of vulnerable groups in consultation.

Key Requirements of WBG ESS	*Related Provisions in Mauritius Legal framework*	*Gap Analysis*
	Assessment) and applicable Regulations - Environment Protection (Declaration of Environmental Laws) Regulations 2005.	Therefore, there is a gap between ESS1 and the various national laws. **ESS1 and national legal framework to apply**
ESS2: Labour and Working Conditions	- The Workers Right Act - The Employment Relations Act No. 32 of 2008; and - The Occupational Safety and Health Act 28 of 2005 and its regulations, including but not limited to: Occupational Safety and Health (Foundries and Construction Works) Regulations GN No 167 of 2019, Occupational Safety and Health (Personal Protective Equipment) Regulations GN No 146 of 2012, Occupational Safety and Health (Noise at Work) GN No 107 of 2012; and Occupational Safety and Health (Employees' Lodging Accommodation) GN No 27 of 2011.	Mauritius' labour law complies with standards set in ILO conventions regarding workers management requirements, labour conditions, the prohibition of discrimination, freedom of association, the prohibition of child and forced labour, grievance mechanism, and OHS requirements. Domestic law is more stringent the ESS2 regarding the legal age to work (16 instead of 14); There is a gap between domestic law and ESS2 requirements regarding due diligence for child labour and forced labour within the supply chain and primary suppliers., The Occupational Safety and Health Act 28 of 2005 and its regulations shall apply **ESS2 and national legal framework to apply**
ESS3: Resource Efficiency and Pollution Prevention and Management	- Environmental Protection Act 2002 as amended (which refers to Environmental impact Assessment) and applicable Regulations - Environment Protection (Declaration of	The national legal framework is in place. There might be some weaknesses in the application of some aspects such as waste management due to lack of specialised facilities in Rodrigues . In terms of air emissions limits the World Bank Group EHSG - WHO Ambient Air Quality Guidelines shall apply as it is more stringent than the limits allowed for under national laws.

Key Requirements of WBG ESS	*Related Provisions in Mauritius Legal framework*	*Gap Analysis*
	Environmental Laws) Regulations 2005.	In terms of Effluent Discharge to the ocean, likewise the WB EHSG shall apply as they are generally more stringent than the Standards for Mauritius **ESS3 and national legal framework to apply**
ESS4: Community Health and Safety	- The Environment Protection (Collection, Storage, Treatment, Use and Disposal of Waste Oil) Regulations of 2006; The Environmental Protection (Environmental Standards for Noise) Regulations of 2022; - The Climate Change Act No. 11 of 2020; - The Environment Protection (Standards for hazardous wastes) Regulations of 2001; - The Planning and Development Act No. 32 of 2004; and The Public Health Act No. 47 of 1925.	Communities' health and safety protection in project development is not explicitly considered in Mauritius legislation. These are considered generally in the Environment Protection Act No. 19 of 2002 in the scope of the EIA, which includes the "social, economic and cultural effects which the undertaking is likely to have on the people and society" (§18). Other legislation and regulations regarding communities' health and safety in Projects are included in sectoral legislation detailed on this line. Main gaps regard: - The absence of consideration for the use of ecosystem services by communities; - No requirements to implement programs to minimize the potential for community exposure to disease during projects implementation; - No consideration for risks posed by security guards in projects **ESS4 and national legal framework to apply**
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	- The Land Acquisition Act - The Planning and Development Act	Overall, Mauritius' legal framework is not aligned with ESS5 requirements. Whereas it is aligned with the requirement to pay a compensation at replacement cost and market value for loss of property and opportunity, the gaps are the following: • The Land Acquisition Act does not require to limit expropriation operations at the strict minimum; • Only formal occupants are entitled to compensation whereas informal occupants, also named "squatters", are not eligible to resettlement (only upon a decision from the Minister); • General requirements to restore livelihood in the Planning and Development Act. • No public consultation or engagement with impacted communities prior decision to expropriate;

Key Requirements of WBG ESS	***Related Provisions in Mauritius Legal framework***	***Gap Analysis***
		• No grievance mechanism required, only judicial remedy; • Compensation in kind only offered for land, not for structures; • No requirement to elaborate a RAP; • No specific measures for vulnerable groups. **ESS5 and national legal framework to apply**
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	- All laws listed under section 3.1 'Main National Legislation on Environmental Aspects'	The national legal framework is in place and meets the requirements under ESS6 for protection and conservation of biodiversity and habitats. Sustainable Management of Living Natural Resources does not apply for the present project **ESS6 and national legal framework to apply**
ESS8: Cultural Heritage	- National Heritage Fund (NHF) Act No. 40 of 2003 - Planning and Development Act No. 32 of 2004 - Environment Protection Act No. 19 of 2002	The national legal framework on the protection of cultural heritage includes significant gap with ESS8, including: the absence of a chance find procedure, no provisions on public participation in cultural heritage protection, no reference to the need to share benefits from the use of cultural heritage. **ESS8 to apply**
ESS10: Stakeholder Engagement and Information Disclosure	Environment Protection Act of 2002, Section 20	Several gaps are identified: According to the Environment Protection Act, public participation is mostly foreseen through comments in written form. Since comments are mostly done in a written form through specific points, people with limited education or disability are less able to provide observations and are, therefore, less involved in engagement activities. **ESS10 and national legal framework to apply**

3 SUMMARY OF THE ENVIRONMENTAL AND SOCIAL IMPACTS

This section of the report provides a summary of impacts identified during the construction and operation phases, as well as identified cumulative impacts.

A detailed assessment and description can be obtained from the relevant chapters in the ESIA that was prepared for the project.

3.1 TEMPORARY IMPACTS DURING CONSTRUCTION PHASE

The summary of Temporary Impacts during Construction Phase is given in Table 3-1 below.

Table 3-1: Summary of Temporary impacts during Construction Phase

Context	Sub-context	Impact ID	Potential temporary Impact during construction
Physical	Marine	Phy-Mar-W-Temp-1	Increase in turbidity Modification of the baseline water quality
		Phy-Mar-W-Temp-2	Modification of the seabed Modification of the baseline marine physical conditions
		Phy-Mar-W-Temp-3	Dredging in front of the boathouse Modification of the baseline water quality and marine physical conditions
		Phy-Mar-W-Temp-4	WTP treated water discharge Plume dispersion Modification of the baseline water quality
		Phy-Mar-W-Temp-5	Desalination plant diluted brine discharge Plume dispersion Modification of the baseline water quality
	Hydrology	None	-
	Hydrogeology and geotechnics	Phy-Kar-W-Temp-1	Vibrations Impact on above ground and underground features structural integrity
		Phy-Kar-W-Temp-2	Mass haul Hauling equipment movement inducing vibration and noise pollutions
		Phy-Kar-W-Temp-3	Erosion Groundwater ingress and impact on ground stability
		Phy-Kar-W-Temp-4	Excavation Noise
		Phy-Kar-W-Temp-5	Cut and fill balance impacts: transport noise and air pollution due to trucks traffic
	Water resource and wastewater	Phy-Wat-W-Temp-1	Impact on public potable water supply Increase in potable water demand which may induce water shortage for local population
		Phy-Wat-W-Temp-2	Impact of works on water resource resulting from impact on karstic groundwater
		Phy-Wat-W-Temp-3	Works wastewater Ground and underground pollution Seawater pollution

Context	Sub-context	Impact ID	Potential temporary Impact during construction
		Phy-Wat-W-Temp-4	Risk of accidental pollution Water contamination
		Phy-Wat-W-Temp-5	Desalination plant Impact on the soil salinity ground, underground water quality, which subsequently has adverse impacts on seawater and marine life and ecosystems
Biological	Terrestrial habitat	None	-
	Terrestrial flora	None	-
	Terrestrial fauna	BioT-Fau-W-Temp-1	Impact on Pteropus rodricensis (Chiroptera) 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
	Marine habitat	BioM-Hab-W-Temp-1	Effects of suspended matter and water turbidity on ecosystems
		BioM-Hab-W-Temp-2	Effects of siltation and modification of the seabed on ecosystems
		BioM-Hab-W-Temp-3	Effects of WWTP and desalination plant discharge on ecosystems
	Marine species	BioM-Spe-W-Temp-1	Marine turtles Disturbance or risk of injury due to light and noise generated by ships and works; Risk of asphyxiation by suspending particles; Decrease in trophic resource
		BioM-Spe-W-Temp-2	Marine mammals Disturbance or risk of injury due to light and noise generated by ships and works; Risk of asphyxiation by suspending particles; Decrease in trophic resource
Transport network, electricity supply and waste management	Transport network	Trspt-W-Temp-1	Impact on the transport network Traffic disturbance
	Electricity supply	Elec-W-Temp-1	Impact on electricity supply Increase in electricity demand which may induce power shortage for local population
	Waste management	Sol-Wst-W-Temp-1	Impact on the solid waste management Increase in waste generation (demolition waste, construction waste and general waste) Stress on waste management facilities of a small island with little treatment/recycling possibilities
		SE-Demo-W-Temp-1	

Context	Sub-context	Impact ID	Potential temporary Impact during construction
Socio-economics	Demographics and social dynamics		Increase of the population of Plaine Corail and its surroundings
		SE-Demo-W-Temp-2	Evolution of internal relations and in relation to foreign influx
		SE-Demo-W-Temp-3	Social tensions arising from hiring conditions
		SE-Demo-W-Temp-4	Temporary employment opportunities for neighbouring residents
	Health and safety of the communities	SE-Safe-W-Temp-1	Increased risk of accidents due to traffic
		SE-Safe-W-Temp-2	Respiratory discomfort of the inhabitants of the towns closest to the building area
	Health and safety of workers	SE-Wor-W-Temp-1	Increased risk of accidents and illnesses
Air quality and noise	Air quality	Air-W-Temp-1	Alteration of air quality due to construction activities
	Noise	Noi-W-Temp-1	Nuisance caused by noise due to construction activities
Heritage resources and visual environment	Landscape	Vis-W-Temp-1	Alteration of the living environment
		Vis-W-Temp-2	Increasing pressure on island landscape
	Palaeontology	Kar-W-Temp	loss of palaeontological specimens

3.2 PERMANENT AND IRREVERSIBLE IMPACTS DURING CONSTRUCTION PHASE

The summary of Permanent and Irreversible Impacts during Construction Phase is given in Table 3-2 below.

Table 3-2: Summary of Permanent and Irreversible Impacts during Construction Phase

Context	Sub-context	Impact ID	Impact description
Physical	Marine	Phy-Mar-W-Def-1	Alteration of the local bathymetry and shoreline
		Phy-Mar-W-Def-2	Modification of the local hydrodynamic processes
		Phy-Mar-W-Def-3	Modification of the sediment transit
		Phy-Mar-W-Def-4	Modification of the bathymetry due to the dredging to access jetty facilities
		Phy-Mar-W-Def-5	Remains of suspended particulate matter and sediment
	Hydrology	Phy-Hyd-W-Def-1	Transfer of sediments to the lagoon
	Hydrogeology and geotechnics	Phy-Kar-W-Def-1	Cavern collapse
		Phy-Kar-W-Def-2	Damage to caves
		Phy-Kar-W-Def-3	Groundwater flow disturbance
		Phy-Kar-W-Def-4	Pollution of groundwater
		Phy-Kar-W-Def-5	Cut and fill balance: impacts of material importation of exportation on extraction and storage sites
	Water resource and waste water	Phy-Wat-W-Def-1	Demolition of an unused reservoir
		Phy-Wat-W-Def-2	Impact on water resource
Biological	Terrestrial habitat	BioT-Hab-W-Def-1	Impact on grazing lands on basaltic resurgences
		BioT-Hab-W-Def-2	Impact on grazing lands on calcarenic substratum
		BioT-Hab-W-Def-3	Impact on coastal vegetation dominated by Ipomoea pes caprae
		BioT-Hab-W-Def-4	Impact on anthropized areas
		BioT-Hab-W-Def-5	Impact on dry forest
		BioT-Hab-W-Def-6	Impact on riparian vegetation
		BioT-Hab-W-Def-7	Impact on estuarine habitat
		BioT-Hab-W-Def-8	Impact on calcarenic dry lawns of anthropogenic origin

Context	Sub-context	Impact ID	Impact description
		BioT-Hab-W-Def-9	Impact on coastal grasslands dominated by secondary thickets (Lantana camara)
		BioT-Hab-W-Def-10	Impact on secondary thickets (Leucaena leucocephala)
	Terrestrial flora	BioT-Flo-W-Def-1	Impact on native species with a major sensitivity *Foetidia rodriguesiana, Hyophorbe verschaffeltii, Latania verschaffeltii, Polyscias rodriguesiana*
		BioT-Flo-W-Def-2	Impact on native species with a high sensitivity *Diospyros diversifolia, Terminalia bentzoe subsp. Rodriguesensis, Antirhea bifurcate, Adiantum rhizophorum, Sarcanthemum coronopus, Phyllanthus dumentosus, Mathurina penduliflora, Pleurostylia putamen, Pandanus heterocarpus, Zanthoxylum paniculatum, Clerodendrum laciniatum, Fernelia buxifolia*
		BioT-Flo-W-Def-3	Impact on native species with a medium sensitivity *Phyllanthus dumentosus, Camptocarpus sphenophyllus, Secamone rodriguesiana, Nephrolepis biserrate, Phymatosorus scolopendria*
		BioT-Flo-W-Def-4	Impact on native species with a low sensitivity *Dodonaea viscosa, Dracaena reflexa, Elaeodendron orientale, Ficus reflexa, Ficus rubra, Premna serratifolia, Thespesia populnea, Cynanchum viminale*
	Terrestrial fauna	BioT-Fau-W-Def-1	Impact on Pteropus rodricensis (Chiroptera) Loss of foraging habitat Risks of collision and death
		BioT-Fau-W-Def-2	Impact on *Tropidophora ssp & Omphalotropis ssp* (Gastropoda) loss of native gasteropoda individuals and their foraging habitat. However, only empty shells were found on the project footprint
		BioT-Fau-W-Def-3	Impact on Lygodactylus lugubris (Reptilia) Loss of habitat Death
	Marine habitat	BioM-Hab-W-Def-1	Effect of alteration of the shoreline on ecosystems
		BioM-Hab-W-Def-2	Effect of modification of the sediment transit on ecosystems
	Marine species	BioM-Spe-W-Def-1	Impact on marine turtles Loss of mobile species. risk of permanent abandonment of the egg-laying site.

Context	Sub-context	Impact ID	Impact description
		BioM-Spe-W-Def-2	Impact on marine mammals Loss of mobile species. marine turtles have the ability to migrate from affected areas, yet the risk cannot be considered as nil.
Socio-economics	Demographics and social dynamics	SE-Demo-W-Def-1	Physical displacement of the population affected by the project
		SE-Demo-W-Def-2	Involuntary economic and physical displacement of the active and non-resident population affected by the project
	Land	SE-Land-Def-1	Loss of houses or infrastructure due to involuntary displacement of the population affected by the project
	Agriculture and livestock	SE-Agri-W-Def-1	Loss of farmland and pasture in the construction area
		SE-Agri-W-Def-2	Loss of perennial crops
	Fishing	SE-Fish-W-Def-1	Loss of direct access to the fishermen landing sites
		SE-Fish-W-Def-2	Loss of fishing infrastructures
		SE-Fish-W-Def-3	Increased distances and travel times to fishermen landing sites
	Community mobility	SE-Mob-W-Def-1	Resettlement of displaced people from the main road line
Heritage resources and visual environment	Landscape	Vis-W-Def-1	Alteration of the living environment
		Vis-W-Def-2	Increased pressure on island landscape
	Palaeontology	Kar-W-Def	loss of palaeontological specimens

3.3 PERMANENT IMPACTS DURING OPERATION PHASE

The summary of Permanent Impacts during Operation Phase is given in Table 3-3 below.

Table 3-3: Summary of Permanent Impacts during Operation Phase

Context	Sub-context	Impact	Impact description
Physical	Marine	Phy-Mar-Op-1	Accidental spillage Terrestrial and marine pollution
		Phy-Mar-Op-2	Uncontrolled waste water discharges Terrestrial and marine pollution
		Phy-Mar-Op-3	WTP treated water discharge Terrestrial and marine pollution
		Phy-Mar-Op-4	Desalination plant discharge Terrestrial and marine pollution
		Phy-Mar-Op-5	Stormwater drainage Alteration of natural drainage paths, erosion and pollution
	Hydrology	Phy-Hyd-Op-1	Stormwater management flooding of facilities
		Phy-Hyd-Op-2	Flooding issues downstream of airport facilities
		Phy-Hyd-Op-3	Transfer of pollution to the natural environment
		Phy-Hyd-Op-4	Increase in supply of materials to the lagoon
	Hydrogeology and geotechnics	Phy-Kar-Op-1	Collapse/Erosion
		Phy-Kar-Op-2	Access to caves If located within the airport restricted zone , caves my not be accessible
		Phy-Kar-Op-3	Pollution of groundwater
	Water resource and wastewater	Phy-Wat-Op-1	Pollution of soil and surface water
		Phy-Wat-Op-2	Peak flows resulting in increasing soil erosion
		Phy-Wat-Op-3	Pollution of marine water
		Phy-Wat-Op-4	Extra burden on the water supply public network
Biological	Terrestrial habitat	None	-
	Terrestrial flora	None	-
	Terrestrial fauna	None	-

Context	Sub-context	Impact	Impact description
	Marine habitat	BioM-Hab-Op-1	Effect of accidental spillage on ecosystems
		BioM-Hab-Op-2	Effects of WWTP and desalination plant discharge on ecosystems
		BioM-Hab-Op-3	Effects of stormwater drainage on ecosystems
	Marine species	BioM-Spe-Op-1	Marine turtles Impact due to light
		BioM-Spe-Op-2	Marine mammals
Transport network, electricity supply and waste management	Transport network	Trspt-Op-1	Impact on the transport network
	Electricity supply	Elec-Op-1	Impact on electricity supply
	Waste management	Sol-Wst-Op-1	Impact on the solid waste
Socio-economics	Power, governance and civil society	SE-Gov-Op-1	Improved relations with directly and indirectly impacted communities
	Land	SE-Land-Op-1	Increasing social tensions in relation to the land resource
		SE-Land-Op-2	Evolution of land management procedures
	Agriculture and livestock	SE-Agri-Op-1	Change in livestock breeding procedures and farming methods
		SE-Agri-Op-2	Need to regenerate the farmland
		SE-Agri-Op-3	Decrease in livestock breeding activity
		SE-Agri-Op-4	Change of livestock breeding practices
		SE-Agri-Op-5	Increase in the rehabilitation time of agricultural surfaces

Context	Sub-context	Impact	Impact description
	Local economic context	SE-Eco-Op-1	Decrease in household incomes
		SE-Eco-Op-2	Increase in local production prices
		SE-Eco-Op-3	Increase in local production prices
		SE-Eco-Op-4	Increase in local development initiatives
		SE-Eco-Op-5	Increase in household incomes
		SE-Eco-Op-6	Change of the local economic landscape
		SE-Eco-Op-7	Opportunities for partnerships or cooperative operations
		SE-Eco-Op-8	Reinforcement of professional skills
	Living environment and landscape	SE-Liv-Op-1	Noise and sound pollution
Air quality and sound environment	Air quality	Air-Op-1	Deterioration of air quality due to increased airport capacity
	Noise	Noi-Op-1	Noise impact due to increased air traffic
Heritage resources and visual environment	Landscape	Vis-Op-1	Alteration of the living environment
		Vis-Op-2	Alteration to landform outside the Airport
		Vis-Op-3	Alteration to the island forest cover
	Palaeontology	Kar-Op	loss of palaeontological specimens

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

3.4 SUMMARY OF THE CUMULATIVE IMPACTS

A summary of cumulative impacts is provided in Table 3-4 below

Table 3-4: Summary of Cumulative Impacts

Theme	Positive impacts	Negative impacts
Tourism	Economic growth	
	Employment creation and additional accommodation.	
	Job creation	
	Income increase for the communities	
	Potential to create collaborative partnerships and operational opportunities between local communities	
	Potential to reinforce the professional skills of the surrounding populations	
		Carrying capacity of the island difficult to assess and may be exceeded
		Increase in tourist arrival having potential to impact the fragile eco-system of the island (terrestrial and marine)
		Potential to deplete local resources and to have to rely on import of good and services
Demography	Reversing the migration trend	
	Strengthening manufacturing, and primary sectors	
	Remigration adding value to the local economy	
	Education, wealth, and experience accumulated abroad contributing to improving socioeconomic conditions and quality of services offered	
Power, governance and civil society		Involuntary displacement of inhabitants, livestock breeders, and fishermen may cause tension between communities
Land resource		Increase in social tensions in relation to the land resource
		Potential to deplete local resources and to have to rely on import of good and services
Water supply	Boosting of the development and modernisation of the water supply infrastructure in order to cope with the demand generated by tourism development	Risk of water scarcity in Rodrigues due to tourism development generating a bigger demand
Wastewater management	Boosting of the development of the wastewater management infrastructure in order to cope with the resulting need generated by tourism development	Increased wastewater generation to be managed to avoid ground and underground pollution

Theme	Positive impacts	Negative impacts
Stormwater management	Boosting of the development of the stormwater management infrastructure in order to cope with the resulting need generated by the development works	Potential modification of natural drainage paths and infiltration areas due to modification of land use and construction leading to further erosion
Solid waste management	Boosting of the development of the solid waste management plan and infrastructure in order to cope with the resulting need generated by tourism development	Increased solid waste generation to be managed to avoid littering and pollution
Education and training	strengthening of the education system	Need for additional staffing and equipment
		lack of access to vocational training
Health	Increase in the capacity of health infrastructure and services.	
	Improved quality and coverage of health services through telemedicine and regular visits from medical practitioners.	
	Facilitation of evacuation and repatriation of patients.	
		Exposure of local population to imported diseases, lack of preparedness from medical professionals
		Medical facilities in Rodrigues are limited ; risk of health facilities being overwhelmed
Food production and supply		
Agriculture	Rehabilitation of abandoned agricultural lands could increase the amount of agricultural land available for cultivation, which could lead to higher levels of agricultural production and increased food security.	Increased pressure on natural resources, particularly water resources, which could exacerbate existing water scarcity challenges in Rodrigues.
	Measures for increased water production could improve water availability for agricultural purposes, which could support expanded agricultural activities.	Increased use of chemical fertilizers and pesticides could have negative environmental impacts, including soil degradation and water pollution.
	Improved training in modern agricultural production techniques could increase the efficiency and productivity of agricultural operations, potentially leading to higher yields and greater profitability.	Depending on the types of crops grown, expanded agricultural activities could contribute to deforestation or other types of habitat destruction
	Development of a land suitability map could enable better land planning and management, which could lead to more sustainable agricultural practices and higher levels of productivity.	Possible overproduction or an oversupply of certain crops, which could depress prices and negatively impact the incomes of local farmers.
		Decrease in income from agriculture during the adjustment period
		Relocated Sainte Marie villagers will need to cultivate new parcels of land that have not been previously farmed

Theme	Positive impacts	Negative impacts
		Agricultural harvests are expected to be lower during the first few years of cultivation, leading to a decline in agricultural incomes
Livestock breeding	Livestock farming provides a source of income for the island's inhabitants through both local consumption and export to Mauritius.	Intensive methods used for raising some types of livestock can have negative environmental impacts, such as water pollution and soil degradation.
	The tradition of raising livestock has cultural significance and can be an important part of local identity.	If livestock farming is not managed properly, it can lead to overgrazing and deforestation
	Livestock farming can contribute to food security on the island.	Water scarcity and land management policy challenges may limit opportunities to produce and export more meat.
	Genetic improvements in cattle, better animal health and nutrition, expected to increase average weight of cattle from 300 kg to 400 kg.	
Off-Lagoon fisheries	Increase in availability of choices of demersal fish for consumption	
	Off-lagoon fishing represents significant potential for economic growth	
	Higher supply of superior grade fish	
	Creation of a robust value chain for off-lagoon industry which will stimulate local entrepreneurship among youth	
	Increase in employment and revenue for off-lagoon fishing activities	
	Increased revenue for fishermen fishing in the lagoon	
		Potential to deplete local resources and to have to rely on import of good and services
The reduction of traditional agriculture, livestock, and fishing activities	Creation of opportunities for new economic activities	It may have an impact on the income of households in the airport area, which could lead to a ripple effect on their financial stability and have a significant impact on the social and economic functioning of the local communities.
	Increase in local development initiatives	It may increase the prices of locally produced goods and services, which could negatively affect the purchasing power of households who rely on these goods and services
		It may have a negative impact on some households who rely on these traditional activities for their primary source of income.
Critical Habitat: Change in land use		Potential impact on critical habitats following the use of available land for the development of new infrastructure for the increasing population (remigration for example, in addition to tourists)

Theme	Positive impacts	Negative impacts
Critical Habitat: Marine	Like for Water Supply and Wastewater themes above, boosting of the development of the water supply and wastewater management infrastructure in order to cope with the demand generated by tourism accommodation development and activities	Potential impact on marine habitat due to discharges at sea with increased water usage and wastewater generation, tempering with marine habitats due to touristic activities, increased pressure on marine resources
Critical Habitat: Terrestrial		Potential impact on terrestrial habitat due to development of new hotels and tourism activities, tempering with terrestrial sensitive habitats due to touristic activities, increased pressure on terrestrial resources
Noise & Air Quality		No significant impact regarding Noise due to the new types of flights. Potential impact on air quality due to increased road traffic

4 SUMMARY OF THE ENVIRONMENTAL AND SOCIAL MITIGATION MEASURES

This section of the report reproduces from the ESIA report a summary of mitigation and or compensation measures proposed for each potential impact identified.

4.1 TEMPORARY IMPACTS DURING CONSTRUCTION PHASE AND MITIGATION OR COMPENSATION MEASURES

The summary of Temporary Impacts during Construction Phase and mitigation or compensation measures is given in Table 4-1 below.

Table 4-1: Summary of Temporary impacts during construction phase and mitigation or compensation measures

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	
		Phy-Mar-W-Temp-4	WTP treated water discharge	Adverse	Low	None	None	Low
		Phy-Mar-W-Temp-5	Desalination plant diluted brine discharge	Adverse	Low	None	None	Low
	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. (The exact number will be determined in the traffic management plan, as field work has just been completed in March 2023.)	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 cut 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	

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
		Phy-Kar-W-Temp-4	Excavation Noise	Adverse	High	Phy-Kar-Mit-7	No use of explosive charge, decreasing noise impact	Medium
						Phy-Kar-Mit-8	No use of explosive charge	
						Phy-Kar-Mit-9	Work only during the day and inform local authorities and communities about the health and safety plan applicable on work site, as the allowable working hours are 45 hours per week.	
						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	Choose the closest extraction site for fill material / no export of excess material	Medium
	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. Note: This is part of the discussions that will be held with RPUC during their rehabilitation works of the desalination plants on the island. Thus, temporarily provide drinking water from sea water to people currently connected to Caverne Bouteille plant Coordinate the water supply option according to Water Development Strategies of Rodrigues Island (updated in 2022 by BRL Report)	Negligible
		Phy-Wat-W-Temp-3	Works wastewater	Adverse	Major	Phy-Wat-Av-3	Provide a temporary wastewater treatment plant dedicated to the site.	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 - Emergency preparedness and response plan	Negligible
		Phy-Wat-W-Temp-5	Desalination plant	Adverse	High	Phy-Wat-Av/Mit-5	Good engineering design to reduce the impacts (namely intake via a borehole rather than directly from the sea, diluted brine discharge via borehole or zero liquid discharge via an evaporator)-More details in relevant section. Importance of ESMP & ESCP in the contractor's contract	Negligible to low
Biological	Terrestrial habitat	None	-	-	-	-	-	-
	Terrestrial flora	None	-	-	-	-	-	-
	Terrestrial fauna	BioT-Fau-W-Temp-1	Impact on Pteropus rodricensis (Chiropter)	Adverse	Low	None	None	Low
	Marine habitat	BioM-Hab-W-Temp-1	Effects of suspended matter and water turbidity on ecosystems	Adverse	High	None	Apply measures to reduce water turbidity (Phy-Mar-Mit-1 to 5)	Medium
		BioM-Hab-W-Temp-2	Effects of siltation and modification of the seabed on ecosystems	Adverse	Low	None	Apply measures to reduce water turbidity (Phy-Mar-Mit-1 to 5)	Low
		BioM-Hab-W-Temp-3	Effects of WWTP and desalination plant discharge on ecosystems	Adverse	Low	None	Low volumes discharged and low sensitivity of adjacent ecosystems	Low

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
	Marine species	BioM-Spe-W-Temp-1	Marine turtles	Adverse	(To define) Medium	BioM-Mit/-1	Type and orientation of lighting can reduce the impact of artificial light on wildlife	Low
						BioM-Mit/-2	Lamps with a broad spectrum or white light should be avoided in favour of lamps with yellow, amber to red light	
		BioM-Spe-W-Temp-2	Marine mammals	Adverse	Low	None	Low attendance of marine mammals at the study site (too shallow depths).	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 which requires a police escort for the mobilization of construction equipment.	
						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 works as much as possible during electric underload periods.	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	
						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 inhabitants of 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	Air-W-Temp-1		Adverse	Medium	Air-Mit-1	Impose speed limits 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 quality and noise			Alteration of air quality due to construction activities			Air-Mit-2	Regularly water sprinkle 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 works and limit works during evening period: from 7h00 pm to 6h00 am.	Low
						Noi-Mit-2	Machinery and equipment must be regularly maintained in accordance with the manufacturer's requirements.	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 by avoiding significant works at night	
						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	Planting is 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	-

4.2 Permanent and irreversible impacts during Construction Phase and mitigation or compensation measures

The summary of Permanent and Irreversible Impacts during Construction Phase and mitigation or compensation measures is given in Table 4-2 below.

Table 4-2: Summary of Permanent and Irreversible Impacts during construction phase and mitigation or compensation measures

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 settlement/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	Low	Phy-Wat-Comp-5	-	Low
		Phy-Kar-W-Def-4	Pollution of groundwater	Adverse	Medium	Phy-Kar-Av/Mit-18	Daily maintenance and inspection of mobile construction equipment and plant	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-2	Relocation of the intake of Cavern Bouteille (replacement by seawater). To be addressed within the Water Development Strategies of Rodrigues with RPUC and RRA.	
		Phy-Kar-W-Def-5		Adverse	Medium	Phy-Kar-Mit-21	Impact assessment of the borrow area/quarry and have the site validated by the client	Low

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
			Cut and fill balance: impacts of material extraction and use			Phy-Kar-Mit-11	Choose the closest extraction site for fill material / Forbid the export of excess material. The Design Consultant GIBB is currently creating a 3D model of the earthworks to determine the appropriate balanced volume of materials and avoid any spoil. The previously determined excess volume was a rough estimate. The aim is to minimize excess material. Any eventual excess material will be used within the project area anyway.	
	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	Low	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	Negligible
						BioT-Mit-3	Moving the control tower out of the nature reserve (done in 2023)	
						BioT-Mit-4	Creating an arboretum of endemic species inside the airport landscaping	
						BioT-Mit-5	Transplant remarkable trees and ferns intended to be cut down during the works phase	
						BioT-Comp-6	Genetic conservation of populations of impacted rare species	
						BioT-Comp-7	Action plan towards more sustainable agricultural practices for native biodiversity.	
		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	Low	none	None	Low
		BioT-Hab-W-Def-9	Impact on coastal grasslands dominated by secondary thickets (Lantana camara)	Adverse	Low	none	None	Low

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
		BioT-Hab-W-Def-10	Impact on secondary thickets (Leucaena leucocephala)	Adverse	Low	none	None	Low
	Terrestrial flora	BioT-Flo-W-Def-1	Impact on native species with a major sensitivity	Adverse	High	BioT-Av-1	Avoid remarkable trees located at the edge of the project	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-2	Impact on native species with a high sensitivity	Adverse	High	BioT-Av-1	Avoid remarkable trees located at the edge of the project	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-3	Impact on native species with a medium sensitivity	Adverse	Medium	BioT-Av-1	Avoid remarkable trees located at the edge of the project	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-Flo-W-Def-4	Impact on native species with a low sensitivity	Adverse	Low	BioT-Av-1	Avoid remarkable trees located at the edge of the project	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	

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	
	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 ssp* & *Omphalotropis ssp* (Gastropoda)	Adverse	Medium	BioT-Mit-8	Collect molluscs from the Tropiphodora & Omphalotropis genus before and during earthworks	Low
		BioT-Fau-W-Def-3	Impact on Lygodactylus lugubris (Reptilia)	Adverse	Low	None	None	Low
	Marine habitat	BioM-Hab-W-Def-1	Effect of alteration of the shoreline on ecosystems	Adverse	Medium	BioM-Av-1	Avoid or move sparse coral heads located at the edge of the project t	Low
		BioM-Hab-W-Def-2	Effect of modification of the sediment transit on ecosystems	Adverse	Negligible	none	-	Negligible
	Marine species	BioM-Spe-W-Def-1	Marine turtles	Adverse	(to define)	BioM-Mit/-1	Appropriate choice of orientation and type of lamp	Low
					Low	BioM-Mit/-2	Appropriate choice of lamp diffusion spectrum	
		BioM-Spe-W-Def-2	Marine mammals	Adverse	Low	none	Low attendance of marine mammals at the study site (too shallow depths)	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
	Fishing	SE-Fish-W-Def-1		Adverse	Major	SE-Comp-1	Resettlement Action Plan (RAP)	Medium

Context	Sub-context	Impact ID	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
			Loss of direct access to the fishermen landing sites			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	
	Community mobility	SE-Mob-W-Def-1	Resettlement of displaced people from the main road line	Positive	Medium	None	-	Medium
Heritage resources and visual environment	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
						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	
	Palaeontology	Kar-W-Def	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 '-'

4.3 Permanent impacts during operation phase and mitigation or compensation measures

The summary of Permanent Impacts during Operation Phase and mitigation or compensation measures is given in Table 4-3 below.

Table 4-3: Summary of Permanent Impacts during Operation Phase and mitigation or compensation measures

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
		Phy-Mar-Op-3	WTP treated water discharge	Adverse	Low	Phy-Mar-Mit-8	Location of the outfall	Low
						Phy-Mar-Mit-9	Outfall sizing	
		Phy-Mar-Op-4	Desalination plant diluted brine discharge	Adverse	Low	Phy-Mar-Mit-10	Location of the outfall	Low
						Phy-Mar-Mit-11	Outfall sizing (diffuser)	
		Phy-Mar-Op-5	Stormwater drainage	Adverse	Medium	Phy-Mar-Mit-12	Relocation of southern discharges	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 tests (Aggregate test) 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	

Context	Sub-context	Impact	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
	Water resource and wastewater	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	-	-	-	-	-	-
	Terrestrial flora	None	-	-	-	-	-	-
	Terrestrial fauna	None	-	-	-	-	-	-
	Marine habitat	BioM-Hab-Op-1	Effect of accidental spillage on ecosystems	Adverse	High	none	Apply measures to reduce accidental impact (Phy-Mar-Mit-6 and 7)	Low
		BioM-Hab-Op-2	Effects of WWTP and desalination plant discharge on ecosystems	Adverse	Low	none	-	Low
		Bio-Hab-Op-3	Effects of stormwater drainage on ecosystems	Adverse	Low	none	-	Low
	Marine species	BioM-Spe-Op-1	Marine turtles	Adverse	Medium	BioM-Mit/-1	Appropriate choice of orientation and type of lamp	Low
						BioM-Mit/-2	Appropriate choice of lamp diffusion spectrum	
		BioM-Spe-Op-2	Marine mammals	Adverse	Low	None	Low attendance of marine mammals at the study site (too shallow depths).	Low
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	

Context	Sub-context	Impact	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
	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	
	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

Context	Sub-context	Impact	Impact description	Positive / adverse	Impact rating before mitigation	Measure ID	Measure	Residual Impact rating
						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 (Auxiliary Power Unit) and GPU (Ground Power Unit)	
						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 equipment	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	
						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	
	Palaeontology	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 '-'

5 ORGANIZATIONAL STRUCTURE AND ROLES AND RESPONSIBILITY

As the implementing agency, it is the responsibility of the Project Implementation Unit (PIU) to manage the environmental and social issues of the project and to ensure that the necessary mechanisms are developed and implemented by the Contractor.

A framework regarding the roles and responsibilities of the PIU and the Construction Contractor is presented in Table 5-1.

Table 5-1: Summary of roles and responsibilities

Responsibilities of the PIU
✓ Implementation of ESMP and related management plans and fulfilment of all commitments within the scope of ESCP Sharing the ESMP and management plans with the Contractor, guiding the Contractor in preparing the implementation plans, approving these plans ✓ Updating the ESMP when necessary and sharing additional commitments with the Contractor ✓ Employment of competent EHS staff and external experts to work under the project ✓ Providing EHS trainings to all Project and contractor staff ✓ Environmental review, monitoring and audits related to ESMP practices, evaluation of results ✓ Auditing contractor activities in line with ESMP requirements ✓ Ensuring compliance with project standards, making necessary emergency corrections in case of noncompliance ✓ Stopping work in any situation that threatens environment and human health and safety Ensuring stakeholder participation, implementing the grievance mechanism, ensuring continuous information transfer through open communication Promptly notify the Bank of any incident or accident related to the Project which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers including but not limited to; incidents and accidents encountered during construction works, environmental spills, etc. Provide sufficient detail regarding the incident or accident, findings of the Root Cause Analysis, indicating immediate measures or corrective actions taken or that are planned to be taken to address it, compensation paid, and any information provided by any contractor and supervision consultant, as appropriate. Ensure the incident report is in line with the World Bank's Environment and Social Incidence ✓ Response Toolkit (ESIRT). Subsequently, as per the Bank's request, prepare a report on the incident or accident and propose any measures to prevent its recurrence. Coordination of the actions and assessments if a change due to engineering/design changes, route/location changes, applicable legislation changes related to environmental and social issues, authority provision changes, any new environmental/social data is introduced, construction/operation strategy changes or stakeholders influence the project.
Responsibilities of the Contractors
✓ Fulfilment of all requirements of the ESMP and management plans ✓ Development of implementation and monitoring plans / procedures in line with the ESMP structure, implementation after the approval of the PIU and the Bank. Plans may include but not limited to Construction ESMPs, OHS Plans etc

- ✓ Implementation of additional requirements and commitments determined by the PIU and as stipulated in the contractual documents
- ✓ Ensuring compliance with project standards, obtaining all relevant permits and licenses
  Monitoring construction activities (including subcontractor activities) and taking measures within the scope of the ESMP or as instructed by the PIU and produce monthly EHS reports to be shared with the PIU
- ✓ Employment of competent EHS staff within the scope of the project
- ✓ Providing the necessary trainings to the contractor and sub-contractor staff on environmental, health and safety and social issues
- ✓ Providing follow-up and analysis of environmental and social incidents/ accidents
- ✓ Environmental inspections, monitoring and audits related to ESMP practices, reporting to the PIU
- ✓ Prompt notification of accident and incidents and keeping an incident register at construction site
- ✓ throughout the Project life.

6 ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

Sections 6.1 below relates to the Environmental and Social Management Plan during construction.

Sections 6.2 thereafter relates to the Environmental and Social Management Plan during operation.

6.1 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN FOR THE CONSTRUCTION PHASE

The contractor will be required to prepare a site-specific Construction Environmental and Social Management Plan (C-ESMP), as set out in the tender documents and this ESMP.

The site specific documentation will need to be submitted for clearance to the Project Implementation Unit (PIU) prior to mobilisation or start of construction as the case may be (refer in tables to 'period of performance' column.

The C-ESMP proposes actions to mitigate adverse impacts - or to enhance positive impacts - and to monitor performance throughout the project. Performance standard for environmental matters are generally local or international applicable standards, e.g. standards for air, noise, water quality, etc.

The Social Management Plan (SMP) primarily outlines the responses to the identified impacts and expresses a willingness to work towards the social integration of the project. The primary objective is twofold: firstly, to limit degradation and secondly, to promote sustainable development in the area of the project's intervention, which allows for the development of the local population and society.

The SMP provides several transversal tools that facilitate the development and use of these plans. An institutional arrangement is proposed that clarifies the roles and responsibilities of the various actors in their implementation.

The table below sets out the components which the contractor needs to address as part of his site specific C-ESMP.

The following tables are provided hereafter:

Table 6-1: Overall Environmental Management Plan for the construction phase
Table 6-2: Overall Social Management Plan for construction phase

Associated indicative cost estimates have been provided. These are to be borne by the contractor as part of his costs of contract.

Note for social measures costs. The 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, organizing and implementing the RAP of the communities identified as directly impacted by the project. Those estimated costs are mentioned in brackets in table 6-2.

Further details on the environment management plans to be implemented for the construction phase are provided at annex 9.1.

Further details on the social management plans to be implemented for the construction phase are provided at annex 9.2.

Table 6-1: Overall Environmental Management Plan for the construction phase

Theme	Management Plan	Main Management Actions/ Mitigation Measures	Period of performance	Performance Monitoring and reporting	Corrective measures (on exceedance of limit/non-compliance)	Cost Estimate in USD
Construction site Enabling facilities	Main plan: - Site establishment (including workers' camp) management plan Sub-plans/procedures/method statements - solid waste management (mostly domestic waste) - wastewater management - potable water supply including a desalination plant, management plan - electricity supply management plan - plant and equipment management plan - any other required plan that may arise from the contractors' specific construction methodology	The purpose of this Site establishment (including workers' camp) management plan is to ensure all aspects relating to construction facilities are taken into account. These include but are not limited to the following: - site establishment including workers' camp to be located at an adequate distance from any identified environmental sensitive area (buffer being different according to ESA, it shall be proposed by the contractor and approved by the PIU); - site establishment including workers' camp to be fenced and controlled - all utilities and services to be provided for the site are in accordance with legal requirements - site establishment including workers' camp solid waste (generally domestic waste) and liquid waste (wastewater) to be managed establishment including workers' camp - layout plan describing all areas (including storage, maintenance, etc) plan to be submitted	Plan to be - prepared in consultation with relevant stakeholders (public bodies for infrastructure and services) - submitted prior to mobilisation - implemented during the complete construction period and up to decommissioning and reinstatement of site	Daily inspection Weekly monitoring Monthly progress report to be submitted to the PIU Reporting on legal requirements (e.g. compliance with applicable environmental standards) and other requirements (contractual, etc)	Management plan to be strengthened where necessary and strictly adhered to	Employment of a full time environmental officer by the contractor over 30 months: 30,000 Note: Cost for employee only and excludes any water quality , air, noise or any other specific analysis which are taken directly in the specific themes below Provision and operation of a 60m3/day desalination plant and water quality analysis (inlet and outlet): 250,000 Provision of a compact 60m3/day wastewater treatment plant and water quality analysis (inlet and outlet): : 250,000
	Main Plan: - Demolition plan (disused structures/vacated houses) Sub-plans/procedures/method statements - demolition method statement - demolition waste management plan - traffic management plan - noise & air quality management plan - demolition waste handling, stockpiling, reuse or carting away management plan	The purpose of this Demolition Management Plan is to detail the procedures for demolition of existing concrete structures located within the project site: - demolition of the disused structures such as Bangelique reservoir and vacated houses or relocated inhabitants to be planned and effected using International Industry Practice (GIIP) - demolition waste to be managed by favouring reuse on site and minimising carting away to an approved site (backfilling at third party or dumping is waste cannot be reused/recycled	Plan to be - submitted prior to demolition - implemented during the demolition period and up to complete management of waste arising from the demolition	Daily inspection Weekly monitoring Monthly progress report to be submitted to the PIU Reporting on legal requirements (e.g. compliance with applicable environmental standards) and other requirements (contractual, etc)	Management plan to be strengthened where necessary and strictly adhered to	
	Main Plan: - Earthworks management plan Sub-plans/procedures/method statements - quarry/borrow area management plan - traffic management plan - noise & air quality management plan - storage management plan	The purpose of the Earthworks management plan is to outline the issues and effects arising from earthworks and to identify methods to manage these - quarry/borrow areas for Ste Marie Hill and Mont Travers to be managed according to GIIP - temporary earthmoving accesses to be identified away from ESAs and traffic corridor to be pegged/fenced to avoid tampering with adjacent lands - quarrying operations to minimise noise impacts (working hours, method of quarrying, exhaust muffler on engines, etc)	Plan to be - submitted prior to mobilisation - implemented during the complete construction period and up to decommissioning and rehabilitation/landscaping of site	Daily inspection Weekly monitoring Monthly progress report to be submitted to the PIU Reporting on legal requirements (e.g. compliance with applicable	Management plan to be strengthened where necessary and strictly adhered to	

Theme	Management Plan	Main Management Actions/ Mitigation Measures	Period of performance	Performance Monitoring and reporting	Corrective measures (on exceedance of limit/non-compliance)	Cost Estimate in USD
		and minimise air emissions (method of quarrying, dust suppression by water sprinkling, exhaust filters on engines, etc) - temporary stockpiling areas to be identified and respected for engineering fill and non-usable material		environmental standards) and other requirements (contractual, etc)		
	Construction Waste management plan	An overarching goal of a Construction Waste management plan is to reduce the amount of solid waste destined for disposal by preventing its generation and increasing reuse, recycling, composting methods - Solid waste generated during construction to be identified, sorted, reused, recycled or carted away to an approved site according to waste streams and local policies	Plan to be - prepared in consultation with relevant stakeholders (public and private bodies) - submitted prior to mobilisation - implemented during the complete construction period and up to decommissioning and rehabilitation of site	Daily inspection Weekly monitoring Monthly progress report to be submitted to the PIU Reporting on legal requirements (e.g. compliance with applicable environmental standards) and other requirements (contractual, etc)	Management plan to be strengthened where necessary and strictly adhered to	
	Hazardous material management plan	The purpose of the Hazardous Materials Management Plan is to describe the proper use, handling and storage practices and procedures to be followed by people working with hazardous materials during construction to assist in protecting them from potential health and physical hazards and to protect the environment. Hazardous material to be managed according to regulations and GIIP; this includes but is not limited to storage and handling according to material safety data sheets, stock management, disposal (if any) to be managed under a specific construction waste management plan	Plan to be - submitted prior to mobilisation - implemented during the complete construction period and up to decommissioning and rehabilitation of site	Daily inspection Weekly monitoring Monthly progress report to be submitted to the PIU Reporting on legal requirements (e.g. compliance with applicable environmental standards) and other requirements (contractual, etc)	Management plan to be strengthened where necessary and strictly adhered to	
	Traffic management plan	The purpose of the traffic management plan is to outline the steps that the contractor needs to follow to manage the flow of traffic in and around a construction site safely. The plan should take into account the type and location of the construction, as well as the expected traffic volume. This traffic management plan is important as significant offsite traffic will be generated from the port area (port Mathurin) to site (Plaine Corail) hence using the main road infrastructure backbone of the island. Measures to ensure safety of inhabitants and road users will also be outlined	Plan to be - prepared in consultation with relevant stakeholders (public bodies for road infrastructure) - submitted prior to mobilisation - implemented during the complete construction period and up to decommissioning	Daily inspection Monthly progress report to be submitted to the PIU Reporting on legal requirements (e.g. compliance with applicable environmental	Management plan to be strengthened where necessary and strictly adhered to	

Theme	Management Plan	Main Management Actions/ Mitigation Measures	Period of performance	Performance Monitoring and reporting	Corrective measures (on exceedance of limit/non-compliance)	Cost Estimate in USD
				standards) and other requirements (contractual, etc)		
	Site reinstatement management plan	The purpose of the reinstatement management plan is to describe the rehabilitation of land disturbed by the construction activities to a condition similar to its original pre-construction character This objective has associated benefits that include: - Minimizing the risk regarding the site integrity because the risk of erosion is reduced; - Maintenance of natural landscapes and consequently their value as a tourism resource; - Preservation of soil fertility in both natural and agricultural environments; - Protection of water catchments and water quality;	Plan to be - submitted prior to demobilisation - implemented during the complete decommissioning and rehabilitation of site	Daily inspection Weekly monitoring Monthly progress report to be submitted to the PIU Reporting on legal and other requirements Management and monitoring to be continued during defects liability period (DLP), if required	Management plan to be strengthened where necessary and strictly adhered to	
Marine environment	Main plan: - dredging and land reclamation management plan Sub-plans/procedures/method statements - marine habitat management plan - marine species management plan	The purpose of the Dredging and land reclamation Management Plan, together with the Sub-plans/procedures/method statements is to specify how works at sea (dredging and land reclamation) practices and procedures will ensure that any actual or potential adverse effects on the marine receiving environment are avoided or otherwise mitigated to the greatest extent practicable. In so doing the contractor will provide the following information: - baseline hydrodynamic, physico-chemical and biological update of surveys undertaken for the purpose of the ESIA to identify any change in the marine environment and to establish its methodologies - dredge and disposal locations, dredge tolerances and quantities - Work Method, including number and type of machines used, dredge and reclamation methodology, mobilisation and demobilisation - provision of settling ponds and discharge of excess water into the environment - Equipment maintenance - Safe Implementation of Simultaneous Operations - Environmental management (e.g. silt curtains around areas and works and discharge areas, etc) - Dredging control & Survey method	Plan to be - prepared in consultation with relevant stakeholders (public and private bodies) - submitted prior to mobilisation - implemented during the complete construction period (work at sea) and up to reinstatement where required	Daily inspection Weekly in situ monitoring of Total suspended solids, dissolved oxygen, and measurement Monthly monitoring for basic parameters (sampling and analysis of Total suspended solids, dissolved oxygen, temperature, PH, nitrate, phosphate) Monthly progress report to be submitted to the PIU Reporting on legal and other requirements	Management plan to be strengthened where necessary and strictly adhered to Additional investigations to be undertaken if required	- One-off Hydrodynamic survey: 60,000 - Current monitoring: equipment and transport: 30,000 + 30,000 for monthly analysis over construction period - Water quality analysis: 25,000 - provision for silt curtains: 10,000 Third party marine survey: quarterly visits over 2.5years: 50,000

Theme	Management Plan	Main Management Actions/ Mitigation Measures	Period of performance	Performance Monitoring and reporting	Corrective measures (on exceedance of limit/non-compliance)	Cost Estimate in USD
		- monitoring of water quality (baseline water quality analysis and regular monitoring during construction, weekly, monthly, quarterly, bi-annually and/or annual) - monitoring of biodiversity (baseline visual inspection, monitoring and daily follow up during construction) - reporting procedures				
Terrestrial environment	Main plan: - terrestrial Biodiversity management plan Sub-plans/procedures/method statements - transplanting management plan (note transplanting procedure will be provide by the specialists) - collection of arthropods (tropiphodora genus) before and during earthworks	The purpose of the Biodiversity Management Plan) is to implement all recommendations made by the specialist team as part of the ESIA for protection, compensation, conservation, restoration and enhancement of biodiversity value of project site and surroundings. The plan shall recall the objectives already available from the ESIA and describes the management actions necessary to deliver the desired outcomes. The actions should be specific, measurable, achievable, and time-bound. The contractor will endeavour to minimize impacts of construction on notable species and loss, fragmentation, alteration, disturbance and disruption of sensitive habitats. The contractor will undertake the transplantation of trees threatened by the project (under specialist supervision) The contractor will implement the compensation plan revised by the specialists	Plan to be - prepared in consultation with relevant stakeholders (public and private bodies) - submitted prior to mobilisation - implemented during the complete construction period and up to reinstatement	Daily inspection Weekly monitoring Monthly progress report to be submitted to the PIU Reporting on legal and other requirements (e.g. transplanting, protection measures, compensation if required, etc)	Management plan to be strengthened where necessary and strictly adhered to	Contractor: - Tree marking, protection and monitoring: 4,500 - transplanting of 20 remarkable trees: 25,000 - collection of arthropods: 5,000 ARL (under compensation schemes): - creating an arboretum: 12,500 - genetic conservation: 11,000 - ecological restoration of anse quitor nature reserve: 100,000 - actions towards sustainable agricultural practices: 35,000
Surface water run-off	Main management plan: - surface water runoff management plan	The purpose of the surface water run off management plan is to - Protect, preserve, and use natural surface and groundwater storage and retention systems - Minimize flooding and water quality problems; - Identify and plan for means to effectively protect surface and groundwater quality;	Plan to be - prepared in consultation with relevant stakeholders (public and private bodies) - submitted prior to mobilisation/earthworks - implemented during the complete construction period and up to reinstatement	Daily inspection Weekly monitoring Monthly progress report to be submitted to the PIU Reporting on legal and other requirements (e.g.	Management plan to be strengthened where necessary and strictly adhered to Remedial measures to be undertaken in case of incident to	

Theme	Management Plan	Main Management Actions/ Mitigation Measures	Period of performance	Performance Monitoring and reporting	Corrective measures (on exceedance of limit/non-compliance)	Cost Estimate in USD
		- Prevent erosion of soil into surface water systems (lagoon and river); protecting the natural receiving environment and biodiversity - Set up a surface water harvesting and recycling plan		effectiveness of measures, incidents, etc)	avoid reoccurrence of same	
Underground geology and groundwater environment	Main management plan: - Groundwater management and monitoring plan Sub-plans/procedures/method statements - emergency response on case of pollution of the groundwater environment	As part of the ESIA baseline studies, groundwater, caves and other underground geological features was studied The purpose of the underground geology and Groundwater management and monitoring plan is to identify actions necessary to contribute to an effective protection of the karstic and riverine environment. The plan will include a baseline monitoring of the groundwater physico-chemical characteristics through a series of coreholes located upstream and downstream of the project site and measurements of water levels on these coreholes. Should coreholes already exist same can be used (with necessary authorisations) for monitoring purposes, else new coreholes will have to be drilled. The plan will also include a baseline water quality analysis of Caverne Bouteille water abstract and further monitoring during (and after) construction works. Regular monitoring during construction (as well as after construction) will be required to inform on any exceedance of legal and other requirements (e.g. regulations, threshold set post review of the baseline data)	Plan to be - prepared in consultation with relevant stakeholders (public and private bodies) - submitted prior to mobilisation/earthworks - implemented during the complete construction period and up to reinstatement	Baseline monitoring to be undertaken prior to start of works Weekly monitoring Monthly progress report to be submitted to the PIU Reporting on legal and other requirements Management and monitoring to be continued during defects liability period (DLP), if required	Management plan to be strengthened where necessary and strictly adhered to Remedial measures to be undertaken in case of incident to avoid reoccurrence of same	200,000 incl coreholes
	Main management plan: - caves management and monitoring plan Sub-plans/procedures/method statements - traffic control management plan - vibration control management plan - Surface water runoff diversion plan - heritage salvage plan	The purpose of the cave management and monitoring plan is to protect the integrity of the underground geological features and their potential palaeontological interest. This plan refers to exposed known caves but also any geological feature that may be discovered during construction works The plan will include amongst others - traffic and vibration control plans in the vicinity the geological features to reduce vibrations and impact on caves and surrounding. In this context a no-go area will be defined and respected - a surface water runoff diversion plan to ensure no abnormal surface water runoff from the construction site reaches the caves and surrounding - method statement for heritage salvage (recovering and protection of any archaeological / palaeontological remains uncovered during earthworks from all threatened caves)	Plan to be - prepared in consultation with relevant stakeholders (public and private bodies – specialists) - submitted prior to mobilisation/earthworks - implemented during the complete construction period	Baseline monitoring to be undertaken prior to start of works and for each new geological features uncovered during excavation works Weekly monitoring Seismometers (data loggers) to be installed in main caves Monthly progress report to be submitted to the PIU Reporting on legal and other requirements	Management plan to be strengthened where necessary and strictly adhered to Remedial measures to be undertaken in case of incident to avoid reoccurrence of same	150,000-300,000 Incl . cost of provision of seismometers and data interpretation (third partly geophysicist)

Theme	Management Plan	Main Management Actions/ Mitigation Measures	Period of performance	Performance Monitoring and reporting	Corrective measures (on exceedance of limit/non-compliance)	Cost Estimate in USD
		note: setting up and implementation of the caves management and monitoring plan may have to be externalised to an expert contractual arrangements will define the responsibilities				
Air quality and noise environment management	Main management plan: - air quality management plan	The purpose of the air quality management and monitoring plan is to describes how the contractor will manage and control air quality during the construction phase . The plan will include amongst others - intended measures to reduce dust emissions from areas of works, including quarry/borrow areas - intended measures to reduce airborne dust associated with offsite traffic - protection measures such as physical screening, water sprinkling, application of ground cover to reduce airborne dust generated with no active works (stockpiles, etc) - complaints management - monitoring protocol	Plan to be - submitted prior to mobilisation - implemented during the complete construction period	Daily inspection Weekly monitoring Monthly progress report to be submitted to the PIU Reporting on legal and other requirements (e.g. air quality monitoring results and actions in case of exceedance of permissible limits)	Management plan to be strengthened where necessary and strictly adhered to	20,000 per month if permanent monitoring 30,000 per campaign if no permanent monitoring is implemented
	Main management plan: - noise and vibration management plan	The noise and vibration management plan defines the measures to control and limit noise emissions and vibration levels, at residential properties and other sensitive receptors in the vicinity of the Project. The plan will include amongst others - control measure at source (equipment, etc) - control across site (working hours, delivery areas and time, physical screening, etc) - complaints management - monitoring protocol	Plan to be - submitted prior to mobilisation - implemented during the complete construction period	Daily inspection Weekly monitoring Monthly progress report to be submitted to the PIU Reporting on legal and other requirements (e.g. air quality monitoring results and actions in case of exceedance of permissible limits)	Management plan to be strengthened where necessary and strictly adhered to	20,000 per month if permanent monitoring 30,000 per campaign if no permanent monitoring is implemented
Emergencies management plans	Spill management plan	The purpose of the Spill Management Plan is to detail spill prevention, preparedness and response requirements to support the safe response to accidental spills, leaks or releases of both hazardous and non-hazardous materials to the environment (releases to land and / or water); to eliminate or minimize the adverse effects should a spill occur and to protect the health and safety of employees.	Plan to be - submitted prior to mobilisation - implemented during the complete construction period	Daily inspection Weekly monitoring Monthly progress report to be submitted to the PIU Reporting on legal and other requirements		Included in cost of contract
	Fire management plan	The purpose of the Fire Management Plan is to detail fire prevention, preparedness and response requirements to support the safe response to fire and to eliminate or minimize the adverse effects should a fire occur and to protect the health and safety of employees.	Plan to be - submitted prior to mobilisation - implemented during the complete construction period	Daily inspection Weekly monitoring Monthly progress report to be submitted to the PIU		Included in cost of contract

Theme	Management Plan	Main Management Actions/ Mitigation Measures	Period of performance	Performance Monitoring and reporting	Corrective measures (on exceedance of limit/non-compliance)	Cost Estimate in USD
		The fire management plan should also include adequate measures to contain and manage the contaminated water of foam used as fire extinguishers		Reporting on legal and other requirements		
	Archaeology or patrimonial chance find procedure	The purpose of this document is to address the possibility of archaeological deposits becoming exposed during earthworks or any ground altering activities within the project area and to provide protocols to follow in the case of a chance archaeological find to ensure that archaeological sites are documented and protected as required.	Plan to be - submitted prior to mobilisation/earthworks - implemented during the complete construction period (during earthworks or any ground altering activities)	Weekly monitoring Monthly progress report to be submitted to the PIU One off removal of remaining of fossiliferous sediments from all threatened caves		30,000 for 15 days of an external specialist, and 15 days of 2 helpers, and transport costs
Visual impact	Visual Impact Management plan	The purpose of this Visual Impact Management Plan is to outline the strategies to be implemented to minimise the visual impacts from the construction site on the surrounding community. The contractor shall identify measures to reduce the visual impact such as - design, construct and maintain of a Noise & Visual Bund - install and maintain suitable planting and screening to minimise the views of onsite works - minimise the visual and off-site lighting impacts of the development - Include a program to monitor and report on the implementation of the detailed plans and their effectiveness	Plan to be - submitted prior to mobilisation - implemented during the complete construction period	Daily inspection Weekly monitoring Monthly progress report to be submitted to the PIU Reporting on legal and other requirements		Included in cost of contract

Table 6-2: Overall 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	Cost estimate in USD
0Communication 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 - PIU/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	(90,000) 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-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.		17,000 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-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 construction phase.	To be monitored by: PIU Annual reports submitted by the Airport of Rodrigues in collabouration with Rodrigues Regional Assembly that include communication measures taken on the period as	- Number of communication activities carried out; - Number of communication media produced and distributed; - Number of organized sessions, meetings or information workshops;	- Organize 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	- Executive Committee of the RRA - PIU/ARL - Project managers for the works - Village committees of the airport area (Anse Quitor and Plaine Corail – Cascade Jean Louis) - Local media (radio)	13,500 (for 2 years)

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation	Cost estimate in USD
	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 construction phase.	well as local surveys on inhabitants as well as external workers.	- Results of carried out surveys; - Number and qualitative details on hired people; - Number of registered complaints and reports on actions taken for complaints management.	treated will have to appear positively handled in following report.		135,000 (for 3 years) 13,500 The complaint bureau depends on the recruitment office specifically created. Additional budget may be 4,500 per year for 3 years
	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 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: PIU 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 - PIU/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) - Optionally an independent external office	The costs may be integrated into the Resettlement Action Plan and will be upon the third mitigation measure's budget of 5,500 per year for 3 years.
	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	13,500 Budget estimated may be integrated into the one allocated for the assistance plan on agricultural techniques. Can be considered an additional cost of 4,500 per year
	SE-Mit-13 - Support and fishermen's	These measures relate to the communication procedures to be undertaken with the	The measures occur from the resettlement of displaced villagers				- Relocation committee appointed by the Executive Committee of the RRA	13,500 The complaint bureau may

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation	Cost estimate in USD
	complaint management plan.	fishermen's community following relocation.	and continue throughout the period of community adaptation.				- Rodrigues fishing Commission - Fishing station managers - PIU/ARL	depend on an office of the Commission of fisheries. A budget may be 4,500 per year for 3 years
	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 - PIU/ARL - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)	27,000 (for 3 years)
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-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 the first steps are taken to provide a solid foundation for the relocation process.	*(before work)*	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-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	This measure is the implementation of an effective and transparent complaint management	This communication plan must begin and continue throughout	To be monitored by: PIU	- Number of registered complaints and reports on actions taken for complaints management,	- Improve communication with local people according to reports' feedback.	- Executive Committee of the RRA - PIU/ARL	

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation	Cost estimate in USD
	connected with employment	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.	the construction phase.	Bi-annual reports submitted by the Airport of Rodrigues in collabouration with Rodrigues Regional Assembly that include communication measures taken on the period as well as local surveys on inhabitants as well as external workers.	- 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.	- 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 - PIU/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) - Optionally an independent external office	
	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.				- 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	

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation	Cost estimate in USD
							- 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 organization 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 - PIU/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)	
	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)	(2,700) 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-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 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	This follow-up takes place from the construction phase and continues during the	To be monitored by: Resettlement Monitoring Committee of Rodrigues Regional Assembly		- Improve communication with local people according to reports' feedback.	- Relocation committee appointed by the Executive Committee of the RRA - PIU/ARL	

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation	Cost estimate in USD
		connection with affected communities throughout the adaptation period.	period of adaptation of the displaced communities.	Bi-annual Relocation Plan Report to be submitted by the Relocation Committee including complaint management and satisfaction surveys.		- 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-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 PIU 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 - PIU/ARL - 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,	

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation	Cost estimate in USD
							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 - PIU/ARL - 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: PIU 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.	- PIU/ARL - Project managers - Rodrigues health Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Media (local radio)	20,000 (for 3 years)
	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.				- PIU/ARL - Project managers - Rodrigues infrastructure commissions - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis)	225,000
	SE-Mit-18- Coordination with the contractors 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 PIU 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	Increased numbers of training and communication activities on Health and safety prevention.	- PIU/ARL - Project managers - Rodrigues health Commission	110,000 (for 3 years)
	SE-Mit-19- Communication plan for the communities	The purpose of this measure is to ensure the safety of the project by prohibiting access					- PIU/ARL - Project managers	

Theme / Issue : Corresponding plan	Title of the measure concerned	Description	Period of performance	Performance monitoring system	Performance indicators	Corrective measures	Responsible managers for implementation	Cost estimate in USD
	concerning the importance of complying with safety instructions.	to sites of unauthorized people and populations through promoting awareness of potential hazards in the work area.			detected directly related to the activities of the project.		- 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 contractors 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 PIU 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.	- PIU/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.				- PIU/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 / PIU Annual reports submitted by the Airport of Rodrigues in collabouration 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 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.	- PIU/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						- PIU/ARL - Project managers - 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	Cost estimate in USD
					- Qualitative evaluation according to survey results.		Plaine Corail – Cascade Jean Louis)	
	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.				- PIU/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 PIU 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.	- PIU/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.				- PIU/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)	

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6.2 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN FOR THE OPERATION PHASE

This section refers to the ESMP associated with the post-commissioning phase and the Operation phase.

Some measures are part of the airport design and must be anticipated during the detailed design stage.

Some other measures correspond to monitoring to be carried out post completion of works for a few months, or to be permanently integrated into the airport's routine environmental management.

The following tables are provided hereafter:

Table 6-3: Overall Environmental Management Plan for the operation phase
Table 6-4: Overall Social Management Plan for operation phase

Associated indicative cost estimates have been provided. These are to be borne by the contractor as part of his costs of contract.

Note for social Social measures costs. Costs have been included in the construction overall SMP (Table 6-2) as social actions span across the construction and operation phases.

Further details on the environment management plans to be implemented for the operation phase are provided at annex 9.3 .

Further details on the social management plans to be implemented for the construction phase are provided at annex 9-4.

Table 6-3: Overall Environmental Management Plan for Operation phase

Theme	Management Plan	Main Management Actions/ Mitigation Measures	Period of performance	Performance Monitoring and reporting	Corrective measures (on exceedance of limit/non-compliance)	Cost estimate in USD
Marine environment	Main plan: - marine environment management and monitoring plan	The main purpose of the plan is to monitor the status of the marine environment post completion of works and start of operation of the new airport facilities The plan to be implemented at the minimum during the first three years of operation Any signs of degradation of the marine environment will be investigated and remedial measures taken as required to reverse the situation. Compensation will be contemplated in case significant non reversible degradation is cause to the environment due to the airport direct and indirect activities: water discharge into the marine environment, coastal erosion, impacts arising from the structures at sea (runway, boat house and associated jetty)	Plan to be prepared under the responsibility of ARL prior to start of operation The plan must take into account all data gathered during the construction period on the state of the marine environment	monitoring of the state of the marine environment and water quality analysis to be undertaken by PIU/ARL/specialists under contract at the minimum during the first three years of operation with - quarterly monitoring during the first year of operation - bi-annual monitoring for the second year and - annual for the third year	Management plan to be strengthened where necessary and strictly adhered to Additional investigations to be undertaken if required Review of design to be undertaken should the project induce significant impact of the marine environment	Water quality analysis: 20,000 (3 years) Third party marine survey: 5,000 per survey
	Main plan: - Emergency prevention and management plan	The main purpose of the plan is to avoid any spills and accidents and in case of spill to remedy the situation promptly and undertake necessary - prevention: Prevent spills and accidents: train staff to avoidance of spills - correction: Implementing methodologies for quick confining and treatment of pollutants and protocol for depollution in case of spill. Carry out necessary analysis in coordination with the marine environment management and monitoring (see above) - implement the plan do check act cycle	Plan to be - prepared in consultation with relevant stakeholders (public and private bodies) - prepared under the responsibility of ARL operation team prior to start of operation - implemented during the complete operation phase	Daily inspection for abnormal conditions Weekly monitoring Monthly progress report to relevant bodies Reporting on legal and other requirements	Preventive and corrective measures to be taken as required Management plan to be strengthened where necessary and strictly adhered to Awareness raising Induction course Training and retraining as and when required	Included in operation costs
Terrestrial environment	Main plan: - terrestrial Biodiversity management and monitoring plan Sub-plans/procedures/method statements - compensation plan	The purpose of the Biodiversity Management and monitoring Plan is to - implement the balance of measures not undertaken during construction phase in as much as compensation plan and replanting of trees that may not have survived - monitor the grow in, stabilisation of planted trees and ascertain the compensation is effective	Plan to be prepared under the responsibility of ARL prior to start of operation The plan must take into account all data gathered during the construction period on the state of the terrestrial environment	monitoring of the state of the terrestrial environment by PIU/ARL/specialists under contract at the minimum during the first three years of operation with - quarterly monitoring during the first year of operation - bi-annual monitoring for the second year and - annual for the third year	Management plan to be strengthened where necessary and strictly adhered to Additional compensation to be undertaken if required	Budget estimated for construction can be split onto operation cost (ARL part)

Theme	Management Plan	Main Management Actions/ Mitigation Measures	Period of performance	Performance Monitoring and reporting	Corrective measures (on exceedance of limit/non-compliance)	Cost estimate in USD
Surface water run-off	Main management plan: - surface water runoff management and monitoring plan	The purpose of the surface water run off management plan is to - ascertain the stormwater drainage network is efficient, e.g. - to avoid/minimize flooding, - to avoid erosion (e.g. with swales, vegetated ditches, buffer tanks/ponds to reduce peak flows), - to restore the watershed, to avoid polluting the environment by implementation and maintenance of treatment measures (oil separators, sediment traps, treatment prior to release in the environment) - respond to any pollution that may arise from the surface water drainage - implement water harvesting and recycling to reduce the use of public water Some specific activities include: - Climate change adaptation: buffering storage and works facilitating infiltration	Plan to be prepared under the responsibility of ARL prior to start of operation The plan must take into account all incidents and accidents that have occurred during the construction period (e.g. flood occurrences, erosion, etc)	To be performed by the maintenance team: Daily inspection for abnormal conditions Weekly monitoring Quarterly water quality analysis (1st Year), bi-annual (2nd year), annual (every year thereafter) Regular maintenance Automation system for monitoring and alarm systems should be considered on the outflows to efficiently manage any emergency situation (pollution, shut off, remedial measure, cleaning, etc) Monthly progress report to relevant bodies Reporting on legal and other requirements	Management plan to be strengthened where necessary and strictly adhered to Review of design/additional engineering input to be considered should the project induce significant impact of the natural environment	water quality analysis: 30,000 (3 years) Cost of minimal automated systems: 400,000
Water supply	Integrated water management plan Sub-plans/procedures/method statements - wastewater treatment management and monitoring plan - water harvesting, recycling	The integrated management plan calls for - Implementation of a wastewater treatment plant including reuse of treated wastewater; hence reducing/avoiding release of water into the marine environment - Implementation of a potable water treatment including reuse / treatment of rainwater harvested for drinking water production	Plants to be designed by the consulting engineers/specialist design and built contractor and operated and maintained as from commissioning Plans to be prepared accordingly under the responsibility of ARL prior to start of operation and implemented during the operation phase	To be performed by the maintenance team: Monitoring of water quality at inlet and outlet of both plants Monitoring of water quality in water storage tanks and additional disinfection if required ; Regular manual sampling/analysis (once a week) and visual control of integrity of the systems automatic real time monitoring on main parameters usually monitored recommended	Management plan to be strengthened where necessary and strictly adhered to Review of design/additional engineering input to be considered in case water quality in not to standards	1.7M Water treatment plant within an integrated water management plan for the airport facilities at Operation phase

Theme	Management Plan	Main Management Actions/ Mitigation Measures	Period of performance	Performance Monitoring and reporting	Corrective measures (on exceedance of limit/non-compliance)	Cost estimate in USD
Underground geology and groundwater environment	Main management plan: - Groundwater management and monitoring plan Sub-plans/procedures/method statements - emergency response on case of pollution of the groundwater environment	The purpose of the underground geology and Groundwater management and monitoring plan is to identify actions necessary to contribute to an effective protection of the karstic and riverine environment. This plan is a continuity of the plan set up and implemented during the construction stage and augmented where necessary taking into account the data gathered during the construction monitoring period The plan will include a regular monitoring of the groundwater physico-chemical characteristics and ground water levels through the coreholes used during the construction phase (upstream and downstream of the project site) The plan will also include a regular baseline water quality analysis of Caverne Bouteille water abstract Groundwater abstract shall not be continued in case the water quality exceeds the permissible limits for potable water supply Remedial measures shall be implemented to restore the water quality Compensation measures shall be taken in case the groundwater abstract cannot further be used due to the airport operation	Plan to be - prepared in consultation with relevant stakeholders (public and specialists) prior to operation - implemented during the complete construction period and up to reinstatement	Quarterly water quality analysis and ground water level recording (1st Year), bi-annual (2nd year), annual (every year thereafter) Quarterly water quality analysis of caverne bouteille abstract to be done by ARL/RRA as the case may be	Management plan to be strengthened where necessary and strictly adhered to Remedial measures to be undertaken in case of nuisance/pollution	water quality analysis: 30,000 (3 years)
	Main management plan: - karst monitoring plan	The purpose of the karst monitoring plan is to - further characterize karstic network (caves and voids), if required due to impacts thereon , e.g. ground subsidence/collapse in the karstic environment - carry out in situ investigation diagnostic of infilled cavities (televisual cavity inspections) - carry out additional labouratory tests (Aggregate test) to characterize erosive potential of in situ geological formations	Plan to be - prepared in consultation with relevant stakeholders and specialists - implemented during operation	Monthly monitoring and reporting as part of the general inspection of the airport perimeter to be extended outside perimeter for geological features of interest	Management plan to be strengthened where necessary and strictly adhered to Remedial measures to be undertaken in case of ground subsidence/collapse	Inspection: 5,000/year
Road infrastructure	Main management plan: - traffic management and monitoring plan	The purpose of the traffic management and monitoring plan is to ensure the additional traffic generated by the airport expansion does not generate road nuisances for road users and inhabitants (for air quality and noise refer to specific plans below) , does not threaten the level of service of the public road (traffic congestion). Persistent traffic congestion may lead to a requirement for resizing of road network and/or redefining of road hierarchy and priorities and road marking	Plan to be prepared by specialist team under the responsibility of the PIU prior to operation and implemented during operation by ARL/RRA	Regular monitoring at part of the general routine	Additional traffic impact assessment in case of nuisance and implementation of mitigation measure spelt out therein	Inspection: 5,000/year
Air quality and noise environment management	Main management plan: - air quality management plan	The purpose of the air quality management and monitoring plan is to minimize air emissions. A series of measures have been proposed as part of the specialist studies undertaken for ESIA purposes, namely: - If possible, limit the taxiing distance - Opt for technologies that limit aircraft pollutant emissions during taxiing - Encourage pilots to shut down unneeded engines when taxiing	Plan to be prepared by specialist team under the responsibility of the PIU prior to operation and implemented during operation under the responsibility ARL	The same monitoring stations used for the baseline data, during the construction should be used for the operation stage.	Management plan to be strengthened where necessary to in case of exceedance of standard or in case of significant decrease in air quality	30,000 per campaign if no permanent monitoring is implemented

Theme	Management Plan	Main Management Actions/ Mitigation Measures	Period of performance	Performance Monitoring and reporting	Corrective measures (on exceedance of limit/non-compliance)	Cost estimate in USD
		- Limit congestion (aircraft queues) by making departures as fluid as possible - Minimize the use of the Aircraft ground power unit and auxiliary power unit - Develop and implement procedures to limit the use of the thrust reverser - 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		Main pollutants to be monitored: PM2.5, PM10, SO2, CO, NO2, O3 Frequency: It is recommended to carry out at least 2 campaigns per year, of 1 month each		
	Main management plan: - noise management plan	The purpose of the noise management and monitoring plan is to minimize noise nuisance. A series of measures have been proposed as part of the specialist studies undertaken for ESIA purposes, namely: - Limit air traffic at night and the use of noisy equipment - Raise the Instrument Landing System glide slope to reduce noise emissions during landing - Adapt departure procedures to minimize noise exposure on the ground during take-off - Limit the use of reverse thrust - Develop an efficient public transport system to limit the use of private vehicles	Plan to be prepared by specialist team under the responsibility of the PIU prior to operation and implemented during operation under the responsibility ARL	The same monitoring stations used for the baseline data, during the construction should be used for the operation stage - 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	Management plan to be strengthened where necessary to in case of exceedance of standard or in case of significant increase in noise level and disturbance to inhabitants	20,000 per campaign if no permanent monitoring is implemented
Emergencies management plans	Spill management plan	The purpose of the Spill Management Plan is to detail spill prevention, preparedness and response requirements to support the safe response to accidental spills, leaks or releases of both hazardous and non-hazardous materials to the environment (releases to land and / or water); to eliminate or minimize the adverse effects should a spill occur and to protect the health and safety of employees.	Existing management Plan to reviewed as required and - implemented during the complete operation period	Daily inspection Weekly monitoring Monthly progress report to be submitted to the competent team	Management plan to be strengthened where necessary and strictly adhered to	Included in operation costs

Theme	Management Plan	Main Management Actions/ Mitigation Measures	Period of performance	Performance Monitoring and reporting	Corrective measures (on exceedance of limit/non-compliance)	Cost estimate in USD
				Reporting on legal and other requirements		
	Fire management plan	The purpose of the Fire Management Plan is to detail fire prevention, preparedness and response requirements to support the safe response to fire and to eliminate or minimize the adverse effects should a fire occur and to protect the health and safety of employees. The fire management plan should also include adequate measures to contain and manage the contaminated water of foam used as fire extinguishers	Existing management Plan to reviewed as required and - implemented during the complete operation period	Daily inspection Weekly monitoring Monthly progress report to be submitted to the competent team Reporting on legal and other requirements	Management plan to be strengthened where necessary and strictly adhered to	Included in operation costs
Landscape	Main plan: Landscape measures follow-up plan Sub-plans/procedures/method statements - Architectural guidelines - Hard and soft landscaping plan - woodland and timber management plan	The purpose of the plan is to favour integration of airport activities within the receiving environment. A series of measures have been proposed as part of the specialist studies undertaken for ESIA purposes, namely: - Airport buildings and infrastructures to reach architectural quality and soundness - Permanent fences and earthworks will be arranged to reduce visual intrusion - Plantings are designed and arranged to form visual screens - Touristic infrastructure to respect the scale of Rodrigues' landscape and sense of place - Urban development to foster the development of public places and public amenities - Establishment of local Urban Development Master Plan to monitor urban development related to tourism growth, to value and enhance local landscape - Set up of green and blue grids - Set up of sustainable and resilient city guidelines and architectural guidelines - Investment in woodland planting to feed the timber industry (supported by private sector) - Set up sustainable timber management plan - Ravine/riverine preservation and sanctuarisation of associated woodlands	Measures to be considered as part of the master plan for the airport and envisaged airport city Plan to be prepared at master planning stage and to be implemented during development and operation	Implementation and Reporting on - Visual acceptability & blending into the natural environment - Urban sustainable development - increase in woodlands and timber generation therefrom - protection of the riverine lands	Management plan to be strengthened where necessary and strictly adhered to Specific actions to be taken as part of the terrestrial biodiversity plan is required	200,000 for anse quitor nature reserve conservation and restoration 20,000 per year for airport landscaping and maintenance of perimeter fences 50,000 for Urban Development Master Plan and sustainable and resilient city guidelines and architectural guidelines

Table 6-4: Overall Social Management Plan for Operation 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 construction phase.	To be monitored by: RRA / ARL Annual reports submitted by the Airport of Rodrigues in collabouration 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 construction 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 specialized 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 collabouration 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)

7 REPORTING AND INCIDENT MANAGEMENT

7.1 PROJECT REPORTING REQUIREMENTS

The Contractor will produce a monthly and final report to the PIU for each section under their responsibility. The PIU will in turn use the information from the contractors report to compile and submit quarterly progress reports on the environmental and social performance to the Lenders

The monthly reports to be prepared by the contractor will include the following as a minimum:

a) Environmental Performance
Number of environmental incidents recorded during the reporting period
Summary of water usage and waste disposed for the reporting period
Register of animal encounters / animals removed from site during the reporting period
Number of environmental awareness sessions conducted during the reporting period
Monitoring results (water quality, noise, air quality etc)
Status of implementation of the tree protection and preservation plan

b) Occupational health and safety
Total number of the health and safety incidents.
Risk assessments: risks identified and attended to.
Number of Lost time injuries (LTIs)
Number of medical treatment cases/ fatalities
Number of Property damages recorded
Disabling Injury Frequency Rate (DIFR) and Disabling Injury Severity Rate (DISR).
Number of inspections completed, deviations noted and correction measures.

c) Social Performance
- Total number of labour appointed during the reporting period
- Number of persons from local communities hired for project work out of total number of persons hired during the reporting period
- Number of project-related grievances, including breakdown of number opened, closed and pending during the reporting period
- Number of grievances submitted by project workers through the project worker grievance mechanism, including breakdown of number opened, closed and pending during the reporting period
- Number of SEA/SH/GBV complaints submitted, including breakdown of number opened, closed and pending during the reporting period
- Number of SEA/SH/GBV awareness sessions conducted during the reporting period
- Number of workers (out of total number employed/engaged for the project) who have signed the Code of Conduct during the reporting period.

7.2 REPORTING AND MANAGEMENT OF INCIDENTS

The contractor will be required to immediately report any reportable incidents or accidents to the PIU using the prescribed incident flash notification form. The PIU will notify the Lenders of the incident through an initial communication/flash report reflecting the basic information known at the time of the report. The contractor with assistance of the PIU will be responsible to conduct an investigation, to the nature and scale of the to determine the root cause of the incident and prepare a corrective action plan. Upon completion of the incident investigation, the report with findings is relevant supporting documentation must be submitted to the Lenders within the stipulated and agreed timeframe. The PIU/Contractor will be required to report on the status of the implementation and closeout of the corrective actions.

The following will be considered reportable incidences for the Project, and require immediate notification to the PIU :

Fatality: Death of a person(s) that occurs within one year of an accident/incident, including from occupational disease/illness (e.g., from exposure to chemicals/toxins).

Lost Time Injury: Injury or occupational disease/illness (e.g., from exposure to chemicals/toxins) that results in a worker requiring 3 or more days off work, or an injury or release of substance (e.g., chemicals/toxins) that results in a member of the community needing medical treatment.

Acts of Violence/Protest: Any intentional use of physical force, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, deprivation to workers or project beneficiaries, or negatively affects the safe operation of a project worksite.

Disease Outbreaks: The occurrence of a disease in excess of normal expectancy of number of cases. Disease may be communicable or may be the result of unknown etiology.

Medical treatment cases - Any treatment, other than first aid, that is administered to an injured or ill employee. The person is taken to a medical station / clinic or hospital for treatment but is immediately released. Ordinarily this type of treatment is to be provided by a physician or other registered medical professional. Examples of medical treatment are setting of fractures, use of sutures and use of surgical instruments

Displacement Without Due Process: The permanent or temporary displacement against the will of individuals, families, and/or communities from the homes and/or land which they occupy without the provision of, and access to, appropriate forms of legal and other protection and/or in a manner that does not comply with an approved resettlement action plan.

Child Labour: An incident of child labour occurs: (i) when a child under the age of 14 (or a higher age for employment specified by national law) is employed or engaged in connection with a project, and/or (ii) when a child over the minimum age specified in (i) and under the age of 18 is employed or engaged in connection with a project in a manner that is likely to be hazardous or interfere with the child's education or be harmful to the child's health or physical, mental, spiritual, moral or social development.

Forced Labour: An incident of forced labour occurs when any work or service not voluntarily performed is exacted from an individual under threat of force or penalty in connection with a project, including any kind of involuntary or compulsory labour, such as indentured labour, bonded labour, or similar labour-contracting arrangements. This also includes incidents when trafficked persons are employed in connection with a project.

Unexpected impacts on heritage resources: An impact that occurs to a legally protected and/or internationally recognized area of cultural heritage or archaeological value, including world heritage sites or nationally protected areas that was not foreseen or predicted as part of the project design or the environmental or social assessment.

Unexpected impacts on biodiversity resources: An impact that occurs to a legally protected and/or internationally recognized area of high biodiversity value, to a Critical Habitat, or to a Critically Endangered or Endangered species (as listed in IUCN Red List of threatened species or equivalent national approaches) that was not foreseen or predicted as part of the project design or the environmental and social assessment. This includes poaching or trafficking of Critically Endangered or Endangered species.

Environmental pollution incident: Exceedances of emission standards to land, water, or air (e.g., from chemicals/toxins) that have persisted for more than 24hrs or have resulted in harm to the environment.

Violence on the basis of SOGI: The threat or use of physical force that injures or abuses a person, or damages or destroys property, and that is motivated in whole or in part by the victim's real or perceived sexual orientation, gender identity, gender expression, or sex characteristics.

Discrimination on the basis of SOGI: Discrimination means creating a distinction, exclusion, or restriction which has the purpose or effect of impairing or excluding a person based on their real or perceived sexual orientation, gender identity, gender expression, or sex characteristics from being on an equal basis with others.

Sexual Exploitation: Any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another. In Bank financed operations/projects, sexual exploitation occurs when access to or benefit from a Bank financed Goods, Works, Non-consulting Services or Consulting Services is used to extract sexual gain.

Sexual Abuse: Actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions. In Bank financed operations/projects, sexual abuse occurs when a project related worker (contractor staff, subcontractor staff, supervising engineer) uses force or unequal power vis a vis a community member or colleague to perpetrate or threat to perpetrate an unwanted sexual act.

Sexual Harassment: Any unwelcome sexual advance, request for sexual favor, verbal or physical conduct or gesture of a sexual nature, or any other behavior of a sexual nature that might reasonably be expected or be perceived to cause offence or humiliation to another, when such conduct interferes with work, is made a condition of employment, or creates an intimidating, hostile or offensive work environment. In Bank financed operations/projects, sexual harassment occurs within the context of a subcontractor or contractor and relates to employees of the company experiencing unwelcome sexual advances or requests for sexual favor or acts of a sexual nature that are offensive and humiliating among the same company's employees.

8 TRAINING AND AWARENESS

The PIU and contractors must be conversant with all legislation pertaining to the environment applicable to the project and the specific activities under their scope of works.

Staff from the PIU and the Contractor will need to be appropriately trained in environmental and social (E&H) management in order to ensure they have the necessary skills and understanding to mitigate environmental and social impacts that may arise from the project activities. The PIU/ARL/AML must ensure that all relevant environmental legislation and project E&S documentation are included as part of the biding documents as a legally binding component of the contract.

All parties involved in the construction of the project will undergo a training and awareness programme on environmental and social management, provided by the PIU E&S specialist prior to mobilisation.

Likewise training and awareness programmes will be provided prior to operation; and thereafter on regular basis .

Project E&S information, including project E&S requirements, site rules, E&S risks and impacts and contractor requirements will be transferred in an appropriate manner and training conducted by the Contractor’s Environmental and Social Representatives. The training must be given to all contractor’s staff before any construction commences and also on a monthly basis thereafter as a refresher. In addition, matters related to social and environmental good practice must also be included in the daily Toolbox Talks. Training courses will take language and cultural and educational levels into consideration.

As part of the induction process, all personnel (including staff, contractors and third parties) involved in the project will undergo a training and awareness programme on E&S aspects of the project including Lender requirements prior to commencing their duties. The PIU will ensure that its staff and other parties employed for the project or their contractors, who carry out any aspects of the work, in any phase of the project are sufficiently trained to ensure full compliance with the implementation of the ESMP and associated project E&S plans and procedures as relevant to their scope of work. To ensure that the contractors and their sub-contractors are fully aware of their health, safety, social and environmental obligations, a training-needs-analysis will be conducted to inform the development of training programmes that will be required, and the appropriate target groups. The training programmes should contain the following information:

- ✓ The names, positions, and responsibilities of personnel to be trained.
- ✓ The framework for appropriate training plans.
- ✓ The summarised content of each training course
- ✓ A schedule for the presentation of the training courses.

Training will highlight the importance of incident reporting and completion of appropriate reports, channels of communication for reporting E&S issues responsibilities under lender requirements and Mauritian legislation. The range of topics that should be considered as part of the training, among other include:

- ✓ Training on community health and safety, including preventing transmission of communicable diseases such as HIV/AIDS, between project workers/personnel and local communities preventing and addressing the risk of SEA/SH due to interactions between project personnel and local communities.
- ✓ Training on labour and working conditions, including but not limited to, child labour, forced labour and trafficking in persons employment discrimination, terms and conditions of employment including

regarding hours and wages, occupational health and safety, including on preventing transmission of communicable diseases among project workers, and workplace sexual harassment.

- ✓ Aspects of routine day-to-day construction and operational activities, which can have environmental, social, safety or health impacts.
- ✓ Environmental and safety hazards, which could arise from non-routine situations and corrective actions.
- ✓ The importance of environmental and safety hazard incident reporting and completion of appropriate reports.
- ✓ Emergency Preparedness and Response procedures
- ✓ Worker Grievance mechanism
- ✓ Areas of high environmental sensitivity which must be avoided.
- ➢ Details regarding archaeological, cultural and/or historical sites which may be unearthed during planting and the procedures to be followed should these be encountered, among other
- ➢

9 ANNEXES

9.1 Environment Management Plans to be implemented for the construction phase

The below is a framework to assist the contractor in developing the specific management plan.

9.1.1 Construction Site and Enabling Facilities

The contractor will be required to prepare site and activity specific plans in line with the requirements as set out below and those stipulated in Chapter 6 of this ESMP. The plans should be submitted to the PIU at least 20 days prior to the commencement of the activities for review and approval.

The contractor is responsible for preparing and implementing the Construction Environmental and Social Management Plans listed in chapter 6.1 .

-
- Main plan:
- Site establishment (including workers' camp) management plan
- Sub-plans/procedures/method statements
- - solid waste management (mostly domestic waste)
- - wastewater management
- - potable water supply including a desalination plant, management plan
- - electricity supply management plan
- - plant and equipment management plan
- - any other required plan that may arise from the contractors' specific construction methodology
-
- Main Plan:
- Demolition plan (disused structures/vacated houses)
- Sub-plans/procedures/method statements
- - demolition method statement
- - demolition waste management plan
- - traffic management plan
- - noise & air quality management plan
- - demolition waste handling, stockpiling, reuse or carting away management plan
-
- Main Plan:
- Earthworks management plan
- Sub-plans/procedures/method statements
- - quarry/borrow area management plan
- - traffic management plan
- - noise & air quality management plan
- - storage management plan
-
- Other main plan
- Construction Waste management plan
- Hazardous material management plan
- Traffic management plan
- Site reinstatement management plan

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Plant and facilities

The main site facilities to be considered when preparing the plans are as follows:

- Base camp (laydown areas, and contractor workers camps),
- Wastewater treatment plant,
- Temporary desalination plant,
- Asphalt plant,
- Concrete batching plant,
- Storage and maintenance sheds and hangars,
- Cranes, and earth moving equipment,
- Worker accommodation and associated facilities
-

Location

These facilities should not be located within or adjacent to any identified sensitive area. The location should be selected in conjunction with and approved by the supervision engineer and PIU E&S specialist.

Limit emissions

All standards and limits of emissions and discharge, as presented in Chapter 2, should be respected.

Focus on the base camp and access roads

The base camp will be designed taking into consideration the requirements as stipulated in the IFC guidance note for workers accommodation[1]; to accommodate foreign workers. It is planned to have about 400-450 people on site.

The following provisions have to be implemented in the site and works facilities management and monitoring plan:

- Provision must be made for all the basic services necessary for the proper functioning and maintenance of the base camp: sanitary facilities, mess, accommodation, electricity supply, and secure access control etc;
- Verification of compliance with standards and regulations regarding health, safety and accommodation conditions in the operation of the base camp;
- Organization of a waste management system for the base camp including waste sorting;
- Clear and signposted demarcation of the base camp;
- Regulation of traffic in the base camp and on the access roads: planning of access schedules and exceptional convoys;
- Planning of a dismantling plan for the base and rehabilitation of the access roads.
-

Hangars and sheds

All material storage and maintenance activities must be carried out under hangars sized to withstand the particular local climatic conditions.

[1] https://documents1.worldbank.org/curated/en/604561468170043490/pdf/602530WP0worke10Box358316B01PUBLIC1.pdf

Hangars and sheds must all have their own pollution containment systems. Maintenance and refuelling hangars must be equipped with their own hydrocarbon separator.

Asphalt and concrete plants

Obtaining all necessary environmental authorisations for the establishment and operation of an asphalt and concrete batching plant, as necessary.

- Concrete and asphalt plants must be equipped with filter systems.
- Storage of bitumen and cement must be done in a manner which do not pose any significant risk to the surrounding environment, and
- Wastewater from the concrete batching plant must be treated separately from the site wastewater.

Facilities monitoring

The condition of all site facilities must be weekly checked by a general inspection by the Contractor EHS specialist using checklists. The same applies to compliance with all environmental management rules and procedures put in place to respond to measures concerning site installations.

Person in charge

This plan should be prepared, managed and implemented by the contractor, under the control of the PIU.

9.1.2 SURFACE STORMWATER RUN-OFF, DRINKING WATER AND WASTEWATER MANAGEMENT AND MONITORING PLAN

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.

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.

Facilities monitoring and survey

The measures implemented during the construction phase will require a monitoring plan of:

- the water quality at the inlet and the outlet of the Water Treatment Plant (Drinking Water via the desalination plant) and the Wastewater Treatment Plant, and
- the stormwater quality at the discharge points at sea.
-

Therefore, a regular sampling/analysis (tentatively once a week) and visual controls of the ancillary facilities (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 those stipulated in the World Bank Group ESHG (refer to Chapter 2 of the ESMP), and will be submitted to local authorities and PIU on a monthly basis. In case of non-compliance, for each installation, discharge should be stopped and information conveyed to relevant local authorities/client for remedial measures. The remedial measures include retention and/or carting away of non-compliant water/effluents for proper evacuation and elimination.

However, regarding the treatment facilities, adequate Operation & Maintenance tasks, under the supervision of the ARL should secure the installations in order to avoid the risks mentioned above. These include the following specific tasks for operation and maintenance of the treatment plant:

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.

Person in charge

This plan should be prepared, managed and implemented by the contractor under the control of the PIU.

The basic monitoring tasks should be carried out by qualified technicians

The specific operation and maintenance tasks for the treatment plants should be carried out by skilled technicians

9.1.3 Karst monitoring plan

Environmental provisions to be implemented

This plan refers to measures for sediments displacement and aims to guide the development of a robust and comprehensive karst monitoring system from both a hydrogeological and geotechnical perspective.

Person in charge

This plan should be prepared, managed and implemented by the contractor, under the control of the PIU, or alternatively directly by the PIU.

Groundwater quality monitoring plan

This plan should assist in identify changes in groundwater quality and flow regime during construction and operation phases.

This plan must be implemented:

- Before the construction phase to define reference values (baseline) of water quality and groundwater levels;
- During the construction and operation phases to identify any changes of indicators.

This plan consists in the:

- Setting up of a network of observation wells (using existing wells or new wells to be provided):
- 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). It is recommended that multi-piezometers 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 start of works. 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 below) should be analysed as well as 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 analysis.

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 odour 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.

9.1.4 Caves Monitoring Plan

This plan aims to carry out a complete survey prior to state of works and then monitor 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 these 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).
- 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:

- Every two weeks during the whole construction 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 criteria should be done every month.

At this stage, signs which should lead to stopping 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).

Person in charge

This plan should be managed by the following persons:

- Spill Response Team Leader;
- PIU;
- Construction contractor during construction phase;
- Mauritius authorities:
    - Environmental Assessment Division;
    - Pollution Prevention and Control Division;
- (WRU) Water Resources Unit.

9.1.5 MARINE BIODIVERSITY MANAGEMENT AND MONITORING PLAN

Provisions to be implemented

This plan should include all the provisions of the site to ensure that the measures regarding with the marine environment: currents and turbidity, but also marine biocenoses are implemented:

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 construction phase to evaluate initial baseline conditions during the dry and wet seasons (2 months minimum each) to determine alert and stop thresholds;
- During the construction phase, and measurements should begin at least one day before commencement of works;
- A few months after the construction phase is achieved until the turbidity has returned to its original value.
-

This plan consists of 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 Baie Topaze.

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 a marine specialist after the first result of the measurement campaign.

This plan should be implemented and managed by the following people:

- External Consulting Engineers will install and determine the initial state;
- ARL ensures the adequate state of the buoy;
- Contractor verifies the performance indicators in real time.

Marine biocenoses monitoring plan

The proposed marine biocenoses monitoring plan concerns only the habitat of fringing reef dominated by *Acropora muricata*, located at Pointe Mapou, 1km downstream from the current, located on the northwest coast of the Topaz Bay, and which is the only ecosystem of significant ecological sensitivity located within range of the negative effects of the airstrip project.

The fringing reef of Cite Patate, located upstream of the general current, could be monitored as a control site and the fringing reef of Pointe Mapou, exposed to the project effects, could be monitored as impacted site.

This plan must be implemented:

- Before the construction phase (done for ESIA purposes, 2023)
- During construction
- Post construction

This plan consists of the:

A GCRMN-type protocol (Global Coral Reef Monitoring Network - Hill and Wilkinson, 2004) combining, on each station, the sampling of:

- a 60m long (or 3 x 20m) linear intercept transect (LIT),
- a 5m wide and 100m long (or 2 x 50m) belt transect (BELT) and possibly
- several 1m^2 quadrats.

In practice, the monitoring stations must be materialized by a tarred rope or fishing floats and visual markers throughout the duration of the monitoring protocol in order to ensure the replication of identical monitoring from a campaign to another.

The LIT method consists of noting on a waterproof slate the category of benthic organisms located vertically on a graduated transect 60m long (3 x 20m), previously unrolled on the substrate, as well as any changes in benthic communities (intercepts). The categories of organisms are grouped according to their bio-indicator characteristics in order to provide relevant keys to interpreting the state of health of the benthic communities sampled.

The BELT method consists of counting fish within a corridor 5m wide and 100m long (2 x 50m), i.e. 500m^2. All species are identified, the number of individuals is noted and the size of 8 target families, grouping together carnivores (Carangidae, Chaetodontidae, Labridae, Lethrinidae, Lutjanidae, Serranidae) and herbivores (Acanthuridae, Scaridae), is estimated to centimetre precision. Ecological characteristics intrinsic to each surveyed species (trophic diet, demography, maximum adult size, gregariousness, etc.) then make it possible to deduce the structure of the sampled fish community, both in terms of biomass and abundance.

The quadrat method allows random and standardized sampling (replication of 1m2) of the abundances of macro-invertebrates. This method is adapted to the study site, where the species *Holothuria atra* is extremely abundant.

The advantage of this protocol, compared to ecological sensitivity assessment following the MERCI-Cor method, is the strict quantitative nature of the indicators measured. This complementary approach, thus allows the fine sampling of reference stations, judiciously placed in the ecological context of the study site and likely to highlight subtle disturbances of the communities, exposed to the project pressures, during and after the construction phase (Before-After Control-Impact - BACI - methodology).

The sampling of these monitoring stations will allow, if necessary, the comparison of the results acquired before, during and after the construction phase, both on the Pointe Mapou station, subject to the effects of the project (impact station) and on the Cite Patate station, located outside the influence of the project (control station).

The performance indicators are the following:

- biocenoses status;

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.
- Competent authority

9.1.6 MARINE WORKS MONITORING PLAN (DREDGING AND RECLAMATION PLAN)

This plan aims to ensure that the major marine biological issues in the project area are preserved.

This plan must be implemented during the construction works.

This plan consists of:

- Visual surveillance by boat, on foot;
- Water quality monitoring (main physico-chemical parameters)
- 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 (under marine biodiversity)
- 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.

9.1.7 AIR QUALITY AND NOISE ENVIRONMENT MANAGEMENT AND MONITORING PLAN

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 are implemented.

The following sections guide the monitoring system to be set up in order 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 during construction and by ARL during operational phase:

- Air quality management and monitoring plan,
- Noise environment management and monitoring plan.

Impact study recommendations

→ Air quality monitoring plan to be implemented during construction phase

- Monitoring of dust deposit 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 exceedance 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.

→ 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 exceedance 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.
-

Objectives

The monitoring plan during the construction phase and during the Operation 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.

Performance indicators

The performance indicators to be taken into consideration are:

- the difference between the thresholds 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.

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.

Reports

It is recommended to produce monthly and 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 measure and the monitoring of their effectiveness.

Person in charge

These plans should be implemented by the contractor, under PIU's control.

9.1.8 TERRESTRIAL BIODIVERSITY MANAGEMENT AND MONITORING PLANS

Avoidance and Offset measures

- Avoidance measures management plan is to be implemented by the contractor prior to start of works.
- Offset measures management plan is to be implemented by the PIU and specialists /competent authorities/NGOs

Mitigation measures

Mitigation measures management plan is to be implemented by the contractor prior to start of works.

9.1.9 VISUAL MANAGEMENT AND MONITORING PLAN

The contractor shall identify measures to reduce the visual impact such as

- design, construct and maintain of a Noise & Visual Bund
- install and maintain suitable planting and screening to minimise the views of onsite works
- minimise the visual and off-site lighting impacts of the development
- Include a program to monitor and report on the implementation of the detailed plans and their effectiveness

Person in charge

This plan should be implemented by the contractor, under PIU's control.

9.1.10 EMERGENCY MANAGEMENT PLANS

An Emergency Preparedness and Response plan for the construction phase will be prepared by the contractor in line with the requirements as set out in the Section 19 of ESS 4 and those contained in the World Bank Group EHS Guidelines.

The contractor will be required to periodically test and adjust its emergency preparedness and response plan during construction phase.

The emergency preparedness and response plan should be communicated to nearby communities.

In addition, the PIU will adjust its Emergency Preparedness and Response Plan as required to take into account the construction works undertaken within the airport perimeter adjoining. To be included:

- ***Planning Coordination***: This should include procedures for:
- Informing the public and emergency response agencies
- Documenting first aid and emergency medical treatment
- Taking emergency response actions
- Reviewing and updating the emergency response plan to reflect changes and ensuring that the employees are informed of such changes
- **Emergency Equipment**: The plan should include procedures for using, inspecting, testing, and maintaining emergency response equipment.
- **Training**: Employees and contractors should be trained in any relevant procedures

9.1.11 SPILL RESPONSE OR ACCIDENTAL POLLUTION MANAGEMENT

In the event of an hydrocarbon or other hazardous materials spills on the ground, two scenarios are possible:

- The hydrocarbons/ other hazardous materials are contained in the topsoil;
- Hydrocarbons/ other hazardous materials seeps into the ground until it reaches the groundwater and flows 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 the deeper layers, changes in groundwater quality should be monitored through monitor well network.

A Spill Emergency Plan must be implemented in detail before the initial earthworks

The objectives of a 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.
- To avoid Land Contamination

During the construction phase, the Spill Emergency Plan should consist to:

- Stop all earthworks within a 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 authorized by the PIU Environmental specialist and ARL.

While the risk of spills cannot be completely prevented, the risks can be significantly minimized with proper training, awareness raising and implementation of procedures.

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.

→ 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

→ 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

→ 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.

→ Contact

As soon as practicable, the spill must be reported to Airport Authorities (ARL) and Spill response team leader.

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

→ 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.

→ 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.

Marine contamination

→ 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

→ Clean

Absorbent materials such as diatomaceous earth or polypropylene are the preferred products for cleaning up any spills. These products absorb the spilled material, leaving no residue, and have no detrimental impact on the environment. An Emergency Response Plan must identify a list of approved cleaning materials.

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 containing contamination at sea must be implemented.

If seawater is contaminated, the clean-up should only be conducted if the benefit outweighs the potential harm caused by removing the spill. If the benefit is less than the potential harm, 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 of threatening spills into the sea, the use of dispersants could be considered. This chemical agent aids biodegradation 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 contractors and transported to a secure disposal site.

Once clean-up operations are complete, consideration will be given to restoring areas identified as having high environmental sensitivity and value.

9.1.12 Fire Prevention and Emergency Response Plan

The Fire Prevention and Emergency Response Plan serves to reduce the risk of fires in the following ways:

- Identifies materials that are potential fire hazards and their proper handling and storage procedures;
- Distinguishes potential ignition sources and the proper control procedures of those sources;
- Describes fire protection equipment and/or systems used to control fire hazards;
- Identifies persons responsible for maintaining the equipment and systems installed to prevent or control ignition of fires;
- specifies what employees should do during an emergency, and ensure that employees receive proper training for emergencies

In case of a minor fire outbreak it is expected that the contractor will respond with his own equipment (fire extinguishers, fire hose, etc). in case a more serious fire breaks, the airport fire services may be called to intervene and hence should be trained accordingly.

The water from firefighting will be contained and as far as possible be collected.

9.1.13 ARCHAEOLOGY OR PATRIMONIAL CHANCE FIND PROCEDURE

Despite the field surveys and fact-finding visits, the construction stages of the project are moments of possible discoveries of cultural or archaeological heritage, which are then considered fortuitous discoveries.

Specialists in the field, such as ethnologists or archaeologists, must conduct a preliminary assessment using an open methodology to determine whether the incidental discovery is part of the cultural or archaeological heritage. Once this assessment is complete, and in the event of a positive response, an investigation process must be put in place. The survey should follow a standard procedure. As the construction phase progresses, the investigation process must be completed promptly.

Ethnological heritage (very low probability of discovery)

The first step is to manage the local population's reaction. Subcontractors must be trained or informed on this subject so that they adopt the right attitude: acknowledging the presence of a heritage site, apologizing, and stopping all works immediately.

In the event of a discovery by a worker, the same approach should be taken. A site assessment should be initiated, and work should be suspended. The local population should be informed and invited to see the discovery themselves.

A chance discovery during the course of work requires the urgent implementation of the usual investigation procedure. This should be followed by further investigation and a decision on how to manage the heritage site.

It is crucial that the contractor uses competent individuals to identify the nature of the heritage. Once the necessary processing is complete, a final report should be written.

Activities can only be resumed after information, consultation, and approval from local authorities.

The contractor must provide a document specifying its internal procedure regarding chance discoveries. This may include establishing effective internal communication, such as providing regular updates on the progress of work and the timetable for investigations.

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 an 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, labouratory, etc.).

9.2 SOCIAL MANAGEMENT PLANS TO BE IMPLEMENTED FOR THE CONSTRUCTION PHASE OR PRIOR TO THE WORKS

This Social Management Plan is accompanied by monitoring and evaluation tools required to monitor the performance and assess its accuracy. The different plans proposed in this document are explained, and a general framework is provided for their development. The SMP alone cannot suffice, and each of the tools must undergo 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 guidelines:

- Communication to the population about the temporary nature of the facility
- Elabouration 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)
- Organization of awareness, prevention and treatment programs 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 an on-site care center 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 Center

- 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.

9.2.1 COMMUNICATION PLAN

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.

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).
-

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.

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.

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 organizational level, of the role of a community liaison officer, the use of local media, etc.;
- Elabouration 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.

Follow-up

It is essential to establish a follow-up process to ensure that the actions of the plan are actually put in place.

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 COMPLAINTS MANAGEMENT PLAN

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.

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.

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 to a mutually acceptable solution.

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.

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 (specialized 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 organized;
- 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.

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.
-

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.

9.2.3 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.

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).

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 elabouration 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.

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.

Management strategy

- For each phase of the implementation of the RAP, the project will endeavor 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.

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).

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.

9.2.4 COMMUNITY DEVELOPMENT PLAN

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.

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).

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.

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...).

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 prioritization.
- Implementation methods: The selection of contractors, partners for implementation, and control officers, as well as the realization of tenders, should be overseen by the local administrative entities as much as possible and monitored by the population. 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.

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.

9.2.5 PUBLIC HEALTH AND COMMUNITY SAFETY PLAN

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.

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).

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.

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.

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.

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.

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.

9.2.6 OCCUPATIONAL HEALTH AND SAFETY PLAN

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.

Impact study recommendations

The recommendations for the establishment of a occupational 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).
-
- The OHS plan should meet the requirements of the World Bank ESS 2 Paragraph D24 to 29.

Objectives

The objectives of the occupational health and safety plan are to:

- Ensure that potential hazardous and risks are actively identified in the work place
- Ensure that the realization 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.
- Set out the procedure for reporting of incidents and putting mechanism in place for correcting of incidents

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 (first aid, medical treatment and Lost time injuries) or mortality;
- The number of cases of work-related illnesses.

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;

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.

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

9.2.7 WORKFORCE MANAGEMENT AND TRAINING PLAN

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.

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 favoring 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 collabouration 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 prioritize 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).

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.
-

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.

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.

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.
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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

9.2.8 Roles and Responsibilities

Table 9-1: SMP Construction – roles and responsibilities

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control
Base camp and works site social management plan	-	**Contractor + PIU**
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 - PIU - 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 - 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 / PIU 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 - PIU - 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 - 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

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control
		- Villagers and livestock breeders of the resettlement area - Rodrigues fishing Commission To be monitored by: RRA / PIU 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 - PIU - 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 - PIU 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	- PIU - 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 / PIU
Occupational health and safety plan	SE-Mit-18 SE-Mit-19	- PIU - Project managers - Rodrigues health Commission

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control
		- Rodrigues labour Commission - Village committees of the airport area (Anse Quitor, Plaine Corail – Cascade Jean Louis) - Media (local radio) To be monitored by: PIU
Workforce management and training plan	SE-Mit-5 SE-Mit-6 SE-Mit-7 SE-Mit-8 SE-Mit-18 SE-Mit-19	- PIU - 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 / PIU

9.3 ENVIRONMENT MANAGEMENT PLANS TO BE DRAWN UP IN OPERATION PHASE

9.3.1 SURFACE STORMWATER RUN-OFF, DRINKING WATER AND WASTEWATER MANAGEMENT AND MONITORING PLAN

Operation monitoring of measures

A monitoring system of the utilities and services should be set up for the Operation phase and integrated into the current routine inspections of the airport.

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.

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.

9.3.2 KARST MONITORING PLAN

Post-commissioning Caves Monitoring Plan

This plan aims to monitor the 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 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 construction 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 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 PIU/ARL.

Operation phase groundwater quality monitoring plan

This plan consists of keeping and 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 Operation 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:

- PIU/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 PIU/ARL.

9.3.3 INFRASTRUCTURES AND ACCESS MONITORING PLAN

At the beginning of the Operation phase, a monitoring plan must be put in place for one year to observe any traffic problems generated and the state of the restored infrastructure.

9.3.4 MARINE BIODIVERSITY AND HABITATS MONITORING PLAN

This plan consists of implementing an ecological diagnosis and assessment of the health status of corals at Pointe Palmiste.

This plan must have begun before the works, and then must be implemented at 1, 3 and 5 years into the Operation phase.

This plan consists of the:

- Monitoring
- 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 PIU/ARL.

9.3.5 AIR QUALITY AND NOISE ENVIRONMENT MANAGEMENT PLANS

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.

- Noise environment monitoring plan

Impact study recommendations

→ 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.

→ 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.

Objectives

The monitoring plan during the Operation 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.

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.

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.

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.

9.3.6 LANDSCAPE MEASURES FOLLOWING-UP PLAN

The landscape measures are both at Airport level and to be implemented under the control of and at island level and to be implemented by RRA services.

9.3.7 EMERGENCY PREVENTION AND MANAGEMENT PLANS

Plaine Corail airport being an existing airport, all emergency prevention and management plans are expected to be in place.

The plans will be reviewed as required to incorporate the new airport facilities.

9.3.8 OIL SPILL 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.

9.3.9 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.

An Oil Spill Emergency Plan must be implemented in detail before the initial earthworks.

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.

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.

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

→ 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

→ 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.

→ Contact

As soon as practicable, the spill must be reported to Airport Authorities (ARL) and Spill response team leader.

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

→ 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.

→ 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.

Marine contamination

→ 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

→ 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.

9.3.10 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.

9.3.11 Summary of environmental management plans for Operation phase

Table 9-2: Summary of Environmental Management Plan 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	<u>Design</u> 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
	<u>Operation monitoring of measures</u> 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	<u>Design – groundwater</u> Phy-Kar-Mit-26	To be implemented by the Detail Design Engineer	- Sizing note and plans - 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
		Under ARL's control	
	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
Infrastructures and access monitoring plan	Design ad post-commissioning monitoring 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	Design Air-Mit-6 to 11 Noi-Mit-3 to 5	To be implemented by ARL E&H Team 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 E&H Team Under ARL's control	- Air quality monitoring plan - Noise environment monitoring plan

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control	Activity / Procedures to include
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

9.4 SOCIAL MANAGEMENT PLANS TO BE IMPLEMENTED FOR THE OPERATION 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.

9.4.1 COMMUNICATION PLAN

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.

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).

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.

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.

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;
- Elabouration 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.

Follow-up

It is essential to establish a follow-up process to ensure that the actions of the plan are actually put in place.

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.

9.4.2 COMPLAINTS MANAGEMENT PLAN

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.

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

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.

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.

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 organized;
- 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.

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.

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.

9.4.3 COMMUNITY ASSISTANCE AND COMMUNICATION PLAN FOR THE DEVELOPMENT OF INCOME GENERATING ACTIVITIES

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).

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.

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).

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, organizing 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.

9.4.4 COMMUNITY DEVELOPMENT PLAN

Management issues

Measures to support the reconstitution of an economic and productive situation favorable 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.

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).

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.

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...).
-

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 prioritization.
- Implementation methods: the realization 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.

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.
-

9.4.5 WORKFORCE MANAGEMENT AND TRAINING PLAN

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.

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 favoring 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 collabouration 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 prioritize the employment of those directly affected by the project (measure SE-Mit-7);

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.

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.

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.

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.

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.

9.4.6 SUMMARY OF PLANS TO BE DRAWN UP FOR SOCIAL MANAGEMENT DURING THE OPERATION PHASE

Table 9-3: Summary of Social Management Plans for Operation phase

Plan	Measures that the plan must allow to implement and monitor	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	

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control
	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 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

Plan	Measures that the plan must allow to implement and monitor	Person in charge of implementation and control
		- 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

9.2 SPECIALIST REPORTS

The following reports are attached:

Volume 2 of 4

- Specialist Report for Terrestrial Biodiversity
- Specialist Report for Marine Biodiversity

Volume 3 of 4

- Specialist Report for Maritime Impacts
- Specialist Report for Hydrogeological Impacts
- Specialist Report for Water Management

Volume 4 of 4

- Specialist Report for Traffic Management and Impact
- Geotechnical Report
- Specialist Report for Noise & Air Quality