REPUBLIC OF SEYCHELLES

DEPARTMENT OF TRANSPORT

SEYCHELLES PORT AUTHORITY

FEASIBILITY STUDY FOR THE REHABILITATION AND EXTENSION OF THE COMMERCIAL PORT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

October 2016

Prepared by

DAR Environmental Services

On behalf of Maritime & Transport Business Solutions and GIBB Seychelles Ltd

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EXECUTIVE SUMMARY

INTRODUCTION

In July 2015, the European Investment Bank ("EIB") (Luxembourg), ("the Client"), and Maritime & Transport Business Solutions, (MTBS, Rotterdam, The Netherlands), ("the Consultant"), signed the Contract for Consultancy to provide Technical Assistance ("TA") Services for the "feasibility study for the rehabilitation and extension of Port Victoria (Seychelles), Reference code TA2014021 SC IF3. A kick-off meeting was held on Friday 3 July 2015 at the European Investment Bank in Luxembourg.

THE PROJECT

The project components are:

- Construction of a new quay of 600m length, shifted 40m seaward;
- Demolition of the existing quays (Halcrow and Norplan Quays) and backfilling to create more space for port operation;
- Dredging of the navigation channel to obtain backfilling materials and creation of depth for safer marine traffic.

EIA PROCESS

The scoping process for the Environmental Impact Assessment was initiated upon the appointment of DAR Environmental Services (a local consultancy services) to provide the MTBS and GIBB Seychelles Ltd an Environmental Consultancy Services with regards to obtaining the necessary approval for the proposed project. The scoping process was engaged through the Environment Department, Environment Assessment and Permit Section as per the Environment Protection (Impact Assessment) Regulations 1996. Upon screening by the Environment Department and as per the contractual ToR, it was found that a full EIA would be needed. As such scoping meetings were done with affected and interested groups as well as the public in general.

SCREENING OF THE PROJECT

CONSULTATION MEETING WITH ENVIRONMENT STAKEHOLDERS

Consultative meeting was undertaken with key stakeholders to obtain their views with regards to the proposed project. Appendix 1 presents the scoping list issued by the Environment Department of the Ministry of Environment, Energy and Climate Change; and Appendix 2 presents the comments received.

CONSULTATION OF STAKEHOLDERS IDENTIFIED BY SPA AND MTBS

The main consultant (MTBS) made a series of meetings from Monday 13 July 2015 until Thursday 16 July 2015. The consultant conducted several stakeholder interviews (list of stakeholder meetings provided in table 2), gathered all the necessary data, and visited all relevant sites. All these different aspects allowed the consultant to fine-tune its proposed approach to the project and resources needed for the project.

PUBLIC MEETING

It is expected that in view of the type of project, the turnout in the public meeting will be poor; as such it would be more appropriate to hold this meeting towards the end of the ESIA; during the public inspection period when the document itself is on public inspection. After that, if the turnout remains poor, then other mechanisms such as press release could be organized to disseminate information.

METTING WITH CIVIL SOCIETY

The matters discuss during the stakeholders meeting are as follows:

Issue/Question/Comments	Commentator	Reply
What will happen with the lighthouse, you mentioned that it would be removed; I think you must bear in mind that the lighthouse is a National Monument, and serious thoughts must be given as it is part of our history and heritage.	Mr. Marcel Rosalie (CEPS) Also a member of the National Monument Board.	The lighthouse itself is not in good condition, it is being affected by waves; especially those made by big vessels, such as *Cat Cocos*. With the new plan we are thinking of moving the lighthouse a bit further on the side, in other instances we are thinking of doing something that will remind people of the actual/original position of the lighthouse, like putting a plaque, but I want to give the assurance that the Ports Authority has given consideration to the lighthouse, but with the new extension it has to be moved. The

		consultants behind this concept had to take into consideration the commercial capacity of the port, such as yards for storage of the containers and how best to cater for future vessels, which will be bigger. The current port was constructed in the seventies and it has lived its life, we need to do something that caters for the future, as this port was not designed for containers, and the infrastructures are weakening. The new extension will gives 600 meters quay to work with and is more favorable for it to discharge its functions to the fullest and in the region we want Port Victoria to be more competitive. We have also a land constraint that is also another reason to build the port out to sea.
I am still not clear what will happen to the lighthouse, a National Monument; will it be moved or demolished?	Mr. Marcel Rosalie CEPS	We have had several consultative meeting during this process and one issue which came out strongly is how safe the passage between Mahe and Romainville island will be now that the port will be extended, how big will be ships and how to manoeuvre in such tight space. The channel in this area is not straight passage, it is rather curve and it takes a lot to manoeuvre tankers and other large vessels in this area. But as for the lighthouse, we have been in touch and consult with the Heritage Foundation to decide what best to do with the lighthouse which cannot be renovated and we know that one day we will wake up and see that the lighthouse have fallen. But we need to discuss further what will be done.
I understand that development must happen, but what I recommend as a member of the National Monument Board, that the lighthouse is relocated, but	Mr. Marcel Rosalie	Mr. Rosette stated: I suggest that you guide us on the best way to deal with the lighthouse because once we send the report to EIB, we must be clear on what we do with the lighthouse,

again I want to bring to your attention that without the lighthouse there is no Victoria, as we often say the lighthouse is the light to the world.		after the meeting we will be distributing the scoping verificationform, please use this as a way to guide us further.
What will you do to ensure that the future generation will know how the current port looked? Some sort of documentation or archives or maintain some features.	Mrs. Rosemarie Elizabeth CEPS	We are reiterating the importance of all of your suggestions to be captured in your scoping forms, make all suggestions and please do comment on issues of the sea bed as well.
I still believe relocation is not an option, we look at the lighthouse as the light out to the world, and the lighthouse has guided so many ships in here creating the Victoria we know now. Say we decide to move the clock tower to English River; it will have no importance there. That is what I am saying; think carefully of what we do to the lighthouse. It is essential that the lighthouse remain in this vicinity.	Mr. Justin Freminot HASO	We have said that we are still looking at the options and nothing is final yet, yes I mentioned the proposition of Romainville, but we think and with take note that shifting in on the side and in same vicinity is a good option. We understand its value, for example two years ago we spend 400,000 SR in rock armoring to safeguard its structure.
We also know that more women is becoming involved in men's role associated to port activities.	Mrs. Rosemarie Elisabeth CEPS	In port activities I can testify that in the last 12 years that I have been working at the Port, there has been a marked increase in women working there, this is due to their reliability, promptness and they are more careful and tend to take less risk on the job. But with development and new technologies I foresee even more women working on the ports. But even though a lot of young women come and do attachment at the SPA, a lot of them are also drawn to the yachting industry, but we do foresee women captains in this industry.
Since the port is being extended, are you planning to have a study on the marine invasive? I have copies of past studies also	Ms. Vanessa Zialot S4S	

pertaining to climate change and ecology, I can forward same to you for your consideration as there are recommendations that you might need to consider as well.			
What plans do you have for Praslin?	Mrs. Elizabeth CEPS	Rosemarie	For Praslin, with EVE island we built 180meter quay, 100m was initially designated only for cargo and 80 meters for other activities including passengers services. But we have seen there is greater demand for cargo and we have looked at other possibilities, we have a warehouse that can take up to 100 containers and we are planning for a second one, so we do have long term plans. For passengers facility we do have two local experts Mr. Charles Pool and Mr. Marc D'Offay who are designing a new jetty with capacity for four vessels, the passenger facility has also been designed but we need to construct the port before.
Have you consulted with civil society on Praslin, with regards to the developments?	Mrs. Elisabeth CEPS	Rosemarie	Yes we do a lot of consultation with DMCs, boat operators and others, as well as with the District Administrations. We hope that DAs then will spread the information, in the event that we consult with other groups as well, so that is why we welcome your contacts for the inner islands, so that we can meet with them, when need be. An example is with the new facilities at Eve, when we consulted with operators they said the original location was not ideal, so we listened and moved location.
What about the artisanal fishers.	Mr. Marcel CEPS	Rosalie	Well artisanal fisheries, is a SFA thing, but we have had attended consultations, notably the greater Victoria plan where artisanal port is currently being developed more and bringing in tourism with the artisanal

		fisheries.
Are you planning to import labour for this project? It is important that you take into considerations the different health and safety issues related to such a project, such as spread of diseases, proper and adequate facilities amongst others.	Mr. Justin Freminot HASO	We have a mix group working on the plan, local as well as international. But with a project of this scale we will have an influx of foreign labour especially Indians or other foreign nationality, we have to ensure that we are prepared and able to cope with the influx so that this does not create negative impacts on social life, health, economy and tourism.

METTING WITH MONT FLEURI FISHERS' COMMUNITY

The matters discussed during the fishers' meeting are as follows:

Issue/Question/Comments	Commentator	Reply
The way I see, only our passage will be affected. We use this passage for our transactions mainly to buy ice and *"la bwet"* and when enter to land Marine Charter with our catch to go to the market	Mr. Ricky Charles	What about going around the lighthouse? Going round the lighthouse will mean using more fuel, which is a core expense for us.
Since so many vessels frequent this area and since the work will be quite challenging, how will things be in this area?	Mr. Ricky Charles	The harbormaster as well as the Seychelles Maritime Safety Administration and Marine Police I suggest will be working together, to ensure smooth implementation of the project.
From my understanding, dredging work will be held in a way which will affect our direct passage in to town. As we sell our catch at the Victoria Market, we normally enter close to the Marine Charter and unload our catch near the NISA office, where a truck transport us to the market, now while work is on the way we will need to unload here at Mont fleuri which will cost us more in terms	Mr. Dereck Monthy	We have taken note

of transportation fees.		
Since we usually fish behind the Ste Anne island, we will not be affected by the project in anyway on our way to our fishing, however since we have to buy ice at Oceania, we will be affected, as if we go around Romainville island we will use more fuel, we do get concession on fuel but frankly it is not a lot. If only ice at Providence could be sold all day. They normally close at around 1pm and we often have to go to Oceania.	Mr. Dereck Monthy	
Will there be any obstruction for bigger vessels such as cargo vessels.	Mr. Ricky Charles	The Ports Authority will manage the area to ensure the channel can still be used while work is being undertaken.
We do not have any problems with this, we are happy that our country is developing but we feel that we are assisted more, as you can see here we do not have proper facilities such as a store, because the number of thefts, everything is lost here even though we are close to a Police station. As soon as we dock, we have to unload our engine, life jackets and even our catch; it is not easy to carry an engine every day. Like the port is being extended I would like to ask the authorities to look into our case. For example why not give us an area at Ex - Coast Guard at Bois de Rose, so that we could have store facilities with security, we do not mind paying as long as our stuff are safe, an engine costs 42 000 rupees, and that is lot of money. Sometimes I leave my boat at English River but even there, there are no proper facilities, recently I cut my feet and I could	Ricky Charles	

not work for three weeks, I got nothing no assistance, I hope that the authorities would look into our case. We do not have basics such as toilet and shower facilities. This building is being dilapidated no one is using it and I just wish that it could be renovated and given to us as storage, of course we are prepared to pay for it.	
We welcome this project, as we know our country needs to develop. We know also that many shipping vessels call to Port Victoria, especially cargo and cruise ships. But we also ask the authority to listen to us small traditional fishermen; in this case we want to still have access to areas mentioned. Please note also that some fishermen fish close by especially in the vicinity of the lighthouse.	Mr. Dereck Monthy
The authorities must also look into the impact of dredging as you see here the lagoon is full of silt, when it is low tide we cannot go fishing like today it is a beautiful day, we have "*labwet*" we have fuel, we have ice, but unfortunately we cannot move, because it is low tide, and it costs a lot to repair damages to our boat. Therefore I am calling to the authorities to think about de-silting the mangroves swamp to ensure our safe passage.	Mr. Ricky Charles

RELEVANT LEGISLATION AFFECTING THE PROJECT

- Constitution of the third republic (1993), Chapter 42
- Environmental Protection Act (1994), Chapter 71

- Land Acquisition Act (1991) - Revised Edition - Chapter 105;
- Town and Country Planning Act (1972) - Revised Edition (1991) - Chapter 237;
- Occupational Safety and Health Decree (1978) - Chapter 154;
- Public Health Act (1960) - Revised Edition (1991) - Chapter 189;
- Environmental Protection (Standards) Regulations (1995);
- Employment Act (1995), Chapter 69;
- Occupational Safety and Health Decree (1978), Chapter 154;
- Harbour Act (1932), Chapter 90;
- Employment Tribunal Act 2010;
- Maritime Zone Act (2000);
- EIB Statement of Environmental and Social Principles and Standards (2009)
- EIB Environmental and Social Handbook.

THE POTENTIAL IMPACTS SOURCES DURING CONSTRUCTION PHASE

Construction Activities	Environment Attributes	Probable Impacts
Mobilization of equipment	Air	• Air emissions from vehicles • Fugitive dust emissions due to traffic movement
	Socio-economics	• Increase employment opportunities • Stress on infrastructure • Fishermen activities will be affected
	Wastewater	• Sanitary effluents from on site facilities
	Public Utilities	• Increased flow of traffic

Excavation and leveling works	Air	• Fugitive dust emissions • Air emissions from construction equipment and machinery
	Water	• Run-off from excavated site
	Land	• Accumulated solid and metal wastes
	Ecology	• Smothering of coral reef
Transportation and Storage of Construction Material	Air	• Air emissions from vehicles • Fugitive dust emissions due to traffic movement
	Water	• Run-off from construction material storage areas
	Public Utilities	• Increased flow of traffic
Civil Construction Activities	Air	• Air emissions from construction machinery • Fugitive dust emissions from construction activities
	Water	• Run-off from construction site
Demolition works	Air	• Fugitive dust emissions due to demolition works • Air emissions from transport vehicles • Fugitive dust emissions due to movement of traffic • Spillage and fugitive emissions of debris materials
	Water	• Run-off from disposal areas
	Land	• Accumulated solid and metal wastes

Possible influx of foreign labour	Socio-Economics	• Employment opportunities shall increase • Stress on infrastructure
	Land	• Change in land use pattern of the area
	Water	• Sanitary effluents from onsite facilities
Dredging operations	Water	• Suspension of sediment
	Land	• Change in land use pattern of the area
	Ecology	• Smothering of coral reef
Transportation and Disposal of Construction Debris	Air	• Air emissions from transport vehicles • Fugitive dust emissions due to movement of traffic • Spillage and fugitive emissions of debris materials
	Water	• Run-off from disposal areas
	Soil	• Disposal of waste
Relocation of Lighthouse	Socio-economic	• Loss of cultural heritage • Loss of benefits
Mont Fleuri Fishers Community	Socio-Economic	• Limited fishers' passage during construction phase • Limited access to fishing ground near to the lighthouse • Additional expenditure for fuel use • increase in transportation fees • Limited options for storage

Marine Invasive	Ecology	• Introduction of marine Invasive • Loss of marine species • Change of marine ecology

CUMMULATIVE IMPACTS

Port Victoria is in a strategic location and is reputed for the services it gives to the vessels calling at our shores. The feasibility study carried out for this project indicates that a new quay of 600m x40m seaward. The existing Halcrow and Norplan Quays will be demolished and used for backfilling works.

The Commercial Port, the site that will accommodate the project, sits on a reclaimed land together with the center of Victoria. Recent reclamation projects run from North East Point to Anse Aux Pins which partially destroyed the longest fringing reef on Mahé (from North East Point to Anse Royale) to create Ile Aurore, Ile Perseverance, Ile du Port, Ile de Romainville, Eden Island, Ile Soleil and the whole strip of reclaimed land running from the English River district to Providence Industrial Estate.

The other projects carried out in the past years are the Roche Caiman and Ile Perseverance Housing Estates, landfill 1 and 2 and an industrial estate established at Providence Industrial Estate, schools, National Assembly Secretariat, Palais de Justice, a tuna canning factory and two new quays and ancillary facilities at the Fishing Port. The future projects that has been earmarked within the port area are as follows:

- 4MW solar park on Ile de Romainville;
- 2100m3 Wastewater Treatment Plant at IOT site;
- Ongoing tuna quays construction at Ile Du Port;
- Ongoing Social Housing Project on Ile Perseverance.

THE MITIGATION MEASURES AND THE ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

ESMP FOR DREDGING OPERATION

WATER QUALITY

Potential Impacts

The immediate increase in suspended sediments in the water column resulting in turbidity of the water and a possible depletion of dissolved oxygen and other physical

parameters could be affected.

Proposed Mitigation Measures

Floating screens or silt screens will need to be deployed in proximity to the dredging sites in the port basin. A Water Quality Monitoring Programme would need to be developed and implemented during the dredging period. The parameters recommended for monitoring are as follows: pH, Salinity, Temperature, Dissolved Oxygen, Total Suspended Solids, Nitrate, Phosphate, Biological Oxygen Demand, Total Faecal Coliform, Turbidity and Heavy Metals.

Dredging should not take place during periods of heavy wind and wave activity in order to limit dispersion of the sediment plume.

Management Plans Required

- Environmental Monitoring Plan
- Sediment Management and Disposal Plan
- Water Quality Monitoring Plan
- Dredging Management Plan

Responsible Parties

- Seychelles Ports Authority
- Dredging Contractor

COMMUNICATION STRATEGY

Potential Impacts

Delays for incoming and outgoing vessels.

Proposed Mitigation Measures

A Communication Procedure has to be prepared to advise the Harbour Master of the movements of the dredger, who in turn regulates ship traffic coming in and going out of the harbour. This is to regulate ship traffic to prevent delays that may arise from dredging activities. A dredging schedule which stipulates dredging times and locations should be developed.

Management Plans Required

- Stakeholder Engagement Plan
- Ship Traffic Management Plan
- Dredging Management Plan

Responsible Parties

- Seychelles Ports Authority
- Dredging Contractor
- Harbour Master

DIPOSAL OF SHIP WASTE (FROM DREDGER)

Potential Impacts

Solid and liquid waste generation from the dredger.

Proposed Mitigation Measures

A plan will have to be developed to manage the solid and liquid waste generated from the dredger. Waste oil and other chemicals are of particular importance.

Management Plans Required

- Environmental Monitoring Plan
- Waste and Hazardous Material Management Plan

Responsible Parties

- Seychelles Ports Authority
- Dredging Contractor

MARINE ECOLOGY

Potential Impacts

The Ste Anne Marine Park is located approximate 4.5Km from the project site, during dredging operation suspension of sediment may drift towards Ste Anne and smoother the coral reef, turbidity may block the sunlight penetration through the water column

and also the reduction of nutrients available for the marine life may result to great loss of marine ecology.

Proposed Mitigation Measures

Banding of the proposed reclamation line should be constructed first; this should be secured with geotextile membrane and rock armoring to prevent the materials being washed away by wave activities. Silt screen should be used to control sediment plumes dispersing away from the project site.

Dredging should be done preferably during calm weather and when current is not pushing towards the Ste Anne Marine Park.

Management Plans Required

- Environmental Monitoring Plan
- Sediment Management and Disposal Plan
- Water Quality Monitoring Plan
- Dredging Management Plan

Responsible Parties

- Seychelles Ports Authority
- Dredging Contractor

LIGHTHOUSE

Potential Impacts

The lighthouse has been in existence for many years and with the proposed project there might be risk that it will be affected when dredging the navigation channel.

Proposed Mitigation Measures

As far as possible the lighthouse should be kept at its existing position and an alternative way of deepening the navigation channel should be identified. If there is no other option available, then an exact replicate of this monument should be done under the guidance of the National Heritage Foundation.

Management Plans Required

- Dredging Management Plan
- Stakeholder Engagement Plan
- Ship Traffic Management Plan

Responsible Parties

- Contractor
- Seychelles Ports Authority

MONT FLEURI FISHERS

Potential Impacts

The proposed project will limit the fishers' passage during the construction phase, limit access to fishing ground near to the lighthouse and will cause additional expenditure for fuel use, increase in transportation fees and also limited option for storage of equipment.

Proposed Mitigation Measures

The Seychelles Port Authority in conjunction with and Seychelles Fishing Authority should decide how best to assist the fishers' that will be affected. A form of compensation should be design.

Management Plans Required

- Environmental Monitoring Plan
- Dredging Management Plan
- Stakeholder Engagement Plan
- Ship Traffic Management Plan

Responsible Parties

- Contractor
- Seychelles Ports Authority
- Dredging Contractor

AIR QUALITY

Potential Impacts

The construction and demolition works (quays) may result in incremental dust and exhaust emissions from vehicles and equipment.

Proposed Mitigation Measures

Mitigation measures aimed at minimizing and controlling dust and exhaust emissions to reduce the impacts of construction demolition works on air quality include continuous monitoring. The parameters to be monitored during construction include PM_{10} and $PM_{2.5}$, NO_2, SO_2, CO and O_3. These parameters may be taken at the property boundaries.

Management Plans Required

- Environmental Monitoring Plan
- Occupational Health and Safety Plan

Responsible Parties

- Contractor
- Seychelles Ports Authority

NOISE

Potential Impacts

Incremental noise disturbance to surrounding areas

Proposed Mitigation Measures

The construction and demolition works associated with the Commercial Port have the potential to result in incremental levels of noise and vibration.

Workers must be properly protected from high noise level using the appropriate protective gear.

Management Plans Required

- Environmental monitoring plan
- Occupational Health and Safety Plan

Responsible Parties

- Contractor
- Seychelles Ports Authority

SOLID WASTE

Potential Impacts

Improper disposal of solid waste

Proposed Mitigation Measures

Solid waste generated during the construction phase may include a variety of construction waste material, putrescible waste and plastics. Solid wastes should be disposed of according to the Waste Management Plan. Construction of a bund along the water front area around the quay will need to be done to prevent generated sediments and solid waste from dispersing into the ocean.

Management Plans Required

- Waste and Hazardous Material Management Plan
- Decommissioning Plan
- Sediment Management Plan
- Waste Management Plan

Responsible Parties

- Contractor
- Seychelles Ports Authority

ESMP FOR THE OPERATIONAL PHASE

STAFFING AND SUPPORT FACILITIES

Potential Impacts

Increase in waste generation, water use and fuel use due to increase in staff

Proposed Mitigation Measures

Additional infrastructure and facilities will be required to handle increase in waste

generation, water use and fuel use.

Management Plans Required

- Environmental Monitoring Plan
- Waste and Hazardous Material Management Plan

Responsible Parties

- Seychelles Ports Authority

SHIP TRAFFIC

Potential Impacts

Increase in ship traffic

Proposed Mitigation Measures

Increase in pilotage

Management Plans Required

- Ship Traffic Management Plan

Responsible Parties

- Seychelles Ports Authority
- Harbour Master

MAINTENANCE DREDGING

Potential Impacts:

Sedimentation and elevated turbidity levels

Proposed Mitigation Measures

Application of procedures to meet standards established for channel upgrade dredging

Management Plans Required

- Dredging Management Plan

Responsible Parties

- Seychelles Ports Authority
- Contractor

WASTEWATER

Potential Impacts

Chemical contamination of the environment from trade effluent discharges from the Commercial Port.

Proposed Mitigation Measures

Increased sewage and trade effluent (due to the expected increase in staff). Port Operators should provide collection, storage and transfer and/ or treatments services and facilities of sufficient capacity and type for all wastewater generated by vessels at the port in accordance with MARPOL and national regulations.

Management Plans Required

- Environmental Monitoring Plan
- Waste And Hazardous Material Management Plan

Responsible Parties

- Seychelles Port. Authority
- Contractor

WASTE GENERATION AND DISPOSAL

Potential Impacts

Improper storage and disposal of old tyres, drums of contaminated materials and used oil, material used for oil spill cleanup, and old air conditioning units and resulting in possible fire hazard, and contamination of environment by CFCs, oil and heavy metals

Proposed Mitigation Measures

Waste may originate from port or from ships and can be hazardous or non-hazardous

Management Plans Required:

Waste and Hazardous Material Management Plan

Responsible Parties

- Seychelles Port Authority
- Contractor

HAZARDOUS MATERIALS

Potential Impacts

Improper disposal and storage of used oil and sludge build up resulting in:

- Fire Hazard
- Contamination of soil and possible ground water
- Contamination of marine environment
- Adverse impacts on human health

Proposed Mitigation Measures

- Restrict access to hazardous material storage site
- Implement proper signage
- Line current hazardous material storage site with an impervious material/ paving

The port receives a significant volume of hazardous material. Spills may occur due to accidents, equipment failure, or improper operation procedures. Spills may also occur from ship traffic, which can result from manoeuvering collisions.

Management Plans Required

- Waste and Hazardous Material Management Plan
- Spill Prevention, Control and Countermeasure Plan

Responsible Parties

- Seychelles Ports Authority
- Contractor

INFRASTRUCTURAL IMPROVEMENTS

Potential Impacts

Accidents, increased use of resources, waste generation

Proposed Mitigation Measures

- Repair deficiencies in facilities
- Implement green strategy - resource conservation and waste minimisation, Support reuse /recycle programs and efficient disposal options

Management Plans Required

- Upgrade Plan
- Environmental Monitoring Plan
- Waste Management Plan

Responsible Parties

- Seychelles Ports Authority
- Contractor

AIR QUALITY

Potential Impacts

Occupational Health and Safety issues from air emissions

Proposed Mitigation Measures

For the operation of the port, air quality management procedures should be developed applicable to ship operators as well as land- based activities. Air quality monitoring should be included.

Management Plans Required

- Environmental Monitoring Plan

Responsible Parties

- Seychelles Ports Authority

NOISE

Potential Impacts

Occupational health and Safety issues from noise disturbance

Proposed Mitigation Measures

Frequent noise assessments are recommended to ensure that the maximum allowable ambient noise levels are not exceeded. Noise monitoring should be included.

Management Plans Required

- Occupational Health and Safety

Responsible Parties

- Seychelles Ports Authority

RECOMMENDATIONS AND CONCLUSIONS

The seaport similar to the airport is an important control point for all that are entering and leaving the country. The elements listed below should be considered for implemented:

a) A Waste Reception Facility to be made available within the port area to receive and manage solid wastes from ships;

b) A Waste Destruction Facility (Incinerator) is critically important for destruction of impounded goods, invasive species thus safeguarding the country's biosecurity;

c) A Waste Oil Reception Facility to be made available for containment and management of waste oil from ships;

d) A separate service road or alternative connectivity between the Commercial Port and the Fishing Port as there will be an increase of port activities which will also increase the flow of traffic between the commercial and the fishing ports and thus add up on the current traffic jam situation in Victoria;

e) The main fuel pipes serving for the loading and unloading of fuel to SEYPEC Fuel Farm should be left clear at all time (no stacking over the line);

f) Separate stacking should be made for hazardous and non-hazardous containers;

g) SPA should adopt clean development mechanism such as use of PV panels for production of electricity, roof harvesting and water reduction devices for conservation of potable, prevention of environment contamination and overall contribute to eco-port/green port development.

The Division of Risk and Disaster Management is undertaking a Risk Assessment of the Commercial Port and upon its completion and approval, a Risk Management Plan should be developed and adopted by the Seychelles Port Authority.

This study has examined the possible impacts of the dredging of the navigation channel for Port Victoria, as well as the demolition of the Halcrow and Norplan quays and construction and backfilling works of a new quay by the SPA. The Mont Fleuri Fishers community will be affected and as such certain mechanism will have to be implemented to ensure they remain functioning during the project implementation phase.

The potential impacts of dredging and the other elements of the port project relates to:

- Water quality due to potential excessive sedimentation from dredging and sediment disposal onshore and offshore;
- Increased vessel sizes and increased operations at the port resulting in more staff and supporting infrastructural facilities.

The mitigation measures proposed primarily surround the issue of sedimentation as a result of the dredging operations. The following are recommended:

- The use of silt screens during dredging operations in the inner channel and around the Port, this should be secured with banding (geotextile membrane and rock armoring) of the onshore disposal site;
- Water quality monitoring programme during the dredging and sediment spoil disposal;
- An ESMP is required for both the construction and operational phases of the project. It includes stated mitigation measures, in the form of plans, procedures and guidelines that need to be developed for avoiding or reducing, as far as possible, any adverse environmental and social impacts.

DAR considers the development of an environmental monitoring plan, waste and hazardous material management plan, dredging management plan, sediments

management and disposal plan, stakeholder engagement plan, emergency preparedness and response plan as necessary. The overall objectives of this ESMP are to:

- Describe the measures required to implement construction related management and mitigation commitments made in the Environmental and Social Impact Assessment;
- Describe specific additional measures required to implement construction related good practice, approval conditions and EIB Directives
- Identify the roles and responsibilities of the environmental and social management organisation of the project;
- Communicate environmental and social expectations and requirements throughout the project team;
- All contractors and subcontractors shall comply with the provisions of the ESMP as applicable to the tasks they are employed to undertake.

1 INTRODUCTION

1.1 COUNTRY PROFILE

There are altogether 90,945 people living in the Seychelles, of which 44,033 are females and 46,912 are males. The population is distributed amongst 2,770 households, with the average household size being 3.7 people. All islands have experienced growth in the number of households. Although 22% of the population of Seychelles is under the age of 15, there is an increase in the elderly population. According to the (last) Census of 2010, the elderly population of Seychelles was 7%. Household income in the Seychelles varies mostly from 3,000 to 10, 000 Seychelles Rupees (SCR) per month. Single parents who are mostly women head 59% of the households in Seychelles.

Mahé is the largest and most populated island of the Seychelles archipelago. It is about 27 km long and 11 km wide. A range of mountains runs down the whole length, most of which are over 300 m in height, rising to the peak of Morne Seychellois, which is 905 m high. The extent of Mahé Island is 154.7 km^2. Figure 1 shows the map of Mahé.

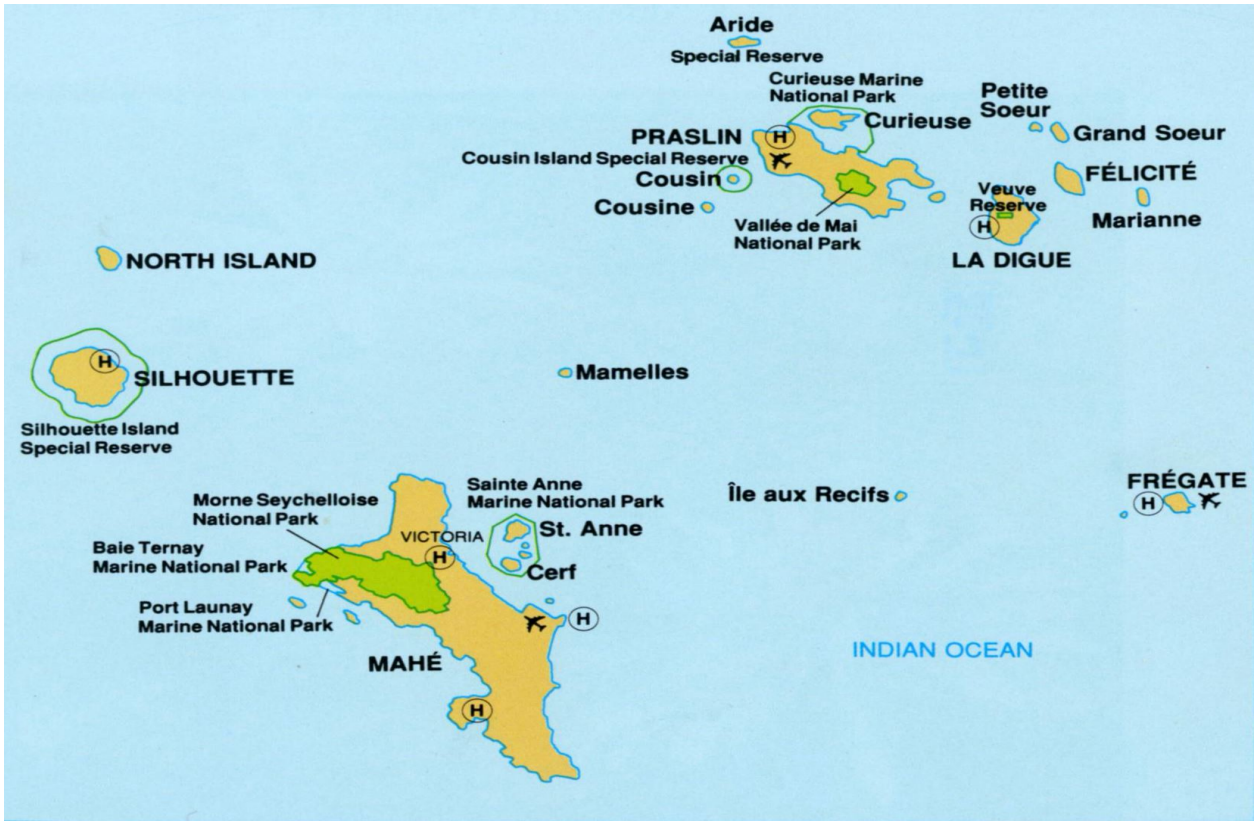

FIGURE 1 – THE INNER ISLANDS OF THE SEYCHELLES ARCHIPELEGO

Victoria (sometimes called Port Victoria) is the capital city of the Seychelles and is

situated on the northeastern side of Mahé Island, the archipelago's main island. The city was first established as the seat of the British colonial government. In 2010, the population of Greater Victoria (including the suburbs) was 26,450 out of the country's total population of 90,945. Attractions in the city include a clock tower modeled on that of Vauxhall Clock Tower in London – England, the Courthouse, the Botanical Gardens, the National Museum of History, the Natural History Museum and the Sir Selwyn Selwyn-Clarke Market. Victoria Market is the local hotspot for the Seychellois people. Figure 1 shows the Inner Islands of the Seychelles archipelago.

The Seychelles economy depends mainly on tourism and fisheries. The government has an extensive presence in the nation's economic activity, with public enterprises active in petroleum product distribution, banking and importation of basic products. Major issues facing the government are the curbing of the budget deficit, including the containment of social welfare costs, and further privatization of public enterprises.

1.1 PORT VICTORIA

The Port includes:

- the Commercial Port (Mahé Quay);
- the Industrial Fishing Port;
- the Inter-island Quay;
- A recently constructed tuna quay on Ile du Port;
- A new commercial fishing quay on Ile du Port.

1.2 HISTORICAL DEVELOPMENT OF THE COMMERCIAL PORT

The commercial port was initially built to handle light (mainly break bulk) commercial activities. However, with the continuing expansion of the fishing industry and space constraints at the fishing port, it is currently being used for both commercial and fishing activities (tuna trans-shipment, loading/unloading of salts and other supplies). Although priority is given to commercial activities, 80% of the commercial port activities are related to fisheries. The new port (the now called the Commercial Port) was built in the 1970s, on the other side of the Long Pier was built, back in the 1870s.

1.2.1 PHYSICAL INFRASTRUCTURE OF THE COMMERCIAL PORT

The commercial port has a 370 m long quay; 264 m were built in 1970 - 1972 (the so-called Halcrow Quay). This section is heavily deteriorated. 105 m were built around 1984 - 1985 (Norplan Quay) and are in much better condition. The maximum water depth is 11.5 m. The operation includes container handling, loading/trans-shipment of fish, cargo discharge and bunkering, berthing of passengers from international cruise ships and from naval vessels. The port has warehouses, silos and depots for the storage of goods, cement, fuels, etc. Private companies do cargo handling and stevedoring.

1.3 INDUSTRIAL FISHING PORT

The quays and bunker pier have a total length of 360 m.

The maximum water depth is 7.5 m.

The operation includes the unloading of (tuna) fish, the trans-shipment of fresh fish, bunkering and minor net repairs.

The port hosts the biggest tuna-canning factory in the Indian Ocean.

1.4 INTER-ISLAND TERMINAL

The quay length of the terminal is 130 m.

The maximum water depth is 5 m.

Operations include passenger boarding and disembarking, as well as cargo for the islands of the Inner Seychelles.

1.5 TUNA QUAY

The EU has funded the construction of a new tuna quay of 120 m on Ile du Port (directly north of the Industrial Fishing Port) through the financial contribution that it provides to Seychelles under the Fisheries Partnership Agreement. Its total cost is approximately 54 million SCR (approximately 3.2 million EUR). Construction was completed in 2014.

1.6 PROPOSED NEW COMMERCIAL FISHING PORT

On 16th March 2014, the Seychelles Government entered into an agreement with JACCAR Holdings, to build and operate a 425-metre commercial fishing quay at Ile du Port. In line with this first project, JACCAR Holdings' subsidiary, SAPMER Holdings, plans to build and operate an unloading, grading & sizing, storage and processing facility on a 35,000 m^2 land, also on Ile du Port. This project will be

implemented in parallel with the IPHS fishing quay and will allow SAPMER to unload up to 90,000 tons of ULT (Ultra Low Temperature) Tuna by 2020.The new facility will provide 5 berthing spots, open to all ship owners.

1.7 THE SEYCHELLES PORT AUTHORITY

The Seychelles Port Authority (SPA) was created in 2004 after the Ports and Marine Services Division was restructured, creating the Seychelles Port Authority (SPA) and the Seychelles Maritime Safety Administration (SMSA).

1.7.1 ROLES

The main functions of the authority as defined by the SPA Act 2004 include:

- regulate, control and administer all matters relating to the safety and security of the port and its facilities;
- promote the development of the infrastructure relating to the port;
- maintain port installations and promote the use, improvement and development of the ports;
- encourage the use of reliable and sufficient equipment in the provision of Port Services;
- participate in matters pertaining to search and rescue;
- collect harbour dues, rental fees and other renumeration payable to the Authority under the Seychelles Port Authority Act, the Harbour Act or any other law;
- plan, execute, monitor and evaluate training programmes of employees, designed to ensure conformity with the standards of the services provided by them;
- act in collaboration with other public authorities and entities, for the prevention of and response to environment incidents;
- advise the Government or any public authority on any matter relating to merchant shipping and prevention and control of marine pollution;
- represent Seychelles on maritime matters at both national and international levels.

1.7.2 ORGANISATION SCHEME OF SPA

The SPA is governed by a Board of Directors and administered by a Chief Executive Officer**.** Figure 2 shows the organisation scheme of SPA.

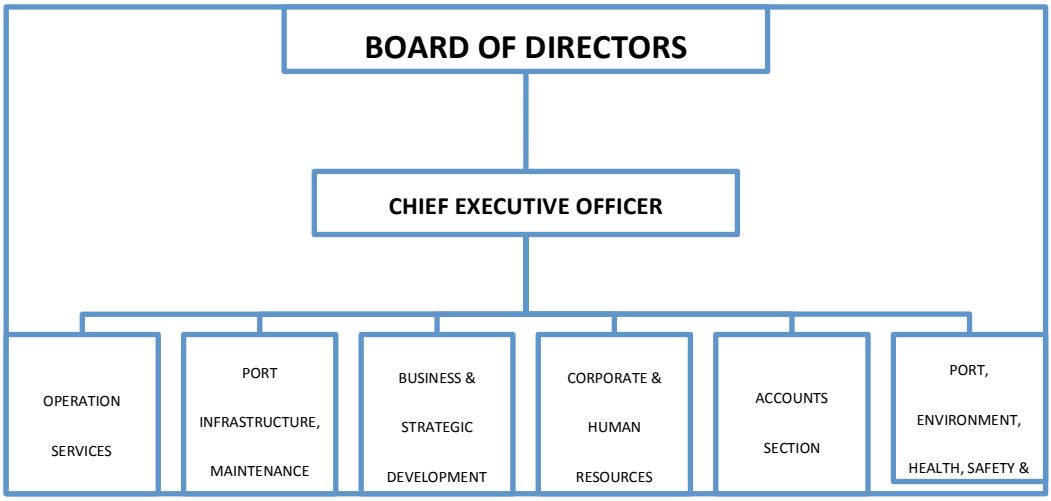

FIGURE 2 – ORGANISATION SCHEME

2 SCREENING AND SCOPING OF THE PROJECT

2.1 SCREENING AND SCOPING ACTIVITIES

2.1.1 SCREENING

The EIA procedures, as required by the Environment Protection (Impact Assessment) Regulations (1996) under the Environment Protection Act 9 (1994), is a pre-requisite for gaining Environmental Authorization from the ministry responsible for environment.

Under Schedule 1 of the Environment Protection (Impact Assessment) Regulations (1996), of the above-mentioned Act (EPA 1994), the desired level of development - its proposed activities and concept - comprises activities, which in accordance with Regulation 3 (1) of the same regulations are projects or activities requiring Environmental Authorization. The proposed project is referred to under section 14.1, 14.3 and 14.5 in table 1.

TABLE 1: PROJECTS OR ACTIVITIES REQUIRING ENVIRONMENTAL AUTHORISATION

CATEGORY OF PROJECT OR ACTIVITIES
1. MINING:
1-1 Quarries and deposit sites.
1-2 Rock crushing, splitting, blasting and excavating.
1-3 Commercial production of aggregates and other materials.
1-4 Earthworks.
2. AGRICULTURAL PRODUCTION:
2-1 Commercial rearing of livestock, including pigs, cattle and poultry.
2-2 Drainage or irrigation for commercial purposes.
3. FORESTRY:
3-1 Logging operations and vegetation clearing.
3-2 Forest tracks or trails: construction or improvement.
3-3 Sawmills: construction.
4. **FISH AND ASSOCIATED PRODUCTS FARMING:**
4-1 Fish farming works and extension, aquaculture.

4-2 Fish processing plants and equipment.
5. CHEMICAL INDUSTRIES:
5-1 Manufacture, handling, storage and transportation of hazardous chemicals or substances.
6. INDUSTRY:
6-1 Construction of industrial buildings.
6-2 Installation of industrial equipments.
6-3 Transportation equipment of industrial products: (classified dangerous as per UNEP specifications)
7. FOOD AND AGRICULTURAL INDUSTRIES.
8. ENERGY PRODUCTION AND DISTRIBUTION:
8-1 Power plant.
8-2 Electric line.
8-3 Gas storage.
8-4 Pipeline.
8-5 Bottling plant.
9. WATER:
9-1 Dams and reservoirs.
9-2 Water treatment plant.
9-3 Public water supply network.
9-4 Desalinization plant.
10. SEWAGE AND WASTE WATER:
10-1 Sewerage treatment plants.
10-2 Sewage networks and outfall.
11. SOLID WASTE:
11-1 Dumping sites.
11-2 Treatment plant.
11-3 Collecting equipment.
12. **HOTELS, RESTAURANTS, AND TOURISM:**

12-1 New hotels or extension of existing hotels.

12-2 Facilities such as golf, swimming pools.

12-3 Restaurants.

13 FISHING VESSELS AND FLEET CONSTRUCTION:

13-1 New industrial vessels.

14. TRANSPORT, HARBOUR AND MARINE:

14-1 Harbour construction and development.

14-2 Construction of airfields aviation strips and landing grounds.

14-3 Harbour dredging operations.

14-4 Equipment purchase and installation.

14-5 Sea defences and sea walls.

14-6 Dry docks.

15. LAND RECLAMATION.

16. HABITAT:

16-1 Housing development and/or land subdivision that would give rise to the creation of a large housing estate.

16-2 Housing development and/or land subdivision that would result in increase pressure on existing infrastructure and or environment.

17 ROAD NETWORK:

17-1 New roads.

17-2 Extension out from existing bank.

17-3 Surfacing of earth tracks or roads.

17-4 Water drainage networks.

2.1.2 CONSULTATION OF AFFECTED AND INTERESTED GROUPS

As mandatory under the EIA Regulations 1996, consultation of affected and interested groups were undertaken to collect their views in regards to this project.

2.1.2.1 CONSULTATION OF STAKEHOLDERS IDENTIFIED BY THE ENVIRONMENT DEPARTMENT

Consultative meeting was undertaken with key stakeholders to obtain their views with regards to the proposed project. Appendix 1 presents the scoping list issued by the Environment Department of the Ministry of Environment, Energy and Climate Change; in which few stakeholders submitted comments (refer to Appendix 2). Appendix 3 contains the presentation made during the stakeholders meeting.

2.1.2.2 CONSULTATION OF STAKEHOLDERS IDENTIFIED BY SPA AND MTBS

The main consultant (MTBS) made a series of meetings from Monday 13 July 2015 until Thursday 16 July 2015. The consultant conducted several stakeholder interviews (list of stakeholder meetings provided in table 2), gathered all the necessary data, and visited all relevant sites. All these different aspects allowed the consultant to fine-tune its proposed approach to the project and resources needed for the project. The minutes of the meetings during the inception visit are presented in Appendix 4.

TABLE 2 – LIST OF STAKEHOLDER MEETINGS DURING INCEPTION VISIT

	Date	Meeting
1	14/07/2015	Meeting Seychelles Port Authority ("SPA")
2	14/07/2015	Meeting Ministry of Home Affairs & Transport ("MoHAT")
3	15/07/2015	Meeting Hunt Detel & Co. Ldt
4	15/07/2015	Meeting Land Marine Services
5	15/07/2015	Meeting Ministry of Tourism ("MoT")
6	15/07/2015	Meeting Fishing Authority
7	15/07/2015	Meeting Ile du Port Handling Services Ltd ("IPHS")
8	16/07/2015	Meeting Ministry of Finance ("MoF")
9	16/07/2015	Meeting Société Seychelloise d'Investissements ("SSI")
10	16/07/2015	Wrap up session SPA
11	16/07/2015	Meeting Ministry of Environment ("MoE")

2.1.2.3 CONSULTATION OF THE GENERAL PUBLIC

It is expected that in view of the type of project, the turnout in the public meeting will be poor; as such it would be more appropriate to hold this meeting towards the end of the ESIA; during the public inspection period when the document itself is on public inspection. After that, if the turnout remains poor, then other mechanisms such as press release could be organized to disseminate information.

2.1.2.4 CONSULTATION WITH MEMBERS OF THE CIVIL SOCIETY

The comment and response report is attached to table 3 and the minutes of meeting is attached to Appendix 5:

TABLE 3 – COMMENT AND RESPONSE REPORT OF THE CIVIL SOCIETY MEETING

Issue/Question/Comments	Commentator	Reply
What will happen with the lighthouse, you mentioned that it would be removed; I think you must bear in mind that the lighthouse is a National Monument, and serious thoughts must be given as it is part of our history and heritage.	Mr. Marcel Rosalie (CEPS) Also a member of the National Monument Board.	The lighthouse itself is not in good condition, it is being affected by waves; especially those made by big vessels, such as *Cat Cocos*. With the new plan we are thinking of moving the lighthouse a bit further on the side, in other instances we are thinking of doing something that will remind people of the actual/original position of the lighthouse, like putting a plaque, but I want to give the assurance that the Ports Authority has given consideration to the lighthouse, but with the new extension it has to be moved. The consultants behind this concept had to take into consideration the commercial capacity of the port, such as yards for storage of the containers and how best to cater for future vessels, which will be bigger. The current port was constructed in the seventies and it has lived its life, we need to do something that caters for the future, as this port was not designed for containers, and the infrastructures are weakening. The new extension will gives 600 meters quay to work with and is more favorable for it to discharge its functions to the fullest and in the region we want Port Victoria to be more competitive. We have also a land constraint that is also another reason to build the port out to sea.
I am still not clear what will happen to the lighthouse, a National Monument, will it be moved or demolished?	Mr. Marcel Rosalie CEPS	We have had several consultative meeting during this process and one issue which came out strongly is how safe the passage between Mahe and Romainville island will be now that the port will be extended, how big will be ships and how to manoeuvre

		in such tight space. The channel in this area is not straight passage, it is rather curve and it takes a lot to manoeuvre tankers and other large vessels in this area. But as for the lighthouse, we have been in touch and consult with the Heritage Foundation to decide what best to do with the lighthouse which cannot be renovated and we know that one day we will wake up and see that the lighthouse have fallen. But we need to discuss further what will be done.
I understand that development must happen, but what I recommend as a member of the National Monument Board, that the lighthouse is relocated, but again I want to bring to your attention that without the lighthouse there is no Victoria, as we often say the lighthouse is the light to the world.	Mr. Marcel Rosalie	Mr. Rosette stated: I suggest that you guide us on the best way to deal with the lighthouse because once we send the report to EIB, we must be clear on what we do with the lighthouse, after the meeting we will be distributing the scoping verification form, please use this as a way to guide us further.
What will you do to ensure that the future generation will know how the current port looked? Some sort of documentation or archives or maintain some features.	Mrs. Rosemarie Elizabeth CEPS	We are reiterating the importance of all of your suggestions to be captured in your scoping forms, make all suggestions and please do comment on issues of the sea bed as well.
I still believe relocation is not an option, we look at the lighthouse as the light out to the world, and the lighthouse has guided so many ships in here creating the Victoria we know now. Say we decide to move the clock tower to English River; it will have no importance there. That is what I am saying; think carefully of what we do to the lighthouse. It is essential that the lighthouse remain in this vicinity.	Mr. Justin Freminot HASO	We have said that we are still looking at the options and nothing is final yet, yes I mentioned the proposition of Romainville, but we think and with take note that shifting in on the side and in same vicinity is a good option. We understand its value, for example two years ago we spend 400,000 SR in rock armoring to safeguard its structure.
We also know that more women is	Mrs. Rosemarie	In port activities I can testify that in

becoming involved in men's role associated to port activities.	Elisabeth CEPS	the last 12 years that I have been working at the Port, there has been a marked increase in women working there, this is due to their reliability, promptness and they are more careful and tend to take less risk on the job. But with development and new technologies I foresee even more women working on the ports. But even though a lot of young women come and do attachment at the SPA, a lot of them are also drawn to the yachting industry, but we do foresee women captains in this industry.
Since the port is being extended, are you planning to have a study on the marine invasive? I have copies of past studies also pertaining to climate change and ecology, I can forward same to you for your consideration as there are recommendations that you might need to consider as well.	Ms. Vanessa Zialot S4S	
What plans do you have for Praslin?	Mrs. Rosemarie Elizabeth CEPS	For Praslin, with EVE island we built 180meter quay, 100m was initially designated only for cargo and 80 meters for other activities including passengers services. But we have seen there is greater demand for cargo and we have looked at other possibilities, we have a warehouse that can take up to 100 containers and we are planning for a second one, so we do have long term plans. For passengers facility we do have two local experts Mr. Charles Pool and Mr. Marc D'Offay who are designing a new jetty with capacity for four vessels, the passenger facility has also been designed but we need to construct the port before.
Have you consulted with civil society on Praslin, with regards to	Mrs. Rosemarie Elisabeth	Yes we do a lot of consultation with DMCs, boat operators and others, as

the developments?	CEPS	well as with the District Administrations. We hope that DAs then will spread the information, in the event that we consult with other groups as well, so that is why we welcome your contacts for the inner islands, so that we can meet with them, when need be. An example is with the new facilities at Eve, when we consulted with operators they said the original location was not ideal, so we listened and moved location.
What about the artisanal fishers.	Mr. Marcel Rosalie CEPS	Well artisanal fisheries, is a SFA thing, but we have had attended consultations, notably the greater Victoria plan where artisanal port is currently being developed more and bringing in tourism with the artisanal fisheries.
Are you planning to import labour for this project? It is important that you take into considerations the different health and safety issues related to such a project, such as spread of diseases, proper and adequate facilities amongst others.	Mr. Justin Freminot HASO	We have a mix group working on the plan, local as well as international. But with a project of this scale we will have an influx of foreign labour especially Indians or other foreign nationality, we have to ensure that we are prepared and able to cope with the influx so that this does not create negative impacts on social life, health, economy and tourism.

2.1.2.1 CONSULTATION WITH MEMBERS OF THE MONT FLEURI FISHERS COMMUNITY

The comment and response report is attached to table 4 and the minutes of meeting is attached to Appendix 6.

TABLE 4 – COMMENT AND RESPONSE REPORT OF THE MONT FLEURI FISHERS COMMUNITY

Issue/Question/Comments	Commentator	Reply
The way I see, only our passage will be affected. We use this passage for our transactions mainly to buy ice and *"la bwet"* and when	Mr. Ricky Charles	What about going around the lighthouse? Going round the lighthouse will

enter to land Marine Charter with our catch to go to the market		mean using more fuel, which is a core expense for us.
Since so many vessels frequent this area and since the work will be quite challenging, how will things be in this area?	Mr. Ricky Charles	The harbormaster as well as the Seychelles Maritime Safety Administration and Marine Police I suggest will be working together, to ensure smooth implementation of the project.
From my understanding, dredging work will be held in a way which will affect our direct passage in to town. As we sell our catch at the Victoria Market, we normally enter close to the Marine Charter and unload our catch near the NISA office, where a truck transport us to the market, now while work is on the way we will need to unload here at Mont fleuri which will cost us more in terms of transportation fees.	Mr. Dereck Monthy	We have taken note
Since we usually fish behind the Ste Anne island, we will not be affected by the project in anyway on our way to our fishing, however since we have to buy ice at Oceania, we will be affected, as if we go around Romainville island we will use more fuel, we do get concession on fuel but frankly it is not a lot. If only ice at Providence could be sold all day. They normally close at around 1pm and we often have to go to Oceania.	Mr. Dereck Monthy	
Will there be any obstruction for bigger vessels such as cargo vessels.	Mr. Ricky Charles	The Ports Authority will manage the area to ensure the channel can still be used while work is being undertaken.
We do not have any problems with this, we are happy that our country is developing but we feel that we are assisted more, as you	Ricky Charles	

can see here we do not have proper facilities such as a store, because the number of thefts, everything is lost here even though we are close to a Police station. As soon as we dock, we have to unload our engine, life jackets and even our catch; it is not easy to carry an engine every day. Like the port is being extended I would like to ask the authorities to look into our case. For example why not give us an area at Ex - Coast Guard at Bois de Rose, so that we could have store facilities with security, we do not mind paying as long as our stuff are safe, an engine costs 42 000 rupees, and that is lot of money. Sometimes I leave my boat at English River but even there, there are no proper facilities, recently I cut my feet and I could not work for three weeks, I got nothing no assistance, I hope that the authorities would look into our case. We do not have basics such as toilet and shower facilities. This building is being dilapidated no one is using it and I just wish that it could be renovated and given to us as storage, of course we are prepared to pay for it.	
We welcome this project, as we know our country needs to develop. We know also that many shipping vessels call to Port Victoria, especially cargo and cruise ships. But we also ask the authority to listen to us small traditional fishermen; in this case we want to still have access to areas mentioned. Please note also that some fishermen fish close by especially in the vicinity of the lighthouse.	Mr. Dereck Monthy

The authorities must also look into the impact of dredging as you see here the lagoon is full of silt, when it is low tide we cannot go fishing like today it is a beautiful day, we have "*labwet*" we have fuel, we have ice, but unfortunately we cannot move, because it is low tide, and it costs a lot to repair damages to our boat. Therefore I am calling to the authorities to think about desilting the mangroves swamp to ensure our safe passage.	Mr. Ricky Charles

2.1.3 TERMS OF REFERENCE

To conclude the scoping process a Scoping Report was prepared and submitted to the Environment Department and where the terms of reference (ToR) was drawn and provided to the EIA Consultant for preparation of the Environmental and Social Impact Assessment Report (refer to Appendix 7).

3 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

The emerging environmental scenario calls for attention on conservation and judicious use of natural resources. There is a need to integrate the environmental consequences of the development activities and for planning suitable measures in order to ensure sustainable development. To achieve such goals the basic principles to be adopted are:

- To enhance the quality of environment in and around the project area by adopting proper measures for conservation of natural resources;
- Prevention of adverse environmental and social impact to the maximum possible extent; and
- To mitigate the possible adverse environmental and socio-economic impact on the project-affected areas.

This report has been prepared with reference to the following policy, legal and administrative frameworks.

3.1 POLICY

The Seychelles National Public Private Partnership Policy states:

"Sea Ports and Shipping *– Seychelles ports are crucial to the growth and sustainability of its two main industries, tourism and fisheries. The only major commercial seaport across the Seychelles islands, Port of Victoria on Mahé, is unlikely to have sufficient capacity over the next few years. The Seychelles Ports Authority (SPA) currently oversees this port, as well as the passenger terminals on Mahé, Praslin and La Digue. The SPA's vision is to transform Port Victoria into an international staging port in the long run. Upgrades and maintenance of Seychelles seaports, therefore, offer opportunities for PPP transactions. In addition, the shipping sector, which is central to the tuna industry, may hold some investment opportunities for the procurement and operation of large shipping vessels. The viability of a dry dock may also be investigated for provision of shipyard services. Infrastructure to support the fishing and fish processing industry will be addressed".*

3.2 LEGAL

3.2.2 CONSTITUTION OF THE THIRD REPUBLIC (1993), CHAPTER 42

Article 30 of the Constitution of the Third Republic recognizes the right of every person to live in and enjoy a clean, healthy and ecologically balanced environment and with a view to ensuring the effective realization of this right the State undertakes:

- To take measures to promote the protection, preservation and improvement of the environment;
- To ensure a sustainable socio-economic development of Seychelles by a judicious use and management of the resources of Seychelles;
- To promote public awareness of the need to protect, preserve and improve the environment.

3.2.3 ENVIRONMENTAL PROTECTION ACT (1994), CHAPTER 71

Under Schedule 1 of the Environment Protection (Impact Assessment) Regulations (1996), of the above-mentioned Act (EPA 1994), the desired level of development – the proposed rehabilitation and extension of the Commercial Port comprises activities, which in accordance with Regulation 3 (1) of the same regulations require an Environmental Authorization.

3.2.4 OTHER RELEVANT LEGISLATIONS

The other legislations relevant to this project are listed below:

- Land Acquisition Act (1991) - Revised Edition - Chapter 105;
- Town and Country Planning Act (1972) - Revised Edition (1991) - Chapter 237;
- Occupational Safety and Health Decree (1978) - Chapter 154;
- Public Health Act (1960) - Revised Edition (1991) - Chapter 189;
- Environmental Protection (Standards) Regulations (1995);
- Employment Act (1995), Chapter 69;
- Occupational Safety and Health Decree (1978), Chapter 154;
- Harbour Act (1932), Chapter 90;
- Employment Tribunal Act 2010;
- Maritime Zone Act (2000).

3.2.5 INTERNATIONAL OBLIGATIONS

The European Investment Bank (EIB) is considering partial financing of the project costs. Therefore, the Environmental and Social Impact Assessment Report is thus

conducted in accordance to the EIB Statement of Environmental and Social Principles and Standards (2009) and the EIB Environmental and Social Handbook.

Seychelles adheres to the principles of compliance with the requirements of international conventions. National laws, policies, and supporting documents endeavour to comply with multilateral environmental agreements (MEAs) and to facilitate international conservation programs and projects. Seychelles is signatory to a number of international agreements and conventions of environmental significance.

3.3 GAP ANALYSIS

The table below presents the gaps between the National ESIA legislation and EIB standards

TABLE 5 – A GAP ANALYSIS BETWEEN NATIONAL E(S)IA LEGISLATION AND EIB STANDARDS

Key areas	National Legislation	EIB Standards
Vulnerable People	+ive	+ive
Gender Issues	+ive	+ive
Cultural Heritage	+ive	+ive
Stakeholder Identification and Stakeholder Engagement	+ive	+ive
Biodiversity and Ecosystems	-ive	+ive
Pollution Prevention	+ive	+ive
Climate Change	+ive	+ive
Cumulative Impacts; Mitigation, Monitoring and Management Plans	+ive	+ive

-ive indicate the area is not covered and whereas the +ive indicate the area is covered under National Legislation or EIB Standards.

4 DESCRIPTION OF THE PROJECT

In July 2015, the European Investment Bank ("EIB") (Luxembourg), ("the Client"), and Maritime & Transport Business Solutions, (MTBS, Rotterdam, The Netherlands), ("the Consultant"), signed the Contract for Consultancy to provide Technical Assistance ("TA") Services for the "feasibility study for the rehabilitation and extension of Port Victoria (Seychelles), Reference code TA2014021 SC IF3. A kick-off meeting was held on Friday 3 July 2015 at the European Investment Bank in Luxembourg.

4.1 PURPOSE OF THE PROJECT

The Commercial Port was built in the 1970s, and overtime its structure has deteriorated in view of the increase and change in activities other than what it was originally built for. The current state of the port requires that a decision be taken to maintain its status, so that it remains competitive in the region. It is on this basis that the feasibility study is being undertaken.

4.2 PROJECT LOCATION

The Commercial Port is located within Port Victoria and the proposed project will be undertaken at its current location where a 600m quay will be built 40m seaward. This will involve the demolition of the existing quays (Holcrow and Norplan) and dredging of the navigation channel towards the lighthouse to deepen the channel, to allow safer passage of vessels. The drilled materials will be used for backfilling works at the project site itself (Refer to Figure 3 and 4) and the excess will be stored at Ile Du Port for other uses approved by the Ministry of Land Use and Housing.

FIGURE 3 – VIEW OF PORT VICTORIA AND ANCILLARY FACILITIES

FIGURE 4 – ARIEL VIEW OF PORT VICTORIA

4.3 PROJECT COMPONENT

Following thorough investigations and evaluation of various options, the option featured in Figure 5 was approved and the ESIA is geared towards this concept:

- Construction of a new quay of 600m length, shifted 40m seaward;
- Demolition of the existing quays (Halcrow and Norplan Quays) and backfilling to create more space for port operation;
- Dredging of the navigation channel to obtain backfilling materials and creation of depth for safer marine traffic.

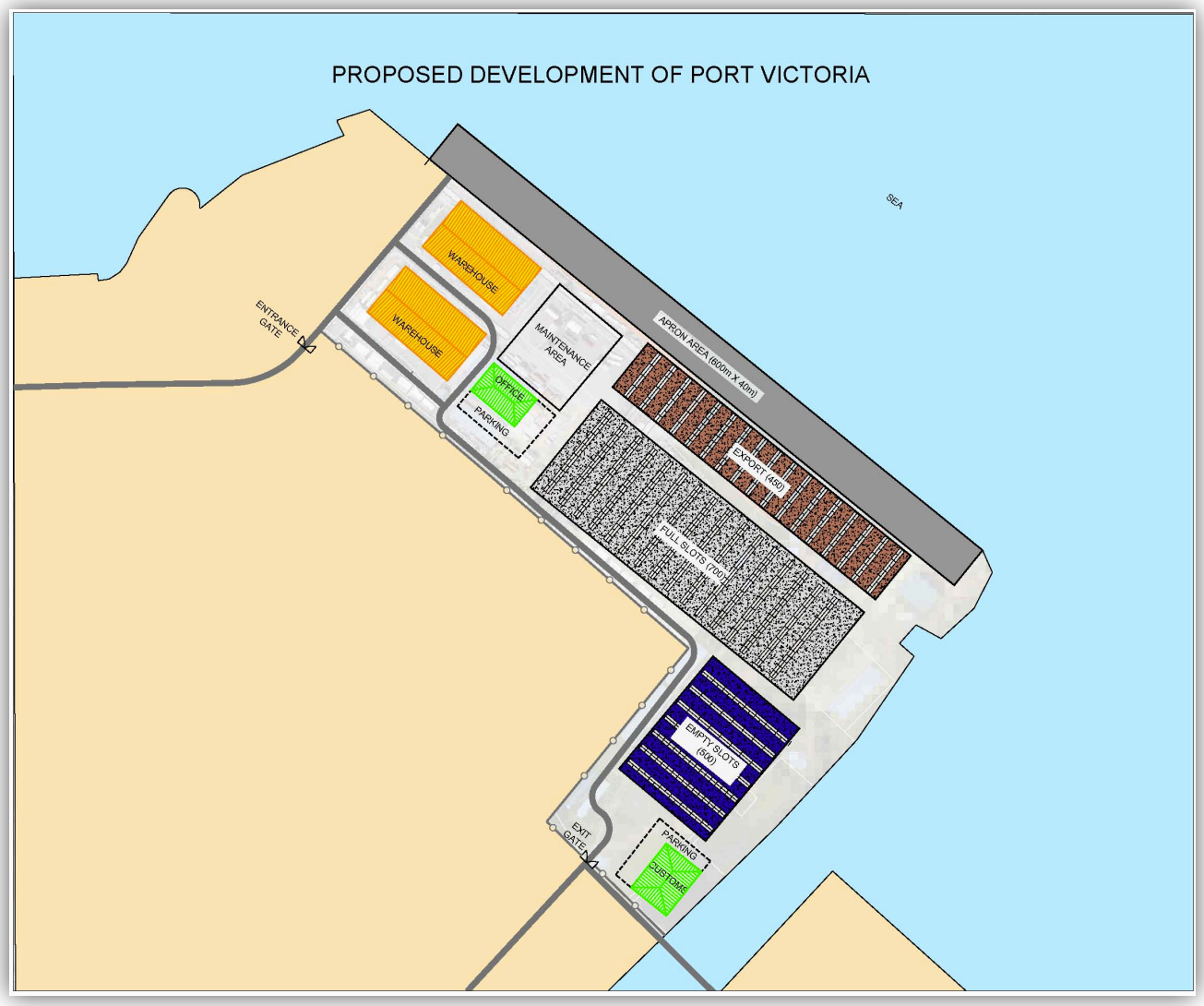

FIGURE 5 – PROPOSED WORKS

4.4 PROJECT JUSTIFICATION

As per a published report dated February 2009 by SSI Engineers and Environmental Consultants from South Africa, the following conclusions were made:

The structure of the quay constructed in 1970 - 1972 (Halcrow Quay - 264 m at 9.5 m draft) is severely compromised, due to a variety of reasons, the most significant being the heavier loads now being applied than was probably envisaged during design. It is also well known that the wheel loads exerted by modern container handling equipment are particularly damaging;

The current practice of double stacking (and possibly even triple stacking) of containers on the quay side prior to arrival of container vessel is also a culprit in exerting significant corner casting loads;

The deterioration of the structure is also due in part to unsuitable cement and aggregate (sand and stone) used in the concrete. There appears to be significant quantities of crushed coral in the concrete, which would imply that elevated quantities of chlorides were present in the concrete from the start;

Additionally, the aggressive corrosion in the chloride laden 'wind and water' zone under the pile and deck structure contributes to the vulnerability of any weakness in the concrete by accelerating the rusting of the reinforcing steel, which, as it expands due to the formation of ferrous oxide, further breaks away the concrete providing the protective cover.

The so-called Norplan Quay (105 m at 11.5 m draft) is in fair condition, although several of the transverse beams are showing distress;
Other weaknesses concern fenders, ladders (completely disrepair), container yard lighting, the service duct covers and the quayside paving on the older Halcrow section.

The quayside yard for containers is evaluated as follows:

The yard is paved in segmental concrete block paving, and although there are some signs of localised deterioration, the surfacing is standing up well to the rigours of the container operation;

However, there is a serious failure of the drainage trench at the south-east end of the yard, requiring urgent attention. The high wheel loads of the handling equipment have destroyed the light, fabricated grid over the surface drains. Not

only have the grids been severely damaged, but the shoulders supporting the grids have been destroyed.

The other problems associated with the port are illustrated below:

4.4.2 INSUFFICIENT SPACE

Limited berthing space to cater for the large and increasing number of container vessels, tankers, cruise ships, military vessels, purse seiners, reefers, and other categories of vessels;

Lack of space for safe and efficient container handling and storage (the Commercial Port was not originally designed for container handling);

Commercial port: incorporation of commercial and fishing activities, limited berthing space, lack of repair facilities for fishing vessels, sanitation problems for cruise vessels;

Limited equipment and space to shift nets and limited manoeuvring space for heavy machinery which represents high accident risks;

Reefer containers: there is insufficient space in the port for promulgating this new technique; fishing vessels compete for berthing space with commercial cargo vessels, tankers, cruise ships etc.

4.4.3 INADEQUATE INFRASTRUCTURE IN THE COMMERCIAL PORT

4.4.3.1 CONDITION OF THE QUAYS

The degree of deterioration presents a risk of structural failures, which may be disastrous for the operation of the port.

The quays were not designed to serve vessels using bow and stern thrusters, which are seriously eroding the underneath of the apron and quay walls.

4.4.3.2 STRUCTURAL LIMITATIONS OF THE QUAYS

In the commercial port (which was not designed to handle the increasingly larger vessels calling to the port and gearless vessels - without onboard cranes - that would like to call).

Structural inability of the quays to handle heavy loads (i.e. containerised cargo and related shore-based heavy equipment).

4.4.3.3 DEPTH OF BERTHS

The depth alongside the quay are inadequate (9.5 m to 11.5 m draft) to cater for the deeper drafts of larger vessels that would like to call at Port Victoria, in line with modern trends in vessel construction.

4.4.4 INADEQUATE AND INSUFFICIENT SUPPORT FACILITIES

Inadequate repair facilities for fishing vessels (mechanical, electrical, etc.).

Inadequate support facilities and services for passenger vessels (cruise ships and military vessels).

Sanitary facilities as the quay in the commercial port is also being used by passenger (cruise/military) ships. The safety of cruise ship passengers is also at stake when cargo vessels are being handled in the presence of cruise ships.

4.5 PROJECT IMPLEMENTATION SCHEDULE

The inception visit by the Consultant to the Seychelles allowed the Consultant to get a more comprehensive understanding of the project stakeholder objectives, stakeholder issues, complex activities, and mobilization. This accumulated knowledge enables the consultant to set out a detailed work plan for the completion of the activities in the remaining TA operation period of execution, as illustrated in Figures 6 and 7.

FIGURE 6 – COMPREHENSIVE PROJECT PLAN – PHASE A

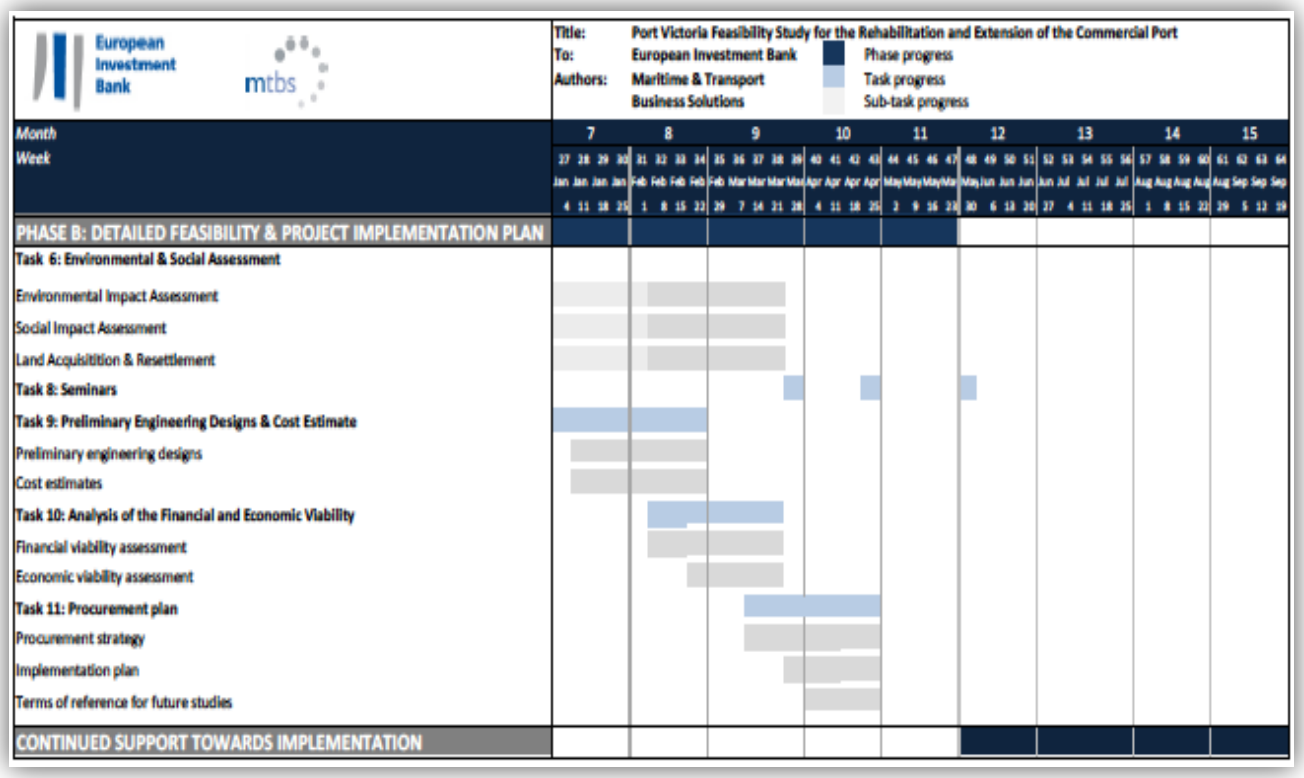

FIGURE 7 – COMPREHENSIVE PROJECT PLAN – PHASE B

4.6 PROJECT ALTERNATIVES

Assessments of alternatives were undertaken and three variants were verified. These are illustrated in sections 4.6.1 to 4.6.3.

4.6.1 SITE ALTERNATIVE

This option looks at building the Commercial Port away from Victoria. Such location could be either at Ile Aurore or the Providence Industrial Estate and does not take into consideration that the Ministry of Land Use and Housing has agreed with such proposal.

4.6.1.1 ADVANTAGES

- There will be more space available to accommodate the new facility with all its ancillary facilities;
- Release pressure on traffic in Victoria;
- Free some space at the current Commercial Port to accommodate other activities (such as waterfront and leisure parks or port related activities).
- The port will be modern and built according to requirement and current nature

of port business.

- The larger vessels will be able to call at Port Victoria;

4.6.1.2 DISADVANTAGES

- Marine environment will be further compromised further from past dredging and reclamation activities;
- Heavy costs to accommodate in the national budget;
- Different sectors will compete for land space;
- A new Industrial Estate will have to be designated;
- The historical heritage of Port Victoria will be compromised/erased;
- Resettlement Action Plan will be required especially with regards to the Providence Industrial Estate.

4.6.2 PROJECT DESIGN ALTERNATIVE

This option looks at rehabilitation and extension of the commercial port at the existing footprint and not extending the quay seaward.

4.6.2.1 ADVANTAGES

- Will cost less in terms of initial investment;
- No need for extensive relocation/mobilization to another site;
- Historical heritage of Port Victoria will be maintained.

4.6.2.2 DISADVANTAGES

- Stability and safety of the quay will be at stake;
- Port Victoria will gradually become less competitive with other ports in the region;
- New and larger vessels becoming in operation will not call at port Victoria because of safety.

4.6.3 NO PROJECT ALTERNATIVE

The 'no project' alternatives assume the project does not move forward and the issues discussed under section 4.4 remain persistent.

4.6.3.1 ADVANTAGES

- There is no advantage with this option.

4.6.3.2 DISADVANTAGES

- Condition of the quay will continue to deteriorate and risk of collapsing at any time;
- Port Victoria will become uncompetitive and fewer ships will call for service;
- There will be less need for the current labor force and as such many port workers will lost their jobs;
- Larger vessels now becoming into operation will not be able to call at the port and such Seychelles will not be able to benefit from these in the future.

5 DESCRIPTION OF THE ENVIRONMENT

Port Victoria is the main point of access between Seychelles and other ports in the region and around the world. It is strategically located in Victoria and it is characterized as an industrial zone, thus the activities range from cruise ships, military, cargo and industrial fishing vessels and tanker operations. The districts of Mont Fleuri, Bel Air, St Louis, Mont Buxton and English River form the belt that encloses the port at the landside. And at the seaside are the recently reclaimed Ile De Romainville, Ile Aurore, Ile Persévérance, Ile du Port, Eden Island and the granitic islands further out of shore. The main rivers connecting to the bay of Victoria are Rivière Moussa, Rivière Maintry, Rivière St Louis, Rivière Rochon and Rivière Trois Frères.

FIGURE 8 – CADASTRAL ILLUSTRATING PARCEL NO WITHIN THE PORT AREA

5.1 CLIMATE

The climate of the Seychelles archipelago is strongly influenced by the ocean, especially through changes in monsoonal winds, ocean currents and sea surface

temperature patterns, hence a tropical maritime climate. In Seychelles two distinct seasonal patterns associated with the wind regime dominate the southeast monsoon, which blows from May to September, associated with the dry season, and the northwest monsoon from November to March associated with the wet season and also the Tropical Cyclone Season over the Southwest Indian Ocean. Synoptically, the main systems, which govern weather over these parts of the world, are primarily the Inter-Tropical Convergence Zone. Hence, complex and highly interactive processes control the Seychelles climate system. The interactions among these various processes are indeed difficult to predict, not least because they may occur on widely differing temporal scales, but also because of the relatively microscopic size yet extensive spatial distribution of the islands in the Seychelles archipelago.

The topography and winds are seen to influence all the rainfall over Mahé. The steep increase in rainfall is concentrated around the high lands of Pérard, La Misère and Cascade Estate. During the North West Monsoon of November to March, rainfall tends to concentrate more towards the north of Mahé. The low land of La Gogue has more rain than the southern part of Monte Cristo and Désert. The South East Monsoon would bring the reverse phenomena, though the western side of Mahé receives more rain. This is more apparent in the months of the well-established South East Monsoon. The western side of Mahé is more in the way of the South East Monsoon. More cloud is thus expected to penetrate inland to the mountainous regions, bringing more rain. The coming northwest wind passes more on the eastern side of Mahé Island.

5.1.1 METEOROLOGICAL OCCURRENCES

The meteorological occurrences recorded at the Seychelles International Airport during the year 2015 are presented in table 6.

TABLE 6 – METEOROLOGICAL RECORDS AT THE SEYCHELLES INTERNATIONAL AIRPORT DURING THE YEAR 2015

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°C)	29.8	30.3	31.6	32.3	31.3	29.9	29.1	29.7	30.1	30.3	30.6	31.2
Rainfall (mm)	182.6	143.8	112.7	69.1	247	142.1	55.2	298.3	254.9	337.6	353.9	298.0
Humidity (%)	80.6	78.4	78.1	77.0	81.4	80.8	80.4	79.1	80.4	81.3	80.0	79.0
Wind (Knots)	8.0	6.5	4.0	4.8	5.8	6.1	9.3	10.4	11.0	8.3	4.6	5.0

5.2 SOIL

The grounds that provide the setting of the Commercial Port, the Fishing Port as well as Central Victoria was reclaimed from dredging material from the Victoria bay some decades back, therefore the nature of the soil is of calcium carbonate in nature ($CaCO_3$).

5.2.2 LAND USE

According to consultation carried out with the Land Use Planning section of the Ministry of Land Use and Habitat, the proposed project is in accordance with the Victoria Master Plan (this is reflected in Figure 9 and Figure 10).

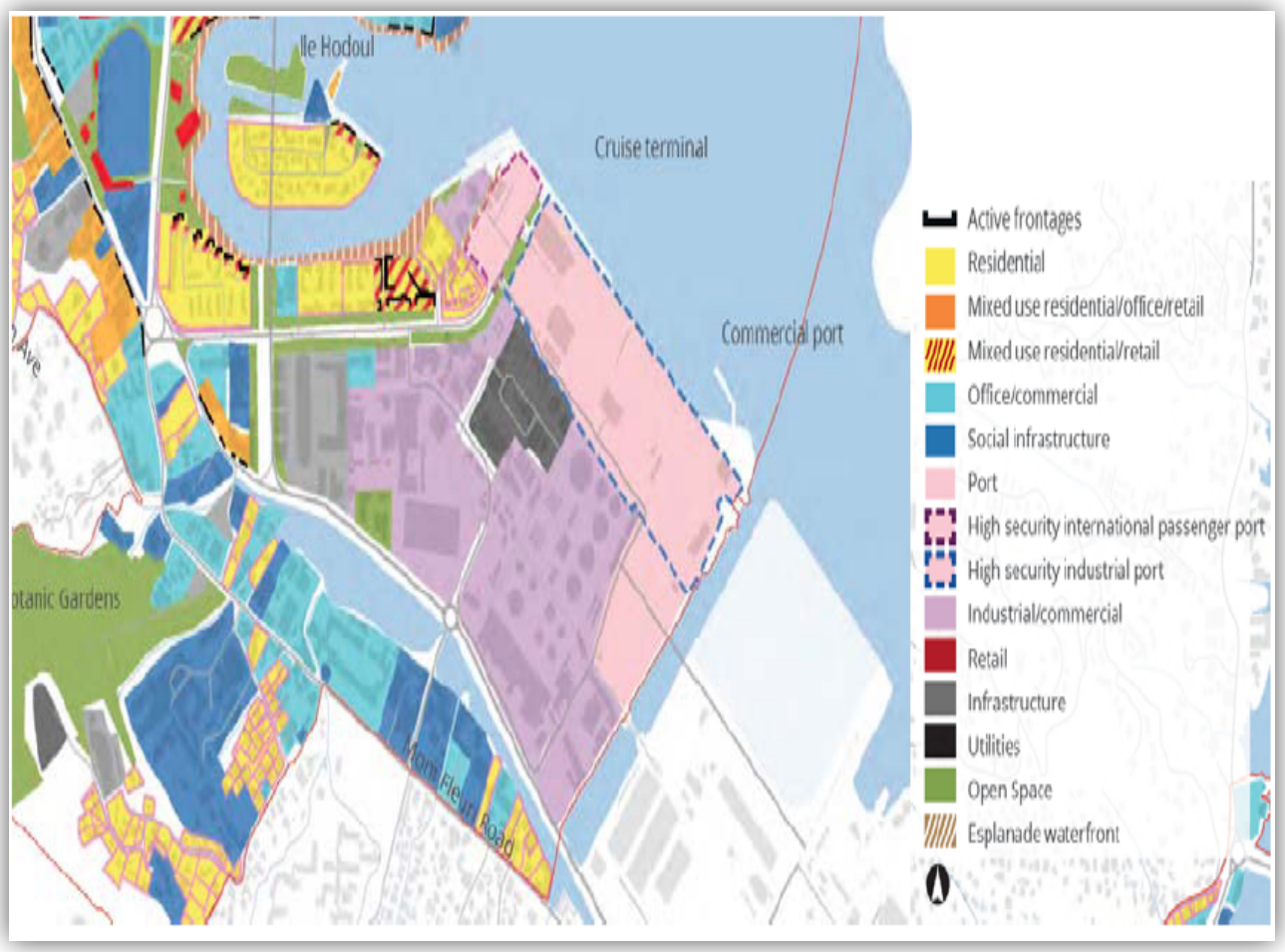

FIGURE 9 – PROPOSED LAND USE (VICTORIA MASTERPLAN)

FIGURE 10 – PROPOSED FUTURE RECLAMATION (VICTORIA MASTERPLAN)

5.3 WAVE AND TIDAL MOVEMENTS

Wave and tidal movements are observed and recorded at the Seychelles International Airport at Pointe Larue. The resultant waves are influenced to a great extent by two weather systems being the Southeast Trade Winds and the onset of the Northwest Monsoon. Predominant offshore wave activity is in the south-easterly direction. During the December–March period, wave activity is reduced, with smaller waves approaching the islands. During the May-October period, larger wave heights are noticed with peaks in July/August. The tides in Seychelles are semi-diurnal with two (2) low tides and two high tides per day. There are also variances between the heights

of water attained at either low or high tide set in any day. There are two tidal reaches being the Neap and Spring tides, each accompanied by a 7-day gap. The tidal movement gradually increases from one neap tide till the maximum heights are attained at the peak for the Spring tide, and this trend then gradually decreases to a minimum over the 7 days, when the other neap tide is reached.

5.4 BATHYMETRY

The bathymetry within the port area varies between 10m to above 16m deep along the outer part of navigation channel. This is according to a study Jan De Nul carried out in March 2007 (Refer to Appendix 8).

5.5 MARINE ENVIRONMENT

The water quality within the port is influence by the various activities occurring within that zone. Upon reaching the pre-construction phase, water samples will be collected and tested for the following parameters: pH, Temperature, Total Dissolved Solids (TDS), Conductivity, Salinity, Dissolved Oxygen (DO), Turbidity, Biological Oxygen Demand (5) and Total Suspended Solids (TSS) to establish baseline condition of the sea.

5.6 AIR

Similar to the marine environment, the air quality within the port is influence by the various activities within that zone. Air Sampling will be taken during the Pre-construction/Construction phase and tested for the following parameters: Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Particulate Matter (PM_{10}), Total Suspended Particulate, Carbon Monoxide (CO) and Ozone (O_3) to establish the baseline condition of the ambient air quality prior to onset of project.

5.7 TERRESTRIAL

The Commercial Port is located within an industrial zone and thus terrestrial ecology within this area is insignificant.

5.8 CLIMATE CHANGE

Seychelles like any other small island developing states is likely to be impacted by the effects of climate change. This is presented in a report published by the World Bank in 2008 (Refer to Appendix 9), where the impact of sea level rise and storm surges are likely to be occurred on Small Island Developing States at a global scale. Whereas in another study carried out by a group of Cuban scientist in 2012, the coasts of the

main islands of Seychelles are seen to be vulnerable taken the different scenarios at certain prescribe time scale (refer to Appendix 10).

5.9 SOCIO-ECONOMIC IMPACT ASSESSMENT

The Socio-economic Impact Assessment (SEIA) is the systematic analysis used during Environmental Impact Assessment to identify and evaluate the potential socio-economic and cultural impacts of a proposed development on the lives and circumstances of people, their families and communities. If such potential impacts are significant and adverse, the SEIA can assist the developer and other parties in the EIA process in finding ways to reduce, remove or prevent these impacts from happening.

The key aim and objectives of this social impact study include:

- To provide a representation of the social, cultural and economic conditions of Mahé Island which will be impacted by the proposed project;
- To identify the potential socio-economic (positive and negative) impacts of the proposed project as part of the feasibility study during the implementation phase;
- To develop attainable mitigation measures to enhance positive impacts and reduce or avoid negative impacts of the project.

5.9.2 METHODOLOGY FOR THE COLLECTION OF BASELINE INFORMATION

5.9.2.1 PRIMARY DATA COLLECTION

Primary data collection for the baseline study of this project is derived from site observation.

5.9.2.2 SECONDARY DATA

Secondary data for the study has been gathered through desktop review of relevant country reports, international instruments, official documents and also international reports of similar projects undertaken in other parts of the world.

5.9.3 LIMITATION TO THE SOCIAL BASELINE

The limitations to the social baseline include limited access to information, which may lead to limited measurement of social value that may impact the project. Furthermore, social impact assessment is based on measurement of intended impact, which is a projection of future occurrences made on past experiences of other projects. Therefore, there is a margin of error to be considered since this particular subject is understudied in the Seychelles context.

5.9.4 SOCIO-ECONOMIC BASELINE CONDITIONED OF SEYCHELLES

5.9.4.1 SOCIAL LEGISLATIVE FRAMEWORK AND POLICIES GUIDING THE PROJECT

The project is operating within several pieces of legislation, guiding policies and international instruments that Seychelles is party to. They complement and also share the same concept as those recognized by the European Union. The legislations include the Employment Act of 1995, the Public Health Act of 1987 and The Employment Tribunal Act of 2010. The Decent Work Agenda Country Programme for Seychelles was adopted from the International Labour Organisation (ILO); the ILO Guidelines on Occupational Safety and Health Management Systems. International Conventions include the Convention on Human Rights, the Convention on the Protection and Promotion of Cultural Diversity and Cultural Expressions, UN Charter on Human Rights, the Convention on the Protection of the Rights of all Migrant Workers and Members of their Families, the Convention on the Elimination of all forms of Discrimination against Women.

5.9.4.2 ADMINISTRATIVE INSTITUTIONS/SOCIO-CULTURAL NETWORKS

5.9.4.2.1 GOVERNMENT ADMINISTRATION

Most government services of Seychelles are relatively centralized in Victoria, although District Administrations, which are under the portfolio of the Department of Community Development and Sports, accommodate many government services including Social Welfare Agency, Social Affairs Department and Housing Department.

5.9.4.3 LEADERSHIP PATTERNS AND REPRESENTATION

Members of the National Assembly (MNA) who are elected on a five-year basis represent the districts of Mahé, Praslin and the Inner Islands. According to the election results of 2016, the Linyon Demokratic Seselwa holds the majority of seats with 18 electorates against the ruling Parti Lepep with only 14 seats in the National Assembly. There are 26 male and 7 female parliamentary members in all districts; this represents 79% male and 21% female representatives.

5.9.4.3.1 COMMUNITY-BASED ORGANISATIONS

There are various community-based organizations on Mahé, which include religious groups and other groups associated with the local government. These include people with disability, Senior Citizens Club, Youth Clubs, environmental groups and cultural groups.

5.9.4.4 DEMOGRAPHICS

5.9.4.4.1 DEMOGRAPHICS AND POPULATION DISTRIBUTION

The population of Seychelles is 90,945 (2010 Census) comprising of 46,912 males and 44,033 females. More than 22% of the population is aged between 0-14years, 70% is aged between 15-64 years and 7% is aged above 64 years old. The population distribution on Mahé is (87%), on Praslin it is (9%) and on La Digue it is (4%). Anse Etoile is the most populated district on Mahé and Port Glaud is the least populated. The most densely populated districts are the suburbs of Victoria including St Louis, Mont Buxton and English River.

5.9.4.4.2 ETHNICITY, LANGUAGE AND RELIGION

The population is predominantly Christian, representing 96% of the population compared to 4% of other religions including Islam and Hindu, (2010 Census Supplements). The inhabitants originated from Europe, Asia and Africa, which is reflective of the whole population of Seychelles. Creole is the mother tongue used by all Seychellois. English, French and Creole are the official languages, although English is used more comfortably by the general population (The Population Country Report, 2010).

5.9.4.4.3 VULNERABLE GROUPS

In the Seychelles context, there is no indigenous population as the islands were inhabited when they were first discovered. However, the vulnerable groups are characterized as the elderly, persons with disabilities, children, fishermen, farmers and stevedores and to some extent teenage mothers. (The Population Country Report, 2010)

5.9.4.4.4 GENDER ISSUES

Gender equality is enshrined in the constitution of Seychelles and complimented by legislations, policies and programmes across the board. Girls and boys enjoy the same educational opportunities as well as the same employment prospects. Health services are free for all Seychellois and infant and maternal mortality is very low in Seychelles. Women represent 21% in Parliament, 27% in Cabinet of Ministers and more than 80% as District Administrators. Seychelles has a Gender Policy, a Gender Secretariat and has adopted several international instruments such as the Convention on the Elimination of all forms of Discrimination against women. The issues persisting include teenage pregnancy, violence against women, and underperformance of boys at primary and secondary schools and unemployment amongst the young male population due to the drug problem.

5.9.4.4.5 EDUCATION

Free education is accessible to all children in Seychelles from crèche (31/2) to Secondary Four Level (17 years). All districts on Mahé have primary schools and students of secondary level attend regional schools. More than 91% of the population aged 10 and above in Seychelles are considered literate according to Seychelles in figures, 2014. Furthermore, there is an on-going observation of the decline of people with primary level of education in Seychelles, which is associated with the Pre-Independence period.

5.9.4.4.6 HEALTH STATUS

The health status of the people on Mahé is considered to be generally good as people in general have free access to health care at the point of delivery. The population has access to the health system through the health centres/clinics, centers and the general hospital at Mont Fleuri. The medical programmes are generally good and immunization coverage against the most common childhood diseases are 100%. The life expectancy rate for men and women are high and the death rate was 7.1 in 2010, which has not shown significant increase in the last few years. The common diseases affecting the population are related to non-communicable diseases such as cancer and hypertension, although there is an increase in the HIV and Hepatitis C prevalence, of which the latter is related to the use of intravenous drugs.

5.9.4.5 LIVELIHOODS AND EMPLOYMENT

5.9.4.5.1 LIVELIHOODS

Most people get their livelihood from formal employment in manufacturing industries, public administration jobs and the construction sector. The government employs the largest percentage (30%) of the population, followed by the private sector (26%) and the unemployed jobseekers are 5%. Agriculture and fishing remain the lowest source of employment due to the seasonal nature of the jobs.

5.9.4.5.2 AGRICULTURE

Seychelles has a skilled agricultural community in the South West of Mahé, including Anse Royale, Takamaka, Baie Lazare, Anse Boileau and Grand Anse Mahé. More than 503 households grow crops for sale whilst 7, 468 households are involved in subsistence farming. Livestock is undertaken by 3, 064 households in Seychelles.

5.9.4.5.3 FISHING

All districts next to the coastline have a fishing community although some are more successful than others. The land reclamation on the eastern coast has affected the

fishing community at Plaisance, Mont Fleuri and Les Mamelles. The most significant group of fishermen is located at Bel Ombre, Anse Boileau, Anse Aux Pins, Anse Royale, Baie Lazare, Beau Vallon and Glacis. Community fishing in Seychelles is mostly artisanal involving more than 605 households and run by family members or local businessmen. Commercial fishing is undertaken by foreign companies and Seychelles benefits from the processing and canning of fish. According to the Census results of 2010, more than 1,711 households are involved in fishing activities for pleasure.

5.9.4.5.4 INFRASTRUCTURE

5.9.4.5.4.1 HOUSING AND ACCOMMODATION

The housing style in Seychelles is mostly bungalow, to suit the tropical climate. More than two thirds of households own their homes whilst others are renting. Block and stone are the main construction materials for 85% of houses in Seychelles. More than 81% of households in Seychelles are single units whilst 16% are blocks of flats.

5.9.4.5.4.2 TRANSPORT INFRASTRUCTURE

The transport infrastructure is generally good in Seychelles. All primary roads are tarmac covered and are appropriate for public transport such as buses. The primary road network cut across the mountainous areas of Seychelles to the West of Mahé Island. Victoria is connected to the east by a highway system leading to the South of Mahé, past the International Airport of Seychelles. There is a good network of secondary roads in all districts on Mahé and most are serviced public transportation on a daily basis provided by the Seychelles Public Transport Corporation. The islands are connected by sea and air on an hourly basis.

5.9.4.5.4.3 WATER SUPPLY

Statistics show that generally 93% of houses in Seychelles are connected to treated water supply provided by the Public Utilities Corporation (PUC). This supply is very prone to water shortages during the drought period which occurs during the South East Monsoon season between the months of April and October. In such a period there are several desalination plants, which provide water to the different regions of Mahé.

5.9.4.5.4.4 ELECTRICITY AND TELECOMMUNICATIONS

More than 95% of the households in Seychelles have televisions and also mobile phones. The connections are from the three main suppliers including Airtel, Cable and Wireless and Intelvision. Electricity supply provided by the Public Utility Corporation

accounts for 93% of houses in Seychelles whilst LPG is the main source of energy for cooking.

5.9.4.6 SOCIAL IMPACT

The project is located on an industrial zone, which is relatively distanced from community areas and less likely to have significant risks for the livelihood and sustainability of the Seychelles society during the project implementation. In fact, the project has more positive benefits for the population of Seychelles in the long term. However, there are indirect social impacts during the implementation phase of the project, which will need to be mitigated as they arise, throughout the project cycle. The mitigation measures will minimize the potential adverse impact. Below is a discussion of the possible impacts and possible mitigation measures.

5.9.4.6.1 LABOUR STANDARDS

The specialized skills of the workforce required for the implementation of this project cannot be supplied locally due to the shortage of expertise in this specific domain. Therefore, provision must be made for the employment of migrant labour on short-term contracts. The promoter must ensure that the application of the UN Convention on the Protection of the Rights of all Migrant Workers and Members of their Families and the UN Charter on Human Rights are applied. The promoter will need to identify the employment of migrant workers and ensure their treatment is no less favorable than that of local workers undertaking similar functions. In the application of the Employment Act of Seychelles of 1995 and the Decent Work Agenda Country Programme for Seychelles, the promoter must ensure that the migrants enjoy the same rights and equal opportunities and treatment as locals. Migrant workers must be supplied with adequate information needed for meaningful negotiations as well as for recourse in cases of physical or psychological coercion.

It is recommended that the promoter consult the Seychelles Labour Department for constant advice.

5.9.4.6.2 OCCUPATIONAL AND PUBLIC HEALTH, SAFETY AND SECURITY

5.9.4.6.2.1 SAFETY TRAINING FOR WORKERS

The project is considered a relatively high-risk endeavour due to its location- next to open sea and the sudden drop in depth. The operation of heavy machinery is also a concern, meaning that all workers involved in the project must follow strict health and safety requirements. The promoter must be aware of the Seychelles Public Health Act (1987) and sensitize project workers of all the risks associated with their work and all

protective measures regarding their health and safety. Continuous training including demonstration in the wearing of personal protective equipments must be provided in accordance with appropriate instructions. The appointment of a Health and Safety Officer throughout the duration of the project will ensure that health and safety procedures are thoroughly adhered to.

5.9.4.6.2.2 ESSENTIAL SANITARY FACILITIES AND LIVING QUARTERS

The employment of migrant workers will necessitate access to adequate, safe and hygienic basic facilities for their living quarters. It is recommended that their accommodation quarters are coordinated by the Health and Safety Officer to ensure they meet the required standards in terms of size and hygienic standards. Special attention should be given to toilet facilities, sewage and waste disposable to prevent seepage into the ground water and contamination of surface water supplies. The spread of infectious diseases amongst the workers and the general population must be mitigated at all costs as it has the potential of causing public uproar and lawsuits against the promoter. The application of the ILO Guidelines on Occupational Safety and Health Management Systems must be applied in the framework of the Seychelles Public Health Act.

5.9.4.6.2.3 THE SPREAD OF COMMUNICABLE DISEASES

Most migrant workers' employment contracts exclude accompanying family members. Statistics on migrant workers in Seychelles show that they are predominantly young men in their mid 20s and mid 30s. The influx of these single male workers will increase interaction with the local population, including sexual relationships. There is a need to contain the spread of communicable diseases associated with immigration, especially sexually transmitted diseases such as HIV/AIDS and Hepatitis C. Adequate awareness programmes should be made available for the workers and ensure that clear codes of conduct for them and those living in the workers quarters are implemented. The promoter must also collaborate with the Ministry of Health and NGOs such as Alliance Solidarity for the Family (ASFF) to build upon existing measures to raise the public awareness and the spread of these communicable diseases.

5.9.4.6.3 INCREASE IN POPULATION AND CULTURAL SENSITIVITY

The employment of migrant workers immediately increases the small population of Seychelles and may put pressure on local resources such as public health services, the use of public transportation in large groups when off-duty, increased use of water supply and electricity provision. Furthermore, those foreign workers are competing for

the same commodities in shops with the locals. The promoter might need to develop an influx management plan to find alternative means of reducing significant pressure on resources caused by the sudden increase in population.

The cultural norms and practices of the people of Seychelles as a tropical and Christian country may require adaptability from migrant workers. On the other hand, to reduce possible conflicts, both the locals and the migrant workers must also exercise cultural sensitivity. Interaction between the local communities and the migrant workers, as they share the same space and resources, may create possible cultural clashes. In view that Seychelles has adopted both the UN Convention on Human Rights and Convention on the Protection and Promotion of Cultural Diversity and Cultural Expressions, awareness campaigns must reflect these two instruments. Both locals and migrant workers must be targeted in the development of these programmes, to maximize the benefit.

5.9.4.6.4 EMPLOYMENT CREATION

The project will not only create employment for migrant workers but for locals as well. There will be a need for casual labourers and other skilled workers available in the country throughout the implementation of the project. This will increase family expenditure and overall economic growth of the local community, as families benefit from the creation of jobs. However, considering the nature of the project, mostly men will be employed; being consistent with statistics of employment in the construction sector, although the Employment Act of Seychelles emphasizes gender equality and Seychelles is a gender sensitive country as party to the Convention on the Elimination of all Discrimination of against Women.

5.9.4.6.5 STAKEHOLDER ENGAGEMENT

Port Victoria accommodates different stakeholders including shipping agencies, fishing companies, government authorities, tourism companies and the general public. Each of these stakeholders will be affected differently during the renovation phase of Port Victoria. Therefore, the promoter will need to establish and maintain a constructive dialogue between these affected parties and other interested stakeholders throughout this project cycle. A communication plan must be developed specifically for stakeholder engagement along with proper mechanism for grievance reporting.

6 IDENTIFICATION OF POTENTIAL IMPACTS

The Commercial Port is not located in a pristine environment. The bay of Victoria itself was dredged several times in the past decades to create part of Victoria, the Commercial and Fishing Ports, the whole stretch of land from English River to Providence Industrial Estate, Ile Aurore, Ile Perseverance, Ile Du Port, Ile De Romainville, Eden Island and Ile Soleil including other small reclamations in this area. All the materials to create these islands or land reclamation were extracted from the sea, so the area itself is heavily compromised.

The project may impact on the environment during the pre-construction, construction and operation phases. During pre-construction & construction, the impacts may be regarded as short-term; whilst long-term impacts may be observed during the operation phase. The project is located within an industrial zone, and relatively distanced from any residential community, thus it is less likely to have significant impact on their livelihood during the project implementation phase. In fact, the project has more positive benefits for the population of Seychelles in the long term. However, there are indirect social impacts during the implementation phase of the project, which will need to be mitigated as they arise, throughout the project cycle.

6.1 THE POTENTIAL IMPACT GENERATION ACTIVITES

The project comprises various activities each of which may have an impact on the environment. The impacts are envisaged during the pre-construction and construction phases. However, it should be noted that the Commercial Port has been in operation for many years and the impacts with regards to the proposed port would be only incremental.

The following activities may have impacts on the environment:

- Mobilization of equipment;
- Excavation and leveling works;
- Transportation and storage of construction material;
- Civil construction activities;
- Demolition works;
- Dredging operations;
- Transportation and Disposal of Construction Debris;

- Influx of foreign labour.

6.2 IMPACTS DURING PRE-CONSTRUCTION PHASE

The potential impact foreseen during the pre-construction phase is mainly related to mobilization to the construction site. This will involve transportation of large construction equipment, which will require space and also impair traffic movement either by land or sea. The impacts will be short term in nature.

6.2.1 ESTABLISHMENT OF THE WORKERS ACCOMODATION

In view that foreign labour will be required to undertake construction of this project and in view that the port area is an industrial zone, and workers will not be allowed to reside on the premises itself. Consultation with the Planning Authority, Environment Department, Health Authority and Social Department will have to be done. This is to allow all parties to participate in this process and appropriate plan to be developed on how this could be implemented.

6.3 IMPACTS DURING CONSTRUCTION PHASE

During the construction phase impacts will be mainly generated from construction activities (construction of the new quay, demolition of Halcrow and Norplan quays, dredging and backfilling works). The environmental and social impacts during the construction phase will be localized and on a short-term magnitude. The details of the activities and probable impact are summarized in table 7.

TABLE 7 – POTENTIAL IMPACTS SOURCES DURING CONSTRUCTION PHASE

Construction Activities	Environment Attributes	Probable Impacts
Mobilization of equipment	Air	• Air emissions from vehicles • Fugitive dust emissions due to traffic movement
	Socio-economics	• Increase employment opportunities • Stress on infrastructure • Fishermen activities will be affected
	Wastewater	• Sanitary effluents from on site

		facilities
	Public Utilities	• Increased flow of traffic
Excavation and leveling works	Air	• Fugitive dust emissions • Air emissions from construction equipment and machinery
	Water	• Run-off from excavated site
	Land	• Accumulated solid and metal wastes
	Ecology	• Smothering of coral reef
Transportation and Storage of Construction Material	Air	• Air emissions from vehicles • Fugitive dust emissions due to traffic movement
	Water	• Run-off from construction material storage areas
	Public Utilities	• Increased flow of traffic
Civil Construction Activities	Air	• Air emissions from construction machinery • Fugitive dust emissions from construction activities
	Water	• Run-off from construction site
Demolition works	Air	• Fugitive dust emissions due to demolition works • Air emissions from transport vehicles • Fugitive dust emissions due to movement of traffic • Spillage and fugitive emissions of debris materials
	Water	• Run-off from disposal areas

	Land	• Accumulated solid and metal wastes
Possible influx of foreign labour	Socio-Economics	• Employment opportunities shall increase • Stress on infrastructure
	Land	• Change in land use pattern of the area
	Water	• Sanitary effluents from onsite facilities
Dredging operations	Water	• Suspension of sediment
	Land	• Change in land use pattern of the area
	Ecology	• Smothering of coral reef
Transportation and Disposal of Construction Debris	Air	• Air emissions from transport vehicles • Fugitive dust emissions due to movement of traffic • Spillage and fugitive emissions of debris materials
	Water	• Run-off from disposal areas
	Soil	• Disposal of waste
Relocation of Lighthouse	Socio-economic	• Loss of cultural heritage • Loss of benefits
Mont Fleuri Fishers Community	Socio-Economic	• Limited fishers' passage during construction phase • Limited access to fishing ground near to the lighthouse • Additional expenditure for fuel use • increase in transportation fees

		• Limited options for storage
Marine Invasive	Ecology	• Introduction of marine Invasive • Loss of marine species • Change of marine ecology

6.3.2 IMPACT ON AIR

Particulate matter in the form of dust would be the predominant pollutant affecting the air quality during the construction and demolition activities. Dust will be generated mainly during construction, back filling and demolition works along with transportation activities.

The main source of gaseous emission during the construction phase is the movement of equipment and vehicles on site. Equipment deployed during the construction phase is likely to cause an increase in the levels of Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Particulate Matter (PM_{10}), Total Suspended Particulate, Carbon Monoxide (CO) and Ozone (O_3).

6.3.3 IMPACT ON WATER ENVIRONMENT

Wastewater generation will be from anthropogenic / industrial processes with solids, temperature, chemicals and other impurities. The effluent management scheme would essentially involve collection, treatment and reticulation / disposal of various effluents. The Effluent Quality Standard prescribe under the Environment Protection Act, 1994 is shown under table 8.

TABLE 7 – EFFLUENT QUALITY STANDARD

Parameters	**Maximum concentration in milligram per litre (mg/1) unless otherwise stated(except PH)**
Temperature	30Â°C measured at the point of discharge
pH	5.5 - 8.5
Suspended Solids	30
BOD5 at 20Â°c	30
COD	80
Free Chlorine (as ClÂ²)	0.5

Phosphorus (as PO4)	5
Nitrate (as NO3)	15
Nitrite (as NO2)	1
Phenols	0.1
Chromium (total)	1.0
Arsenic (total)	0.1
Mercury (total)	0.05
Cadmium (total)	0.2
Lead (total)	0.9
Copper (total)	1
Zinc (total)	2
Iron (total)	5.0
Nickel (total)	1
Aluminium (total)	1
Tin (total)	0.1
Manganese (total)	2.0
Oil and grease	10
Total coliforms	500/100 ml
Faecal coliforms	100/100 ml
Faecal streptococcus	100/100 ml
Salmonella	Must not be detectable in any100 ml sample
Pesticides	In accordance with the law relating to pesticides, which may be in force.

6.3.4 IMPACT ON LAND USE

The mobilization of construction equipment and construction materials will require space for storage to avoid environmental impact and inconvenience. The Commercial

Port is situated in a restricted area (Industrial Zone) and the project will have to be planned in a manner to avoid delaying the port operations whilst providing sufficient space to allow the execution of the project.

6.3.5 IMPACT ON SOIL

Construction and demolition activities will be confined within the Commercial Port and the marine environment where the project will be undertaken. Fill materials will be dredged to deepen the navigation channel and these will be used for backfilling works. The landside will not be affected, as the works will be to extend the existing port and some backfilling of the area where the quays are located.

6.3.6 IMPACT OF SOLID WASTE

Solid waste during the construction and demolition phase consists primarily of scrapped metals, excess concrete and cement, rejected components and materials, packing and shipping materials and human waste. During construction, there will be the generation of garbage, for which designated practices of solid waste disposal shall be followed. Solid waste disposal will be done as follows:

- A waste inventory of various waste generated will be prepared and periodically updated;
- The excavated material generated will be reused for backfilling works to the maximum extent possible;
- Scrap metals will be segregated and occasionally transported to a local recycling company;
- Hazardous waste such as waste oil will be collected and transfer to the designated waste handling facility.

6.3.7 IMPACT OF NOISE

The major noise generating sources during the construction phase are vehicular traffic, construction equipment like bulldozers, scrapers, concrete mixers, cranes, generators, pumps, compressors, pneumatic tools, vibrators, dredger etc. The operation of equipment will generate noise. The noise emission standards prescribed under the Environment Protection Act, 1994 are shown under table 8.

TABLE 8 – NOISE EMISSION STANDARDS

Description of Area	Time	Limits In Decibel dB(A)
Residential	0600 hrs - 2300 hrs	60 Leq
	2300 hrs - 0600 hrs	55 Leq
Industrial	At all times	(L10) 75 Measurement shall be done at boundaries of industrial site
Audible intrusion in pristine acoustic environment		60 Leq

6.3.8 IMPACT ON ECOLOGY

The site of ecological importance within the project area is the Ste Anne Marine National Park, situated approximately 4 km from Mahé. Ile de Romainville is located in between them (approximately 500 m to the Commercial Port and 3.5 km to Ste Anne Island). The area in between the two islands as indicated previously is not a pristine environment and is already compromised from past reclamation projects. Dredging activities will take place in between the new port and the lighthouse, to open the channel, and the dredged material will be used for backfilling works for the new quay. The excess dredged materials will be stockpiled for other use in the future. (The appropriate dredging technique will be included).

6.3.9 IMPACT ON FISHER COMMUNITY

The construction and dredging activities will have an effect on the Mont Fleuri Fishers Community. There are about eight fishermen that use that route in between the Commercial Port and Ile de Romainville and the one in between the old fishing port and Romainville, to carry out their transactions. This will cause limited fishers' passage during construction phase, limited access to fishing ground near the lighthouse, additional expenditure for fuel use, increase in transportation fees, limited options for storage of fishing equipment. (A Stakeholder Engagement Plan for stakeholders that will be affected by the project).

6.3.10 IMPACT ON CULTURAL HERITAGE

The lighthouse has been in existence for very long and has been earmarked as a landmark of Port Victoria. It has been added on the list of national monuments and thus its preservation is being upheld. Through discussions with representatives of civil societies, there were contentions on the way the lighthouse is to be handled during the construction phase of the port. The representatives appeal that SPA does its utmost to protect this national asset. In respect to the arguments that have been echoed during that meeting, SPA will have to discuss this matter before the monument board and evaluate what are the possibilities of upholding both interests.

6.3.11 IMPACT ON VULNERABLE GROUPS AND WOMEN

This component is referred in section 5.9.3.4.3 and 5.9.3.4.4 of the socio-economic impact assessment. Seychelles has a well organized social welfare system that looks at the vulnerable groups in society, whereas women has equal rights to men and can benefit the same opportunity and as such this project is not likely to have an adverse on these group

6.3.12 IMPACT OF DREDGED MATERIAL DISPOSAL SITE

The dredged materials will be used to backfill the area behind the new quay wall that will be extended 40m seaward. The excess will be stored at Ile du Port and the Ministry of Land Use and Housing will organize its use towards other upcoming projects.

6.3.13 CLIMATE IMPLICATION OF INCREASED SHIP TRAFFIC

The ship traffic and the equipment that will be used to carry out the construction works will affect the ambient air quality within the port area. This will be limited during the construction phase.

6.3.14 IMPACT ON LAND TRAFFIC

The Latanier and Bois de Rose avenues could become congested during the construction phase and with the current traffic jam situation in Victoria most likely, this will worsen. The port is also served by an unused service road, which runs behind the property towards the Ex-Coast Guard site. This route may be used during the construction phase by the construction vehicles.

6.3.15 IMPACT ON SHIP TRAFFIC

Dredging operations are not expected to result in significant interruptions in shipping

movement in the port, as ships arriving and departing the port are required to provide Notice of Arrival/Departure so that tugs and piloting services are arranged.

6.3.16 IMPACT ON EMPLOYMENT

The project is expected to result in an increase in employment opportunities. As it is the case in the Seychelles, there are more foreigners in the construction industry than the locals. In this case, the Public Health Authority prior to issuance of Gainful Occupational Permit (GOP) to foreign workers will require screening of foreign workers for communicable diseases (such as HIV/AIDS). A screening programme and testing through their stay will have to be established in collaboration with the Ministry of Health.

6.4 IMPACT DURING OPERATION PHASE

Upon commissioning of the new port facilities, the Seychelles Ports Authority will take over operation and management. It is foreseen that more staff will be required in the team to undertake the additional works. SPA will analyze this and necessary adjustments will be made.

6.5 PORT OPERATION

With regards to port operations, several areas require attention. These are presented in table 9.

TABLE 9 – AREAS OF CONCERNS AND POSSIBLE IMPACTS

AREAS OF CONCERNS	POSSIBLE IMPACTS
Disposal and Storage of Used Oil and Sludge Buildup	
a. Waste oil storage area b. Area used for solid waste collection c. Storm water drains in engineering area	• Fire hazard • Contamination of soil and possible ground water with petroleum products • Contamination of the marine environment • Adverse impacts on human health
Storage and Disposal	
a. Old tyres b. Drums of contaminated materials and	• Fire Hazard • Contamination of environment by CFCs

used oil c. Material used for oil spill clean-up d. Old split air conditioning units	oil and heavy metals
Hazardous Material Storage site	
a. Unrestricted access to site b. Lack of proper signage c. Disposal of contaminated soil d. Current area is not lined with an impervious material or paved e. Effluent discharges	• Chemical contamination of the environment • Adverse health impacts on humans and wildlife
Safety Condition	
a. Frequent Noise Assessment b. Air Quality Assessment	• Increased frequency of accidents • Adverse health impacts on humans

6.5.2 SHIP TRAFFIC

After completion of the project, ship traffic will eventually increase. Also with the deepening of the navigation channel and the new 600m quay, more and larger vessels will be able to berth without major difficulties. A proper management by the harbormaster will have to be implemented, to avoid accidents that can result in the spillage of fuel oil. Also with the increase of traffic, marine invasive species from other locations can become an issue. In this respect, upon completion of construction of the port, a marine invasive assessment will be required to benchmark the existing nature and future situations.

6.5.3 WASTEWATER

Wastewater associated with port activities may include storm water and sewage from port operations, as well as ballast water, sewage, bilge water and vessel cleaning wastewater from ships. Sewage and wastewater from ships generally contain high levels of BOD and Coliform bacteria with trace concentrations of constituents such as pharmaceuticals, and typically low pH levels. Pollutants in bilge water tend to contain elevated levels of BOD, COD, dissolved solids, oil and other chemicals that accumulate due to routine operations. Wash water may contain residues such as oil. With an increase in ship size and supporting land-based equipment, along with

personnel, there is likely to be an increase in wastewater, which would have to be carefully monitored by the local authority. The sewer line from the port should be connected to the Greater Victoria Sewerage network.

6.5.4 WASTE MANAGEMENT

With an increase in the number and sizes of the vessels, there may be an increase in waste originated from ships, which may include oily sludge, inert materials such as food packaging and food waste. From port operations, solid waste from cargo packaging may be generated and hazardous or potentially hazardous waste may be associated with vehicle maintenance. SPA should discuss with the Landscape and Waste Management Agency, Plant Protection Unit, Public Health Authority and Environment Department on waste management plan that would be appropriate for Port Victoria

6.5.4.1 HAZARDOUS MATERIALS

Spills may also occur due to accidents, equipment failure, or improper operation procedures. Spills may also occur from ship traffic, which can result from manoeuvering collisions. Equipment maintenance may also involve the use of potentially hazardous materials including solvents and lubricants. The continued operation of the port will result in the continued generation of hazardous material, which will have to be managed appropriately.

6.5.5 AIR QUALITY

Air Quality may be impacted by different sources of air pollutants from port operations. These include combustion emissions from ships' thrust and auxiliary engines and combustion source emissions from vehicles and land-based engines. They contribute sulfur dioxide, nitrogen oxides, greenhouse gases, fine particulate matter and volatile organic compounds. With an increase in ship sizes and supporting land-based equipment, there is likely to be an increase in air emissions, which would have to be carefully monitored by the local authority.

6.5.6 NOISE

In ports, noise sources include cargo handling, vehicular traffic and loading/ unloading of containers and ships. With an increase in ship sizes and supporting land-based equipment, there is likely to be an increase in noise, which would have to be carefully monitored by the local authority.

6.5.7 FISHING ACTIVITY

There will be no significant impact on fishing activities during the operation of the port. The routes for the Mont Fleuri Fishers Community will get back to normal, but all shipping movements will still be regulated by the Harbour Master and these vessels will be required to comply.

The project is still in the feasibility stage and taken the high risks associated with the activities taking place in the port, a risk assessment is still being undertaken by the Division of Risk and Disaster Management.

6.5.8 SUMMARY OF IMPACTS

Tables 10, 11 and 12 summarize the identified impacts in terms of their magnitude, nature of the impact, spatial extent of the project impacts, duration, direction and permanence of the impact.

TABLE 10 – CONSTRUCTION PHASE

RISKS	MAGNITUDE	NATURE OF POTENTIAL IMPACT	SPATIAL EXTENT	DURATION	DIRECTION OF IMPACT	PERMANENCE
Water Quality	Moderate- Significant	Increased Sediment suspension in the water column	Victoria Harbour	Short Term	Negative	Reversible
Ship Traffic	Minor	Delay/ disruption in ship traffic	Victoria Harbour	Short Term	Negative	Reversible
Dredging of the Navigation Channel	Minor	Destruction of marine ecology/benthic species	Ste Anne Marine National Park	Long Term	Negative	Irreversible
Air Quality	Minor	Increased emissions from construction activity during quay construction. Potential impact on workers' health and safety	Port facilities	Short Term	Negative	Partly reversible
Noise	Minor	Increased noise and vibration levels resulting in potential impacts on workers' health and safety	Port facilities	Short Term	Negative	Partly reversible

TABLE 11 – OPERATION PHASE

RISKS	MAGNITUDE	NATURE OF POTENTIAL IMPACT	SPATIAL EXTENT	DURATION	DIRECTION OF IMPACT	PERMANENCE
Expanded Port Operation	Significant	Increased staffing and support facilities. There will likely be increased air emissions, noise, water usage, generation of waste, hazardous materials. Increased handling of oil	Port facilities	Long Term	Positive and Negative	Partly Reversible
Upgrade of Port facilities	Minor-Moderate	Hazardous material and solid waste.	Port facilities	Short term	Negative	Reversible
Induced impacts	Minor	Increased number of ship calls/traffic Increased size of non-container vessels e.g. tankers Increased waste from ships	Channel and docks Channel and docks Port facilities	Long term Long term Long term	Positive Positive/Negative Negative	Irreversible Irreversible Reversible

TABLE 12 – OPERATION PHASE

BENEFITS	MAGNITUDE	NATURE OF POTENTIAL IMPACT	SPATIAL EXTENT	DURATION	DIRECTION OF IMPACT	PERMANENCE
Expansion of port: Increasing capacity of the quay (at the berth)	Significant	Ability to accommodate larger vessels	Port and Navigation channel	Long term	Positive	Irreversible
		Position country to function as regional hub	National			
Increasing capacity of the stacking yard		Economic benefit derived from increased capacity of port	National			
Dredging of inner channels and turning circle		Increased regional competitiveness in shipping industry	National			
Enhanced trade	Significant	Economic stimulation	National		Positive	
Direct and Indirect Employment	Significant	Expansion of labour force Indirect benefits for suppliers and auxiliary workers etc.	National		Positive	

6.6 CUMMULATIVE IMPACT ASSESSMENT

Cumulative impacts result when the effects of an action are added to, or interact with, other effects in a particular place and within a particular time. Thus, the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action, and all other activities affecting that resource. Cumulative impacts are also assessed in terms of the incremental effect that acts cumulatively with the effects of other actions, either past, existing or future. Consideration is given to the effect of projects planned, projects in the future, or in the reasonably foreseeable future.

Port Victoria is in a strategic location and is reputed for the services it gives to the vessels calling at our shores. The feasibility study carried out for this project indicates that a new quay of 600 m x 40 m in front of the existing Halcrow and Norplan Quays, demolition and backfilling of the Halcrow and Norplan Quays with demolition materials and materials that will be dredged along the navigation channel to allow safe passage of the targeted larger vessels that will be calling to port Victoria in the future, could be an effective solution to increase the capacity of Port Victoria.

The Commercial Port, the site that will accommodate the project, sits on a reclaimed land together with the center of Victoria. Recent reclamation projects run from North East Point to Anse Aux Pins which partially destroyed the longest fringing reef on Mahé (from North East Point to Anse Royale) to create Ile Aurore, Ile Perseverance, Ile du Port, Ile de Romainville, Eden Island, Ile Soleil and the whole strip of reclaimed land running from the English River district to Providence Industrial Estate.

The other projects carried out in the past years are the Roche Caiman and Ile Perseverance Housing Estates, landfill 1 and 2 and an industrial estate established at Providence Industrial Estate, schools, National Assembly Secretariat, Palais de Justice. The future projects that has been earmarked within the port area are as follows:

- 4MW solar park on Ile de Romainville;
- 2100m3 Wastewater Treatment Plant at IOT site;
- Ongoing tuna quays construction at Ile Du Port;
- Ongoing Social Housing Project on Ile Perseverance.

7 PROPOSED MITIGATION MEASURES AND THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This Environmental and Social Management Plan (ESMP) provides the framework for management and mitigation of the environmental and social impacts associated with the proposed project and extension of the Commercial Port. The ESMP has been prepared in compliance with the Seychelles policy, legal and administrative frameworks and the EIB Statement of Environmental and Social Principles and Standards (2009) and the EIB Environmental and Social Handbook. The development and approval of the ESIA and the ESMP are necessary as pre-conditions for the bank's approval of the project.

7.1 PROJECT OVERVIEW

In order to improve the competitiveness and develop business throughout Port Victoria, SPA proposes to increase the capacity of the port by facilitating the movement of larger vessels through the deepening of the inner channel, expanding the capacity of the stacking yard through new equipment, and implementing changes in the operational systems of the port. The outputs of the project are as follows:

a. Dredged inner channel to a depth of -14 m Chart Datum (CD);

b. Construction of a new quay of 600 m x 40 m;

c. Demolition of the Halcrow and Norplan quays and backfilling of these areas with dredged material to extend the stacking yard.

7.2 SCOPE OF THE ESMP

The ESMP presents a discussion of all the mitigation and management requirements for the entire project including the associated plans (EMPs) that will form part of an overall Environmental and Social Management Plan (ESMP). These EMPs are to be utilized by the contractor commissioned by the Seychelles Ports Authority (SPA) for the project and will form the basis of site-specific management plans that will be prepared by the contractor as part of their construction methodology prior to commencement of works. The ESMP outlines the environmental and social management processes and procedures applicable to the project and includes the topics, which are common to all environmental and social disciplines.

The potential impacts and associated mitigation measures and management procedures presented in this ESMP are based on the baseline information and assessments provided in the ESIA Report.

Key potential impacts and the recommended mitigation measures are summarized by parameters of risk and are prioritized in descending order of significance. Development of the required Management Plans that cover the standards for compliance in light of the Seychelles EIA procedures and the EIB policy directives and Performance Standards are provided.

The Construction and the Operational Phases of the Project are presented as separate sections, as each of the phases has its particular receptors and stressors. Responsibilities for development, implementation and monitoring are clearly defined.

The *Construction Phase* (dredging and quay construction works) includes attention to the oversight and overall responsibility of SPA; provisions to be implemented by the Project Manager/Engineer and standards for other contractors under the responsibility of SPA.

The *Operations phase* addresses issues related to the post-construction phase and like the construction phase it also speaks to the oversight and overall responsibility of SPA; provisions to be implemented by the Project Manager/Engineer; and standards for other contractors under the responsibility of SPA.

Environmental and Social Monitoring is an overarching responsibility for implementation of this project, and the principle of an environmental and social management system will be applied where there is a focus on continuous improvement through monitoring and corrective action on the planning and implementation process.

7.3 ROLES AND RESPONSIBILITIES

The roles and responsibilities of the key parties involved in the implementation of the ESMP (in particular, the management actions and monitoring requirements) include the Proponent/Promoters, the appointed contractor (direct appointments including civil works contractor, building contractor), the Environmental Officer, representatives of the Ministry of Environment, Energy and Climate Change.

TABLE 13 – ROLES AND RESPONSIBILITIES

7.3.1 MINISTRY OF ENVIRONMENT, ENERGY AND CLIMATE CHANGE (MEECC)

The MEECC is the authority responsible for environmental issues and that of the ESMP and has the overall responsibility to ensure that the proponent complies with the conditions of its environmental authorization as well as the ESMP. Any alterations to the ESMP are subject to approval by the MEECC.

7.3.2 PROPONENT/PROMOTERS

The SPA is ultimately responsible for the implementation of the project and compliance with all conditions of approval of the development or any aspect thereof by any authority. With respect to this Port project, SPA is:

- Responsible for attaining all necessary approvals and permits prior to the start of the construction activities on the site;
- Ensure that the ESMP has been approved by the MEECC prior to initiating construction;
- Appointment of an Environment Officer prior to the start of construction and for the duration of the construction phase;
- Provide the contractor with a copy of the ESMP as part of the tender contract documentation to allow the contractor to cost for its requirements within their respective construction contracts;
- Responsible for ensuring ongoing liaison with key players to ensure effective implementation of the ESMP;
- Also has the authority to deduct environmental penalties.

7.3.3 CONTRACTOR

This refers to any directly appointed company or individual undertaking on-site implementation (by the Proponent/Promoters).

The Contractor shall have the following responsibilities:

- Prepare the required Method of Statements;
- Ensure implementation of all provisions of the ESMP, including all additional requirements related to the approved method of statements, during all works on site;
- Ensure that all sub-contractors, employees, suppliers, agents or any other workers are familiar with the ESMP;
- Liaise closely with the Engineers and Environmental Officer and ensure that all works on site are conducted in an environmentally sensitive manner;
- Report any incidents of non-compliance (dumping, littering, pollution) with the ESMP to the Engineer/Promoter and Environmental Officer;
- Carry out instructions issued by the Engineer/Promoter, on request of the Environmental Officers, required to fulfill his/her compliance with the ESMP.

7.3.4 THE PROJECT MANAGER/ENGINEER

The Engineer or Project Manager (or any such person such as the project manager/principal agent authorized by the Developer) shall oversee all the technical and contractual implementation and act as

the on-site implementing agent.

The responsibilities of the Engineer/Project Manager are to:

- Ensure that the requirements as set out in this ESMP and by the relevant authorities are adhered to and implemented;
- Assist the Environmental Officer in ensuring that the conditions of the ESMP are being adhered to and promptly issuing instructions requested by the Environmental Officer to the Contractor.

All site instructions pertaining to environmental matters issued by the Engineers are to be copied to the Environmental Officer;

- Assist the Environmental Officer in making decisions and finding solutions to environmental problems that may arise during the project works;
- Reviewing and approving construction method statements with input from the Environmental Officer;
- Ordering the removal of person (s) and/or equipment not complying with the specifications or issuing a stop works order (as required by the Environmental Officer or otherwise);
- Issuing of penalties for transgressions of environmental site specifications;
- Providing input into the Environmental Officer's ongoing internal review of the ESMP.

7.3.5 ENVIRONMENTAL OFFICER

The Environmental Officer's duties, *inter alia*, must be to ensure compliance with the ESMP through monitoring and proactive and open communication channels with the project/site management and, when necessary, enforce the environmental requirements.

The Environmental Officer's responsibilities shall include the following:

- The identification of potential environmental impacts, prior to the onset of construction, using the Environmental Impact Assessment Report and where deemed necessary, a site visit. This will be carried out in consultation with the Contractor.
- Ensuring that the ESMP and conditions of approval are adhered to at all times and taking action (via the Contractor) where the specifications are not followed.
- Ensuring that environmental impacts are kept to a minimum.
- Reviewing and approving construction Method of Statements in consultation with the Contractor.
- Briefing session with the contractors and personnel prior to construction activities.
- Advising the Engineer and Contractor on environmental issues and assisting in developing environmentally responsible solutions to problems.

- Attending the site meetings (when necessary) and giving a report back on the environmental issues at these meetings and other meetings that may be called regarding environmental matters.
- Inspecting the site and surrounding areas regularly.
- Requesting the removal of person(s) and/or equipment not complying with the specifications.
- Keeping both a written and photographic record of progress on site from an environmental perspective, and an ad-hoc record of all incidents or events on site with environmental ramifications.
- These records should be updated on a monthly basis, be dated and accurately catalogued and copy sent to the MEECC;
- Undertaking continual internal review of the ESMP and submitting post construction audit report, which evaluates overall compliance with the ESMP at the end of the project. The report should contain the monthly progress reports and photographic record.

The EO will submit all written instructions and verbal requests to the Contractor via the Promoter.

- Keeping a register of complaints on site and recording community comments and issues, and the actions taken in response to those complaints.

7.4 KEY ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION

7.4.1 CONSTRUCTION PHASE

The mitigation measures proposed for the Construction Phase primarily surround the issue of sedimentation as a result of the dredging activities. The impacts and mitigation therefore relate to the following risks:

a. Water quality during dredging and spoil disposal
b. Ship Traffic
c. Ship Waste
d. Waste and hazardous material
e. Noise
f. Biodiversity

There are fewer and relatively minor impacts associated with the construction of the quay. The ESMP for the construction phase includes the following plans to guide compliance.

7.4.1.1 ENVIRONMENTAL MONITORING PLAN

The EMP is an overarching plan that meets the requirement of the ESIA document. It

pays particular attention to pollution prevention, resource efficiency and environmental health and safety guidelines. It should be completed in detail to include all requirements necessary to monitor the effectiveness of the mitigative measures implemented to reduce adverse impacts from the activities carried out under the aspects of the construction phase. The monitoring plan will extend across all phases of the project.

7.4.1.2 DREDGING MANAGEMENT PLAN

The DMP will be developed to include all aspects of dredging operations and spoil disposal activities. The plan will include a description of proposed measures to be implemented to help achieve and maintain minimal levels of environmental impact. These measures are to limit disruption of on-going port activities and lateral spread of sediment plumes, timing, attention to unexpected "finds" on the seafloor, etc. Plan development is the responsibility of the Dredging Contractor.

7.4.1.3 SEDIMENT MANAGEMENT AND DISPOSAL PLAN

The SMDP forms part of the Dredging Management Plan and will stipulate how dredged sediment will be managed, including details on the transportation of dredged sediments, contingencies for any spills that might occur; and details regarding the disposal of dredged sediment, including disposal at the permitted onshore and offshore disposal sites.

7.4.1.4 BIODIVERSITY MONITORING PLAN

The BMP will contain a series of action items that will ensure that the dredging activity will have a minimal impact on any species in the vicinity of the port, and that opportunities for biodiversity maintenance and enhancement are maximised. This plan will also outline the key stakeholders' responsible for biodiversity management such as Seychelles National Parks Authority (SNPA) and ensure that their guidelines and policies are strictly adhered to.

7.4.1.5 EMERGENCY PREPAREDNESS AND RESPONSE PLAN

The EPRP will seek to identify and encompass all potential hazards associated with the construction phase of the project and will include key components such as communication procedures, evacuation plans, early warning systems, procedures for first responders, emergency supplies and equipment lists, and other contingency provisions.

7.4.1.6 DECOMMISSIONING PLAN

The DP will outline the necessary procedures to be followed when decommissioning and dismantling any used/obsolete equipment during the demolition and construction works on the quay. This will include procedures for proper handling, storage, and disposal of

any waste and/or hazardous materials being removed from the port. Reference to the equipment manuals is essential.

7.4.1.7 STAKEHOLDER ENGAGEMENT PLAN

The SEP will outline the measures to be used for community engagement, dissemination of project information and grievance management and will be utilized as a key element in all the proposed management, monitoring and mitigation measures outlined in this document. This plan will be the responsibility of SPA.

7.4.1.8 WASTE AND HAZARDOUS MATERIAL MANAGEMENT PLAN

The WHMMP describes procedures for the compliant management of waste petroleum products, hazardous waste and other solid wastes. The contractor should develop this with responsibility for quay construction.

Each of these plans will be developed to include roles and responsibilities, budgetary considerations, reporting mechanisms, detailed procedures, etc. These plans and procedures will be developed in accordance with bank requirements as well as local regulatory agencies.

7.4.2 ESMP FOR DREDGING OPERATION

7.4.2.1 WATER QUALITY

Potential Impacts

The immediate increase in suspended sediments in the water column resulting in turbidity of the water and a possible depletion of dissolved oxygen and other physical parameters could be affected.

Proposed Mitigation Measures

Floating screens or silt screens will need to be deployed in proximity to the dredging sites in the port basin. A Water Quality Monitoring Programme would need to be developed and implemented during the dredging period. The parameters recommended for monitoring are as follows: pH, Salinity, Temperature, Dissolved Oxygen, Total Suspended Solids, Nitrate, Phosphate, Biological Oxygen Demand, Total Faecal Coliform, Turbidity and Heavy Metals.

Dredging should not take place during periods of heavy wind and wave activity in order to limit dispersion of the sediment plume.

Management Plans Required

- Environmental Monitoring Plan
- Sediment Management and Disposal Plan
- Water Quality Monitoring Plan
- Dredging Management Plan

Responsible Parties

- Seychelles Ports Authority
- Dredging Contractor

7.4.2.2 COMMUNICATION STRATEGY

Potential Impacts

Delays for incoming and outgoing vessels.

Proposed Mitigation Measures

A Communication Procedure has to be prepared to advise the Harbour Master of the movements of the dredger, who in turn regulates ship traffic coming in and going out of the harbour. This is to regulate ship traffic to prevent delays that may arise from dredging activities. A dredging schedule which stipulates dredging times and locations should be developed.

Management Plans Required

- Stakeholder Engagement Plan
- Ship Traffic Management Plan
- Dredging Management Plan

Responsible Parties

- Seychelles Ports Authority
- Dredging Contractor
- Harbour Master

7.4.2.3 DIPOSAL OF SHIP WASTE (FROM DREDGER)

Potential Impacts

Solid and liquid waste generation from the dredger.

Proposed Mitigation Measures

A plan will have to be developed to manage the solid and liquid waste generated from the dredger. Waste oil and other chemicals are of particular importance.

Management Plans Required

- Environmental Monitoring Plan
- Waste and Hazardous Material Management Plan

Responsible Parties

- Seychelles Ports Authority
- Dredging Contractor

7.4.2.4 MARINE ECOLOGY

Potential Impacts

The Ste Anne Marine Park is located approximate 4.5Km from the project site, during dredging operation suspension of sediment may drift towards Ste Anne and smoother the coral reef, turbidity may block the sunlight penetration through the water column and also the reduction of nutrients available for the marine life may result to great loss of marine ecology.

Proposed Mitigation Measures

Banding of the proposed reclamation line should be constructed first; this should be secured with geotextile membrane and rock armoring to prevent the materials being washed away by wave activities. Silt screen should be used to control sediment plumes dispersing away from the project site.

Dredging should be done preferably during calm weather and when current is not pushing towards the Ste Anne Marine Park.

Management Plans Required

- Environmental Monitoring Plan
- Sediment Management and Disposal Plan
- Water Quality Monitoring Plan
- Dredging Management Plan

Responsible Parties

- Seychelles Ports Authority
- Dredging Contractor

7.4.2.5 LIGHTHOUSE

Potential Impacts

The lighthouse has been in existence for many years and with the proposed project there might be risk that it will be affected when dredging the navigation channel.

Proposed Mitigation Measures

As far as possible the lighthouse should be kept at its existing position and an alternative way of deepening the navigation channel should be identified. If there is no other option available, then an exact replicate of this monument should be done under the guidance of the National Heritage Foundation.

Management Plans Required

- Dredging Management Plan
- Stakeholder Engagement Plan
- Ship Traffic Management Plan

Responsible Parties

- Contractor
- Seychelles Ports Authority

7.4.2.6 MONT FLEURI FISHERS

Potential Impacts

The proposed project will limit the fishers' passage during the construction phase, limit

access to fishing ground near to the lighthouse and will cause additional expenditure for fuel use, increase in transportation fees and also limited option for storage of equipment.

Proposed Mitigation Measures

The Seychelles Port Authority in conjunction with and Seychelles Fishing Authority should decide how best to assist the fishers' that will be affected. A form of compensation should be design.

Management Plans Required

- Environmental Monitoring Plan
- Dredging Management Plan
- Stakeholder Engagement Plan
- Ship Traffic Management Plan

Responsible Parties

- Contractor
- Seychelles Ports Authority
- Dredging Contractor

7.4.3 ESMP FOR THE DEMOLITION AND CONSTRUCTION WORKS

7.4.3.1 AIR QUALITY

Potential Impacts

The construction and demolition works (quays) may result in incremental dust and exhaust emissions from vehicles and equipment.

Proposed Mitigation Measures

Mitigation measures aimed at minimizing and controlling dust and exhaust emissions to reduce the impacts of construction demolition works on air quality include continuous monitoring. The parameters to be monitored during construction include PM_{10} and $PM_{2.5}$, NO_2, SO_2, CO and O_3. These parameters may be taken at the property boundaries.

Management Plans Required

- Environmental Monitoring Plan
- Occupational Health and Safety Plan

Responsible Parties

- Contractor
- Seychelles Ports Authority

7.4.3.2 NOISE

Potential Impacts

Incremental noise disturbance to surrounding areas

Proposed Mitigation Measures

The construction and demolition works associated with the Commercial Port have the potential to result in incremental levels of noise and vibration.

Workers must be properly protected from high noise level using the appropriate protective gear.

Management Plans Required

- Environmental monitoring plan
- Occupational Health and Safety Plan

Responsible Parties

- Contractor
- Seychelles Ports Authority

7.4.3.3 SOLID WASTE

Potential Impacts

Improper disposal of solid waste

Proposed Mitigation Measures

Solid waste generated during the construction phase may include a variety of construction waste material, putrescible waste and plastics. Solid wastes should be

disposed of according to the Waste Management Plan. Construction of a bund along the water front area around the quay will need to be done to prevent generated sediments and solid waste from dispersing into the ocean.

Management Plans Required

- Waste and Hazardous Material Management Plan
- Decommissioning Plan
- Sediment Management Plan
- Waste Management Plan

Responsible Parties

- Contractor
- Seychelles Ports Authority

7.4.4 OPERATION PHASE

During the operational phase, the areas of concern related to the project and operational systems. The considerations include:

a. Staffing and support facilities;
b. Infrastructural improvements;
c. Maintenance dredging;
d. Ship traffic;
e. Wastewater management and disposal;
f. Waste and hazardous material management;
g. Air quality and noise.

The ESMP for the operations phase of the project includes the following plans, in addition to some of the plans previously discussed above.

7.4.4.1 INFRASTRUCTURE UPGRADE PLAN

This IUP will outline all the plans for infrastructural upgrades of the port facility, as well as SPA's commitment to continuous upgrade of the port facilities during the course of the operation. This plan may form part of the Occupational Health and Safety Plan in-keeping with the regulatory requirements. SPA will have to define its roles and responsibilities.

7.4.4.2 OCCUPATIONAL HEALTH AND SAFETY PLAN

The OHSP should outline the action items designed to prevent accidents and other occupational hazards. SPA will assume responsibility and the Contractor will have specific roles.

7.4.4.3 SHIP TRAFFIC MANAGEMENT PLAN

The STMP should be developed and implemented by the Seychelles Ports Authority, and the Harbour Master in anticipation of more, and larger vessels. This plan will regulate ship movements as well as account for channel maintenance and include mitigation measures for any potential environmental impact from the larger vessels and larger bow waves. SPA will have specific responsibilities.

7.4.4.4 SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN

The SPCCP plan may form part of an emergency response plan, a hazardous waste material management plan, or as a stand-alone document. It should outline the operating procedures to prevent oil and other hazardous materials/chemical spills; and countermeasures to contain, clean up, and mitigate the effects of a spill. SPA has the overall responsibility.

7.4.5 ESMP FOR THE OPERATIONAL PHASE

7.4.5.1 STAFFING AND SUPPORT FACILITIES

Potential Impacts

Increase in waste generation, water use and fuel use due to increase in staff

Proposed Mitigation Measures

Additional infrastructure and facilities will be required to handle increase in waste generation, water use and fuel use.

Management Plans Required

- Environmental Monitoring Plan
- Waste and Hazardous Material Management Plan

Responsible Parties

- Seychelles Ports Authority

7.4.5.2 SHIP TRAFFIC

Potential Impacts

Increase in ship traffic

Proposed Mitigation Measures

Increase in pilotage

Management Plans Required

- Ship Traffic Management Plan

Responsible Parties

- Seychelles Ports Authority
- Harbour Master

7.4.5.3 MAINTENANCE DREDGING

Potential Impacts:

Sedimentation and elevated turbidity levels

Proposed Mitigation Measures

Application of procedures to meet standards established for channel upgrade dredging

Management Plans Required

- Dredging Management Plan

Responsible Parties

- Seychelles Ports Authority
- Contractor

7.4.5.4 WASTEWATER

Potential Impacts

Chemical contamination of the environment from trade effluent discharges from the Commercial Port.

Proposed Mitigation Measures

Increased sewage and trade effluent (due to the expected increase in staff). Port Operators should provide collection, storage and transfer and/ or treatments services and facilities of sufficient capacity and type for all wastewater generated by vessels at the port in accordance with MARPOL and national regulations.

Management Plans Required

- Environmental Monitoring Plan
- Waste And Hazardous Material Management Plan

Responsible Parties

- Seychelles Port. Authority
- Contractor

7.4.5.5 WASTE GENERATION AND DISPOSAL

Potential Impacts

Improper storage and disposal of old tyres, drums of contaminated materials and used oil, material used for oil spill cleanup, and old air conditioning units and resulting in possible fire hazard, and contamination of environment by CFCs, oil and heavy metals

Proposed Mitigation Measures

Waste may originate from port or from ships and can be hazardous or non-hazardous

Management Plans Required:

Waste and Hazardous Material Management Plan

Responsible Parties

- Seychelles Port Authority
- Contractor

7.4.5.6 HAZARDOUS MATERIALS

Potential Impacts

Improper disposal and storage of used oil and sludge build up resulting in:

- Fire Hazard

- Contamination of soil and possible ground water
- Contamination of marine environment
- Adverse impacts on human health

Proposed Mitigation Measures

- Restrict access to hazardous material storage site
- Implement proper signage
- Line current hazardous material storage site with an impervious material/ paving

The port receives a significant volume of hazardous material. Spills may occur due to accidents, equipment failure, or improper operation procedures. Spills may also occur from ship traffic, which can result from manoeuvering collisions.

Management Plans Required

- Waste and Hazardous Material Management Plan
- Spill Prevention, Control and Countermeasure Plan

Responsible Parties

- Seychelles Ports Authority
- Contractor

7.4.5.7 INFRASTRUCTURAL IMPROVEMENTS

Potential Impacts

Accidents, increased use of resources, waste generation

Proposed Mitigation Measures

- Repair deficiencies in facilities
- Implement green strategy - resource conservation and waste minimisation, Support reuse /recycle programs and efficient disposal options

Management Plans Required

- Upgrade Plan

- Environmental Monitoring Plan
- Waste Management Plan

Responsible Parties

- Seychelles Ports Authority
- Contractor

7.4.5.8 AIR QUALITY

Potential Impacts

Occupational Health and Safety issues from air emissions

Proposed Mitigation Measures

For the operation of the port, air quality management procedures should be developed applicable to ship operators as well as land- based activities. Air quality monitoring should be included.

Management Plans Required

- Environmental Monitoring Plan

Responsible Parties

- Seychelles Ports Authority

7.4.5.9 NOISE

Potential Impacts

Occupational health and Safety issues from noise disturbance

Proposed Mitigation Measures

Frequent noise assessments are recommended to ensure that the maximum allowable ambient noise levels are not exceeded. Noise monitoring should be included.

Management Plans Required

- Occupational Health and Safety

Responsible Parties

- Seychelles Ports Authority

7.4.6 EMERGENCY RESPONSE DURING CONSTRUCTION AND OPERATION PHASES

TABLE 14 – EMERGENCY RESPONSE FOR CONSTRUCTION AND PORT OPERATION

RISK	POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	MANAGEMENT PLANS REQUIRED	RESPONSIBLE PARTY
Communication	Loss of human life, damage to property and goods, damage to infrastructure. Prevention of the movement of critical goods and supplies.	Appropriate and timely communication is vital to effective emergency response. An effective communication plan based on hierarchical notification for reporting threats and warnings and other critical information to appropriate individuals at each stage of the response will need to be implemented. It will include an internal and external notification procedure. There needs to be emergency response	Emergency Preparedness and Response Plan Occupational Health and Safety Plan	Seychelles Ports Authority Disaster and Risk Management Division (DRDM) Seychelles Coast Guard

	procedures specific to dangerous goods.	
Equipment	There will need to be an emergency equipment and material list during the operational phase that may be required to respond to various emergencies.	Seychelles Ports Authority
Action Plans	The Action Plans (APs) or Response Guidelines, are tailored ERPs that address specific major events. The action plans should be accessible and can be taken to the field by the Utility Emergency Response Manager or another emergency responder. Each AP should include the following basic information: Any special notification requirements	Seychelles Ports Authority

	Special response steps to be taken upon ERP activation Recovery actions to bring the diesel storage facility back into operation.	
Evacuation Procedures	Evacuation procedures and escape route assignments will be developed so employees understand who is authorized to order an evacuation; under what conditions an evacuation is necessary, how to evacuate, and what routes to take.	Seychelles Ports Authority

7.5 ENVIRONMENTAL AWARENESS TRAINING

Training is essential for ensuring that the ESMP provisions are implemented efficiently and effectively. Training often includes field instruction on appropriate implementation of environmental controls (dependent on the nature of duties).

7.5.2 PROJECT INDUCTION

All personnel including direct contracted employees and general personnel are required to attend a compulsory project induction before commencing work on the project.

The Environmental Officer shall arrange an environmental awareness-training course (induction) within seven days of the commencement of any work. The duration of the course will be for one hour and will be presented at a level which takes cognizance of the level of education, designation and language preference of the personnel. General site personnel will receive a basic education awareness presentation/lecture highlighting general environmental "dos" and "don'ts" and how they relate to the site. Management staff on the site, e.g. foremen, who require more detailed knowledge about the environmental sensitivity on the site and the contents and application of the ESMP itself will benefit from a separate presentation dealing with these issues.

The environmental component of the induction will include at least the following:

- Explanation of the importance of complying with the ESMP;
- General environmental duty and duty to notify;
- Conditions of environmental licenses, permits and approvals;
- Discussion of the potential environmental impacts of construction activities;
- Employees' roles and responsibilities, including emergency preparedness;
- Explanation of the mitigation measures that must be implemented when carrying out their activities;
- Incident reporting;
- Explanation of the specifics of this ESMP and its specification (no-go areas etc.…);
- Explanation of the management structure of individuals responsible for matters pertaining to the ESMP.

7.5.3 PRE-START MEETINGS

The Contractor or Foreman holds pre-start meetings prior to commencing works each day. This meeting itemizes the work that will be undertaken during the day and the following environmental related components:

- Weather observations / forecast;
- Potential visits from external stakeholders;
- Environmental focus for the day (e.g., housekeeping/litter clean up, water management, dust control and others);

- Feedback on environmental issues that have recently occurred within the area or other areas of the project.

7.5.4 TOOLBOX TALKS

Toolbox Talks include relevant environmental management awareness training as well as site-specific environmental information that may be required to undertake a particular work activity. Toolbox Talks may also be developed and delivered to improve performance and in response to an Environmental Improvement Notice being issued. Appropriate supervisors, senior project personnel, visiting authorities, Environmental Officers or specialist consultants will deliver or participate in the Toolbox Talks depending on the subject matter.

7.6 MONITORING, INSPECTIONS AND AUDITS

7.6.2 ENVIRONMENTAL MONITORING AND INSPECTIONS

The day-to-day monitoring and verification of adherence to the ESMP will be undertaken by the contractor (or its representative). The Environment Officer shall visit and inspect the site regularly to ensure that correct operational procedures are being implemented and that the Contractor is complying with the environmental specifications in the ESMP. Additional site inspections by the Environment Officer may be needed during the initial stages of the project. The Environment Officer shall address any queries to the contractor (or its representative). If the queries cannot be resolved at this level they shall be referred to the Promoter / Project Manager and, if necessary, to the Proponent.

7.6.3 AUDITS

The Contractor/Promoter and Environmental Officer shall establish an internal review procedure to monitor the progress and implementation of the ESMP during the construction phase. Where necessary, and upon the recommendation of the Contractor and / or the Environment Officer, procedures that require modification will be changed to improve the efficiency of the ESMP. All modifications to the ESMP shall be approved by MEECC before any changes or adjustments to the ESMP are implemented. Any changes or adjustments to the ESMP shall be registered in the daily records of the Contractor. Adjustment and update of the original ESMP document is not required when these *ad hoc* changes are made. At the conclusion of the project an environmental audit report shall be compiled. The Environment Officer, in collaboration with the Engineer/Promoter and Contractor, shall compile this report. It shall, as a minimum, outline the implementation of the ESMP during the phase, and highlight any problems

and issues that arose during the construction period to report, on a formal basis, the lessons learned from this project.

7.7 INCIDENT/COMPLAINT MANAGEMENT, CORRECTIVE ACTIONS

7.7.2 COMMUNITY LIAISON AND COMPLAINT MANAGEMENT

The Promoter/Proponent shall be responsible for all third party or public queries and/or complaints relating to operations. In addition, the Promoter/Proponent shall be responsible for the dissemination of information to the community and the media (press releases, notice boards). The Contractor shall notify the Environment Officer and the Engineer of any complaints lodged. The Contractor shall be responsible for maintaining a Complaints Register/Grievance book at respective locations, to record complaints received and actions taken. This register will be made available to the Promoter/Proponent, Environment Officer and the relevant authority.

7.7.3 ENVIRONMENTAL INCIDENT/EMERGENCY REPORTING

All project and subcontractor personnel shall report all actual environmental incidents to the Contractor/Promoter/Proponent and Environment Officer.

7.7.4 ENVIRONMENTAL OFFICER DIARY ENTRIES

The Environment Officer will maintain a site diary that relates to environmental issues as they occur on site, for record keeping purposes. Comments from this diary will form part of the reports presented at site meetings by the Environment Officer.

7.7.5 SITE MEMO ENTRIES

Site memos stipulating recommended actions required to improve compliance with the ESMP by the Contractor will be issued by the Environment Officer to the Engineer, who in turn will ensure that the Contractor is informed on the said instruction. Comments made by the Environment Officer in the Site Memo book are advisory and the Contractor may only issue all Site Instructions required. Site Memos will also be used for the issuing of stop work orders for purposes of immediately halting any particular activity of the Contractor deemed to pose immediate and serious risk of unnecessary damage to the environment.

7.7.6 INCIDENT/EMERGENCY PREPAREDNESS AND RESPONSE

An up-to-date list of the contact details of emergency services, including local firefighting service, police and ambulance services will be maintained in the Contractor's office near the telephone. Method of Statements for the following emergencies is required.

7.8 ESMP REPORTING AND COMMUNICATION

Copies of the ESMP shall be kept at the site office during the construction phase and shall be distributed to the Environment Officer and all other senior contract personnel. All senior personnel shall be required to familiarize themselves with the contents of the ESMP. Amendments to the ESMP document must be approved by the MEECC before the ESMP is revised. The Environmental Officer shall be responsible for the implementation and distribution of any approved amendments to the ESMP during the construction phase. The Promoter/Proponent may order the Contractor to suspend part or all of the works during the construction phase if the Contractor fails to comply with the specifications set out in the ESMP and Method of Statements supplied by the Contractor and any Sub-contractors. Such suspension will be enforced until compliance is achieved.

7.8.2 INFORMATION BOARD

The Contractor shall be responsible for erecting a general information board during the construction phase. The Promoter/Proponent shall approve the number, positions, design and dimensions of these information boards. The general information board shall, as a minimum, provide the name and contact number of the Environmental Officer, to ensure that the public has access to the Environment Officer, to request information and / or to lodge any complaints.

7.8.3 METHOD OF STATEMENTS

The Contractor shall submit a written Method of Statements to the Promoter/Proponent /Engineer and Environmental Officer, for approval prior to commencement of project works which are deemed to be environmentally sensitive aspects of the work, and/or not covered in sufficient detail in the ESMP. A Method of Statement is a 'living document' in that it can be modified as a result of negotiations between the Contractor and Environment Officer/project management team as circumstances arise. Every Method of Statements will form part of the ESMP and are subject to all terms and conditions contained within the ESMP.

7.8.4 SITE MEETINGS

The Environment Officer is required to attend meetings on a regular basis, or as required during the initial stages of the project, to facilitate transfer of information and to update all parties on the environmental compliance of the project as a whole and record any additional requirement.

The Environment Officer will present a summary report outlining the main construction activities that relate to the environment, at this meeting.

The minutes of these meetings will be incorporated in the ESMP records. These minutes will reflect environmental queries, agreed actions and dates of eventual compliance by the Contractor.

The following people should attend these meetings:

- The Promoter/Proponent;
- Engineer/Project Manager;
- The Environmental Officer;
- Contractors' representative.

8 RECOMMENDATIONS AND CONCLUSIONS

The seaport similar to the airport is an important control point for all that are entering and leaving the country. The elements listed below should be considered for implemented:

h) A Waste Reception Facility to be made available within the port area to receive and manage solid wastes from ships;

i) A Waste Destruction Facility (Incinerator) is critically important for destruction of impounded goods, invasive species thus safeguarding the country's biosecurity;

j) A Waste Oil Reception Facility to be made available for containment and management of waste oil from ships;

k) A separate service road or alternative connectivity between the Commercial Port and the Fishing Port as there will be an increase of port activities which will also increase the flow of traffic between the commercial and the fishing ports and thus add up on the current traffic jam situation in Victoria;

l) The main fuel pipes serving for the loading and unloading of fuel to SEYPEC Fuel Farm should be left clear at all time (no stacking over the line);

m) Separate stacking should be made for hazardous and non-hazardous containers;

n) SPA should adopt clean development mechanism such as use of PV panels for production of electricity, roof harvesting and water reduction devices for conservation of potable, prevention of environment contamination and overall contribute to eco-port/green port development (Refer to Appendix 11).

The Division of Risk and Disaster Management is undertaking a Risk Assessment of the Commercial Port and upon its completion and approval, a Risk Management Plan should be developed and adopted by the Seychelles Port Authority.

This study has examined the possible impacts of the dredging of the navigation channel for Port Victoria, as well as the demolition of the Halcrow and Norplan quays and construction and backfilling works of a new quay by the SPA. The Mont Fleuri Fishers community will be affected and as such certain mechanism will have to be implemented to ensure they remain functioning during the project implementation phase.

The potential impacts of dredging and the other elements of the port project relates to:

- Water quality due to potential excessive sedimentation from dredging and sediment disposal onshore and offshore;
- Increased vessel sizes and increased operations at the port resulting in more staff and supporting infrastructural facilities.

The mitigation measures proposed primarily surround the issue of sedimentation as a result of the dredging operations. The following are recommended:

- The use of silt screens during dredging operations in the inner channel and around the Port, this should be secured with banding (geotextile membrane and rock armoring) of the onshore disposal site;
- Water quality monitoring programme during the dredging and sediment spoil disposal;
- An ESMP is required for both the construction and operational phases of the project. It includes stated mitigation measures, in the form of plans, procedures and guidelines that need to be developed for avoiding or reducing, as far as possible, any adverse environmental and social impacts.

DAR considers the development of an environmental monitoring plan, waste and hazardous material management plan, dredging management plan, sediments management and disposal plan, stakeholder engagement plan, emergency preparedness and response plan as necessary. The overall objectives of this ESMP are to:

- Describe the measures required to implement construction related management and mitigation commitments made in the Environmental and Social Impact Assessment;
- Describe specific additional measures required to implement construction related good practice, approval conditions and EIB Directives
- Identify the roles and responsibilities of the environmental and social management organisation of the project;
- Communicate environmental and social expectations and requirements throughout the project team;
- All contractors and subcontractors shall comply with the provisions of the ESMP as applicable to the tasks they are employed to undertake.

9 REFERENCES

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Analysis of sea level rise and coastal flooding in the Seychelles due to climate change. Current scenario and future projections for 2025, 2050 and 2100, Republic of Seychelles. December 2012

10 APPENDICES

APPENDIX 1: SCOPING LIST

NAME	ORGANIZATION	CONTACT	Submitted comments
Alain de Commarmond	Environment Department	adecommarmond@gov.sc 2722980	NO
Angela Servina	Planning Authority	aservina@mluh.gov.sc 2723054	Yes
Michelle Azemia	Environment Department (Standards Unit)	m.azemia@env.gov.sc 2722020	No
Kenneth Antat	Environment Department (Enforcement Unit)	k.antat@env.gov.sc 2723887	No
Rosanie Barreau	Environment Department (Enforcement Unit)	r.barreau@env.gov.sc 2723539	No
Ronley Fanchette	Environment Department (Conservation Section)	r.fanchette@env.gov.sc 2722075	No
Kevin Moumou	Environment Department (Conservation Section)	kmoumou@env.gov.sc 2513446	No
Selvan Pillay	Department of Environments (CAMS)	s.pillay@gov.sc 2723235	Yes
Kevin Pompey	Public Health Services	kevin.pompey@health.gov.sc 4388512	Yes
Kenny Julie	Department of Environments (CAMS)	k.julie@env.gov.sc 4670400	Yes
Vincent Lucas	Seychelles Fishing Authority	vlucas@sfa.sc 4670300	No
Regis Bethew	Seychelles Fire & Rescue Services Agency	rbethew.sfrsa@email.sc 2723382	Yes
Cpt. Andre Ciseau	Ports Authority	aciseau@seyport.sc 4294700	No
Dr. Muru	CAMS	murugaianseyseychelles@gmail.com 2722159	Yes
Cpt. Valmont	Seychelles Maritime Safety	dg@smsa.sc	Yes

	Administration		
Jean- Claude Labrosse	Department of Environments (CAMS)	j.labrosse@env.gov.sc 2723325	No
Veronique Baker	Department of Risk & Disaster Management	vbaker@gov.sc 2722101	Yes
Bernice Elisabeth	Tourism Department	Bernice@goc.sc 2724274§	Yes
Patrick Andre	Seychelles Land Transport Agency	pandre@gov.sc	No
Ernest Quatre	Seychelles Police (Commissioner of Police)	compol@seypolice.sc 4288000	No
Lt. Col Simon Dine	Seychelles Coast Guard	seycoast@seychelles.net 4225812	No
Flavien Joubert	CEO-Seychelles National Parks Authority.	f.joubert@env.gov.sc 2722890	No
Conrad Benoiton	Seypec	c.benoiton@seypec.com 4290600	No
Lenny Payet	LWMA	lkpayet@hotmail.com 2722074	Yes
Anne Naiken	Public Utilities Corporation(PUC)	anaiken@puc.sc 4678000	No
Ray Hoareau	Seychelles Petroleum Company Limited	rhoareau@seypec.com 4290607	Yes

APPENDIX 2: SCOPING VERIFICATION FORMS - COMMENTS

FEASIBILITY STUDY FOR THE REHABILITATION AND EXTENSION OF THE COMMERCIAL PORT

COMMENTS FROM: Seychelles Planning Authority
PREPARED BY: Julie Low (Urban Planner)

In principle the proposed rehabilitation and extension is in line with the Victoria Masterplan, however should ensure to take into consideration the following as part of the rehabilitation and estension project for the commercial port :

1. **Waterfront and Passenger Cruise Terminal:**
   Area dedicated for Waterfront development which includes the Passenger cruise terminal and the new esplanade (refer to Figure 1 and 2). The facilities at these two points identified will be upgraded to provide an improved arrival point for cruise terminals, which will be complimented by the esplanande providing a direct, high quality pedestrian environment connection to central Victoria.

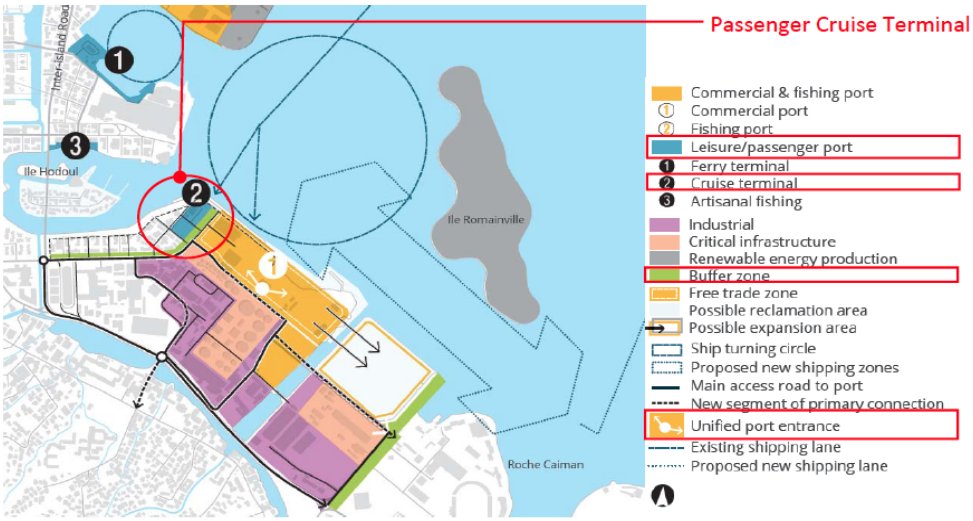

Figure 1: Area of passenger Cruise Terminal - Commercial port

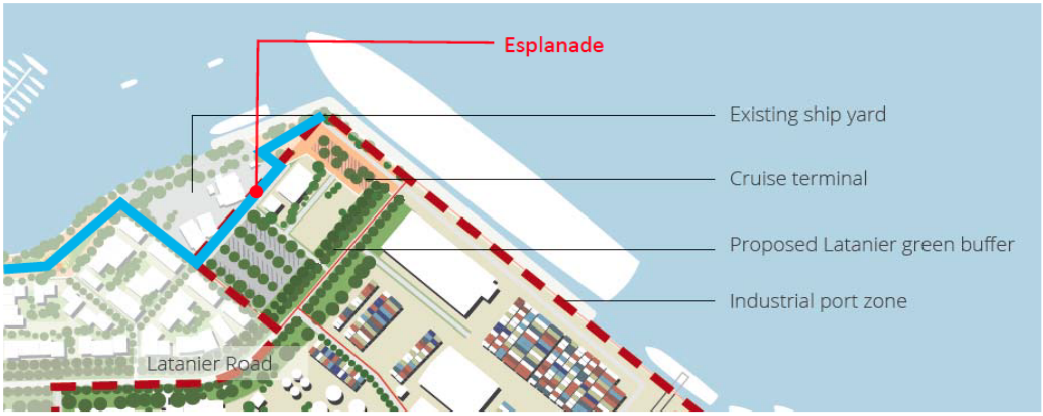

Figure 2: Pedestrian Access Esplanade - Commercial Port

2. **Road Access:**

The additional connector roads as highlited in Figure 3a should be considered in order to improve traffic flows and legibility. The proposed road connector as per MTBS/GIBB proposal (Figure 3b) should not be at point B but at point A which provides direct connection to Roche Caiman road. As for road connection point B this will cause traffic interruption between freight coming from the Commercial port and other vehichles entering the FSA premises. Deatiled road access is provided in Figure 4. Refering to Figure 1, a unified access to the commercial port is also being proposed.

Figure 3a: Road access - Victoria Masterplan

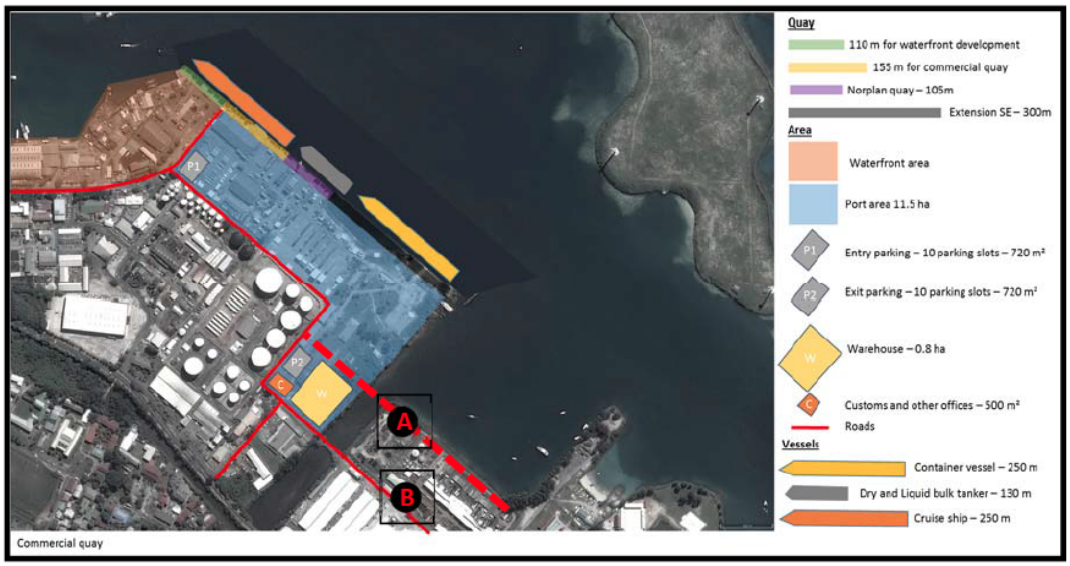

Figure 3b: Road access - GIBSS proposal

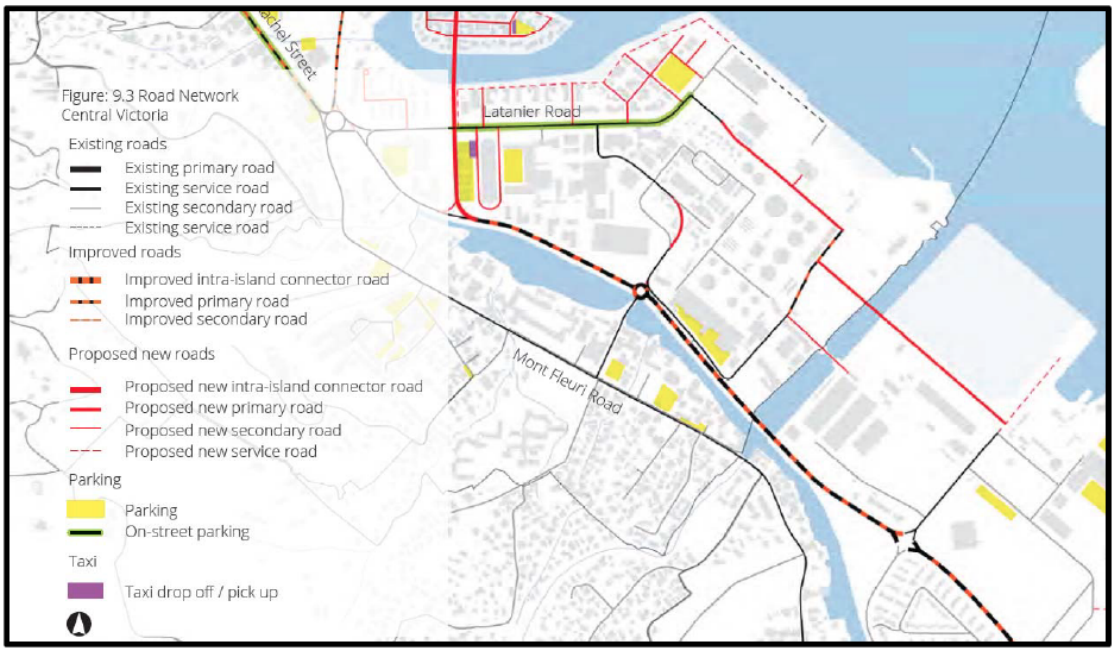

Figure 4: Road Network - Victoria Masterplan

3. **Extension of Commercial Port:**

The Victoria Masterplan supports for extension of the commercial port towards the ex-coast guard premises as indicated in Figure 5a and 5b. Proposed reclamation as per MTBS/GIBB proposal is also in line with the Victoria Masterplan, in addition for future consideration the masterplan also highlights the south-east of potential future port expansion.

Figure 5a: Proposed land use – Victoria Masterplan

Figure 5b: Proposed future reclamation – Victoria Masterplan

MINISTRY OF ENVIRONMENT, ENERGY & CLIMATE CHANGE
ENVIRONMENTAL ASSESSMENT AND PERMITS SECTION
(E.A.P.S)
SCOPING VERIFICATION FORM

PROJECT TITLE: PORT VICTORIA EXTENSION

PROPONENT/CONSULTANT: DANIEL ROSETTE **email:** darenv.rosette2@gmail.com

Tel: 2524712

LOCATION: VICTORIA

ISSUES DISCUSSED

(Please use additional sheets if required- a separate sheet is to be used for each organization/person undergoing scoping)

The Landscape and Waste Management Agency (LWMA) has no general adverse comments to the proposal, on condition that developer / proponent makes inclusion of a sound solid waste management plan as part of the proposal. The management plan shall entail plans for the re-usage, reducing and recycling and eventual deposition of the following potential waste categories:

- Plastics, including beverage containers; plastic packaging; plastic cases of consumer goods
- Paper, including newsprint; ledger paper; computer paper; corrugated cardboard; and mixed paper
- Glass, including glass containers and window glass
- Metals, both ferrous and nonferrous, including cans; parts from abandoned vehicles; plumbing; fences; metal doors and screens; tools; machinery; and any other discarded metal objects.
- Putrescibles, including animal, fruit, and vegetable debris; cooked food; manures; offal; and sewage sludge.
- Wood, including non-reusable lumber; tree trunks, plant parts; and pallets
- Textiles, including non--reusable clothing; upholstery; and pieces of fabric
- Ceramics, including rock; tile; china; brick; concrete; plaster; and asphalt.
- Soils, including excavation soils from barren or developed land and excess "imported soil

Proponent must ensure that the development is equipped with a proper solid waste receptacle facility. The facility must be rodent-proof, vermin-proof and insect proof. The proposed facility must be situated well away from major roads and public accesses, however accessible by compactor trucks. The proponent is requested to liaise with the LWMA for proper design of same, based on the size and type of development.

The proponent is required to enter into a contract agreements with the LWMA for the removal of solid waste when the establishment is in operation. The contract agreement shall allow Government through the LWMA to collect waste at the establishment at an agreed fee, payable to government, which shall form part of the operating license of the operator. This is to promote the polluter-pay-principle.

PERSON/ORGANISATION SCOPED

NAME: LEMMY PAYET **Post Title:** CONSULTANT

ORGANISATION: L. W. M. A

Phone Number: 4324334 **Mobile Number:** 2722074

Email Address: lkpayet@hotmail.com

SIGN: **DATE:** 12/11/15

MINISTRY OF ENVIRONMENT, ENERGY & CLIMATE CHANGE
ENVIRONMENTAL ASSESSMENT AND PERMITS SECTION
(E.A.P.S)
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PROPONENT/CONSULTANT: DANIEL ROSETTE **email:** darenv.rosette2@gmail.com

Tel: 2524712

LOCATION: VICTORIA

ISSUES DISCUSSED

The Tourism Department has no adverse comments to the project proposal.

However, due regard must be given to the potential positive increase in the number of cruise ships. Therefore, the required infrastructure and facilities must be catered for at the port.

The Department reserves the right to comment further once the plans are submitted.

PERSON/ORGANISATION SCOPED

NAME: Bernice Elizabeth **Post Title:** Director Policy, Strategy, Research an International Cooperation

ORGANISATION: Tourism Department

Phone Number: 4286513 **Mobile Number:** 2724274

Email Address: bernice@gov.sc

SIGN: B. Elizabeth **DATE:** 12 November 2015.

The completed form can be posted on the following e-mail addresses_ n.laure@env.gov.sc ; r.dubignon@env.gov.sc or a.sorry@env.gov.sc or contact the ENV ASSESSMENT AND PERMITS SECTION-Ministry of Environment, Energy & Climate Change-Tel; 4670500 to organise for collection.

NOTE: TO PROPONENT/CONSULTANT - PLEASE RETURN EACH COMPLETED FORM TO THE MINSTRYOF ENVIRONMENT AND ENERGY AS AN APPENDIX TO THE SCOPING REPORT

MINISTRY OF ENVIRONMENT, ENERGY & CLIMATE CHANGE
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PROPONENT/CONSULTANT: DANIEL ROSETTE **email:** darenv.rosette2@gmail.com

Tel: 2524712

LOCATION: VICTORIA

ISSUES DISCUSSED

(Please use additional sheets if required- a separate sheet is to be used for each organization/person undergoing scoping)

The Division of Risk and Disaster Management (DRDM) has the following recommendation:

- That a throughout Risk Assessment of infrastructure and activity being carried out presently and those that is expected to be carried out at the Victoria port is done as part of the feasibility study for the renovation and extension of the port.
- This risk assessment should also take into account the different activities/business and the level of risk that they pose to the port as well as the risk the port poses to them.
- A proposed plan for emergency preparedness and response is also produce for the time that the construction is being carried out and for the operational phase of the infrastructure.
- Consultative work is ongoing with all Emergency Services during the time of proposal and construction and at operational stages to ensure that all emergency preparedness and response are in place at all of these stages.
- Scenarios planning and the remedial measure to be taken of all incidence and occurrence during time of construction and operation should be produce and circulated to those concerned.
- The existing facilities and services currently ongoing are revisited and relocated to create space for real port activities and space maximisation.

PERSON/ORGANISATION SCOPED

NAME: Veronique Baker **Post Title:** Senior Coordinator

ORGANISATION: Division of Risk and Disaster Management

Phone Number: 248 4672200 **Mobile Number:** 248 2724842

Email Address: vbaker@gov.sc

SIGN: _____ **DATE:** 23/11/15

The completed form can be posted on the following e-mail addresses_ n.laure@env.gov.sc ; r.dubignon@env.gov.sc or a.sorry@env.gov.sc or contact the ENV ASSESSMENT AND PERMITS SECTION-Ministry of Environment, Energy & Climate Change-Tel; 4670500 to organise for collection.

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	MINISTRY OF ENVIRONMENT, ENERGY & CLIMATE CHANGE **ENVIRONMENTAL ASSESSMENT AND PERMITS SECTION** **(E.A.P.S)** **SCOPING VERIFICATION FORM**

PROJECT TITLE: **PORT VICTORIA EXTENSION**

PROPONENT/CONSULTANT: DANIEL ROSETTE **email:** darenv.rosette2@gmail.com

Tel: **2524712**

LOCATION: **VICTORIA**

ISSUES DISCUSSED

(Please use additional sheets if required- a separate sheet is to be used for each organization/person undergoing scoping)

- **With such a development the risk of introducing alien species of pests, rodents and any other invasive species would be doubled if preventive measures are not in place and maintained; the need for an isolation\quarantine area for goods (merchandise) suspected of harbouring any insect, rodents prior to being cleared. Existing facilities such as the incinerator which would need to be in full working order in cases of decontamination.**
- Separate access points for water and fuel intake for ships to reduce risk of contaminating the potable water supply. The said facility should be housed in an area that is free from rodents and pests.
- The port area should be free of rodents and pests, with that regards all practicable measures should be undertaken to ensure such which inclusive of wall\ fencing demarcating the port limit.
- Adequate personnel welfare facilities should be provided and be made available at all times; toilet facilities, washing facilities etc.
- Sanitary facilities should be upgraded and extended to cater for the extension and at regular interval now that the port is being extended.
- Ensure that facilities for showering and eye washing are made available in cases of emergencies as multiple types of chemicals are moved during daily operations.
- Health and safety is of paramount importance, a health and safety management system should be implemented to ensure safe operations on the port.
- Safe walkways should be provided to all parts of the port areas to which persons with legitimate access have to walk, such people includes ships' crew members, pilots passengers etc.
- Appropriate warning signs should be provided and posted at conspicuous areas.
- Special attention should be paid to the need to ensure the safety of passengers of cruise ships, passenger access and exit routes should be marked and laid out. Routes for foot passengers should be segregated from that of vehicles routes as far as practicable. Areas to which entry of unauthorised personnel or passengers should be clearly marked.
- By the nature of ports, falls into water are a commonplace hazard, and not all port workers who may fall into water may be able to swim. Means by which such persons can rapidly escape from the water or be rescued should be provided.
- Waste holding facilities onsite should be upgraded to cater for the extension.

PERSON/ORGANISATION SCOPED

NAME: __KEVIN POMPEY_____ Post Title: _PUBLIC HEALTH OFFICER_____

ORGANISATION: PUBLIC HEALTH SERVICES_____

Phone Number: _____4388512_____ Mobile Number: _____2722842_____

Email Address:___Kevin.pompey@health.gov.sc_____

SIGN: _____ **DATE:_____23\11\15_____**

The completed form can be posted on the following e-mail addresses_ n.laure@env.gov.sc ; r.dubignon@env.gov.sc or a.sorry@env.gov.sc or contact the

MINISTRY OF ENVIRONMENT, ENERGY & CLIMATE CHANGE
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PROJECT TITLE: PORT VICTORIA EXTENSION

PROPONENT/CONSULTANT: DANIEL ROSETTE **email:** darenv.rosette2@gmail.com

Tel: 2524712

LOCATION: VICTORIA

ISSUES DISCUSSED

(Please use additional sheets if required- a separate sheet is to be used for each organization/person undergoing scoping)

We are recommending the following to be complied with:

(1) An adequate buffer area should be erected between the port area and the SEYPEC compound.

(2) Storage of containers on the Port area should be classified whereby a specific secured area should be well designated to safely store containers with hazardous goods or materials therein.

Policy of the Port Authority should clear out the issue of the declaration of the contents of the containers to ensure that the above proves to be effective.

(3) Adequate fire safety and evacuation measures should be put in place in the Port area this includes fire equipment, main exits facilities, staff training and contingency plan (inclusive of an emergency response and evacuation plan).

Guideline on this should be sought from the SFRSA and other stakeholders.

(4) Standby point for fire service should be designated in a safe area and demarked appropriately and cleared when it is required.

(5) Any existing international fire safety norms related to Port areas should be viewed for possible consideration.

(6) Major structural defects including buildings should be reassessed for possible renovation or rebuilt.

PERSON/ORGANISATION SCOPED

NAME: REGIS BETHEW **Post Title:** DIVISIONAL OFFICER

ORGANISATION: SEYCHELLES FIRE AND RESCUE SERVICES AGENCY

Phone Number: 4289954 / 4289950 / 4289953 **Mobile Number:** 2723382 / 2723380

Email Address: rbethew.sfrsa@email.sc / cfo@seychelles.net

SIGN: _____ **DATE:** 18th November 2015

The completed form can be posted on the following e-mail addresses_ n.laure@env.gov.sc ; r.dubignon@env.gov.sc or a.sorry@env.gov.sc or contact the ENV ASSESSMENT AND PERMITS SECTION-Ministry of Environment, Energy & Climate Change-Tel; 4670500 to organise for collection.

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MINISTRY OF ENVIRONMENT, ENERGY & CLIMATE CHANGE
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(E.A.P.S)
SCOPING VERIFICATION FORM

PROJECT TITLE: PORT VICTORIA EXTENSION

PROPONENT/CONSULTANT: DANIEL ROSETTE

email: darenv.rosette2@gmail.com

Tel: 2524712

LOCATION: VICTORIA

ISSUES DISCUSSED

(Please use additional sheets if required- a separate sheet is to be used for each organization/person undergoing scoping)

Seychelles Petroleum Company Limited will require bunkering points at least every fifty (50) linear metres along the length of the propose quay.

The bunkering points must sit in pits that will cater for minor spillage/s
Feeder pipes leading to the bunkering points will initiate from existing facilities at the South End of the Commercial Port and will have to run in ducts, that should be easily accessible, to allow for installing the pipelines originally and access for maintenance in the future.

The main feeder pipe will be 6 inches which will be reduced to 4 inches as it gets to the respective bunkering points.

Pipeline propose will be seamless steel of API grade 5L standard and will be laid in accordance to API guidelines for the petroleum industry.

For closed system operating all bunkering points will be fitted with breakaway couplings and similar fittings will be installed on the bunker trolleys.

The Port Developer must provide for a safe lockable shelter to store at least three (3) bunker trolleys.

PERSON/ORGANISATION SCOPED

NAME: RAY HOAREAU

Post Title: OPERATIONS AND TECHNICAL MANAGER

ORGANISATION: SEYCHELLES PETROLEUM COMPANY LIMITED

Phone Number: 4290607

Mobile Number: 2512060

Email Address: r.hoareau@seypec.com

SIGN: _____

DATE: 23rd NOVEMBER 2015

The completed form can be posted on the following e-mail addresses_ n.laure@env.gov.sc ; r.dubignon@env.gov.sc or a.sorry@env.gov.sc or contact the ENV ASSESSMENT AND PERMITS SECTION-Ministry of Environment, Energy & Climate Change-Tel; 4670500 to organise for collection.

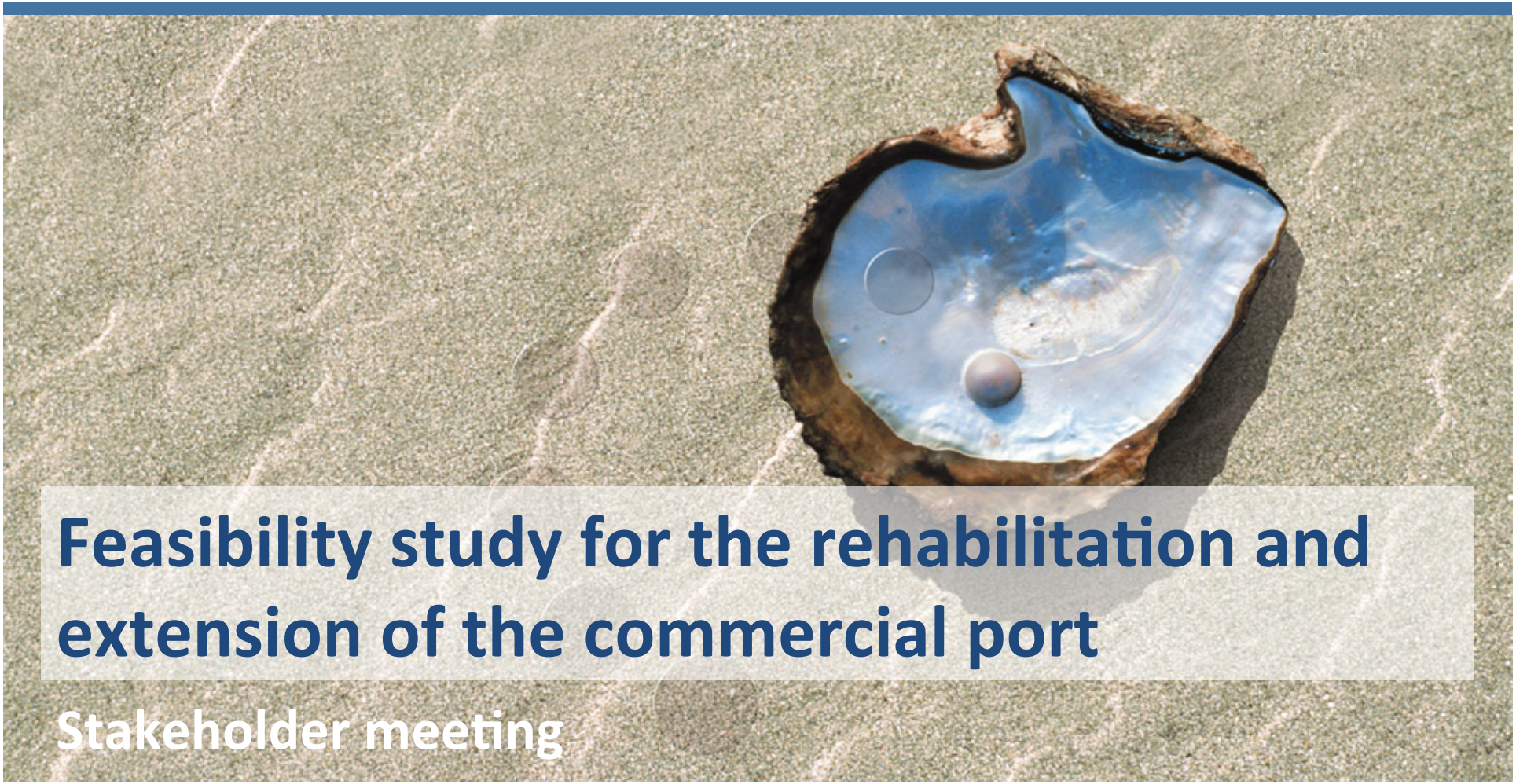
NOTE: TO PROPONENT/CONSULTANT - PLEASE RETURN EACH COMPLETED FORM TO THE MINSTRY OF ENVIRONMENT AND ENERGY AS AN APPENDIX TO THE SCOPING REPORT

APPENDIX 3: PRESENTAION

European Investment Bank

Seychelles Ports Authority
Propelling Port Victoria Forward

Witteveen + Bos
GIBB
mtbs
maritime & transport business solutions



Feasibility study for the rehabilitation and extension of the commercial port

Stakeholder meeting

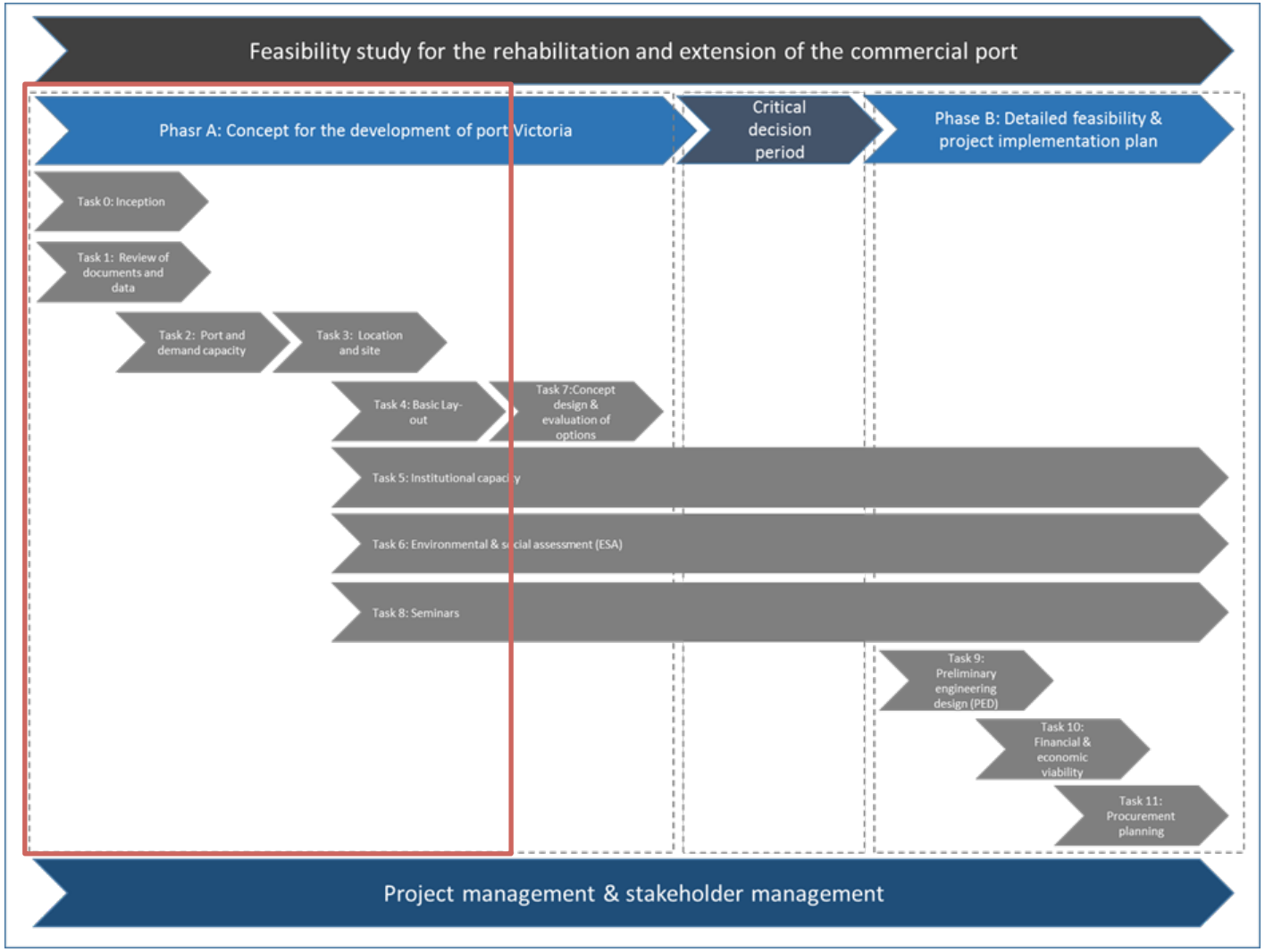
26 October 2015

maritime & transport business solutions

Objective

The development of an economically efficient and modally complementary infrastructure in port Victoria contributing to the socio-economic growth of the Seychelles.

Approach of the project



Partners of the projects

- European Investment Bank
- Seychelles Port Authority
  - Promotor of the project.
- Consortium
  - MTBS;
  - Witteveen+Bos;
  - Emergance Legal; and
  - Gibbs.

Feasibility study for the rehabilitation and extension of the commercial port

1. DEMAND PROJECTIONS

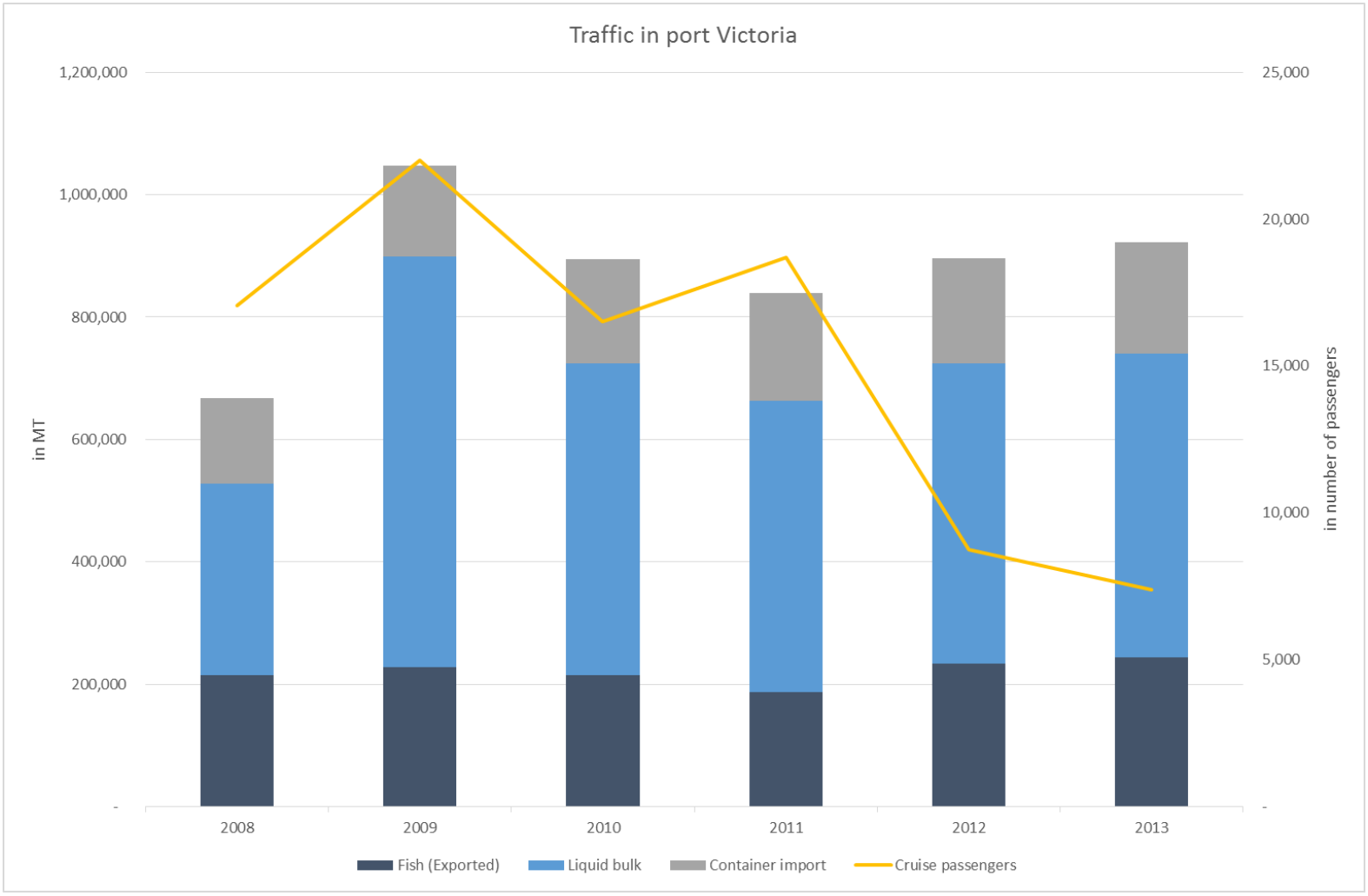
Approach

Four main traffic segments:

1. Fish;
2. Container/Cargo;
3. Liquid & dry bulk; and
4. Other market segments.

Projections 2015 - 2040

Historic data



Forecast results

Large increase in the total throughput expected

Fish – 692,650 MT in 2040

- Reefer vessels will disappear.

General cargo – 178,188 TEU in 2040)

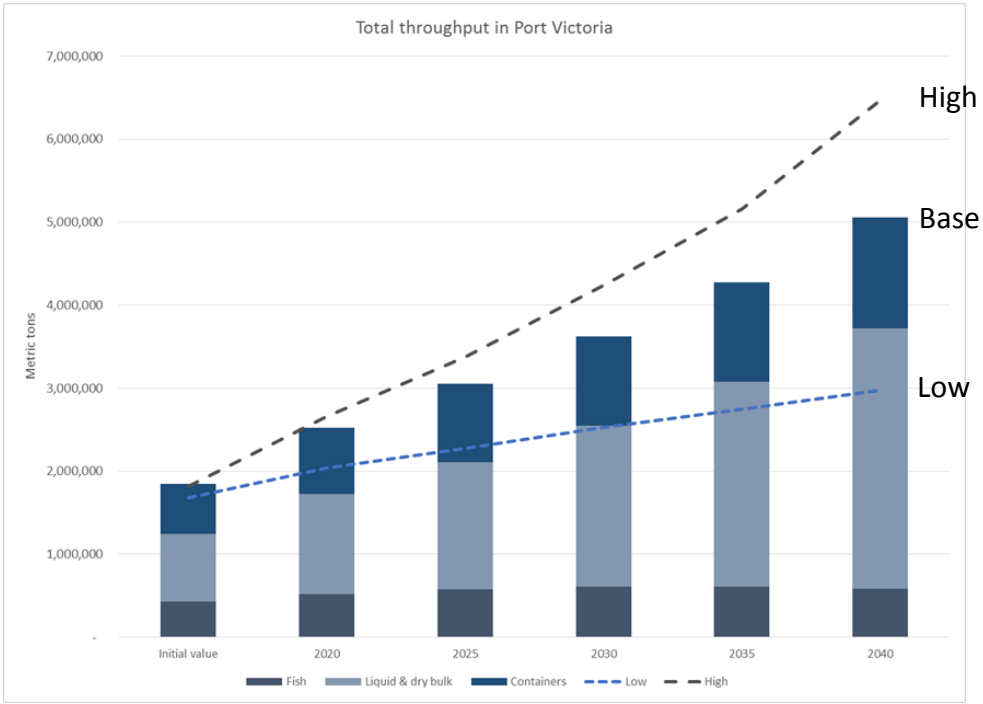
- Need for extra container yard area

Liquid bulk – 3,992,826 MT in 2040

- No need to extend current tank capacity

Passengers – 33,376 passengers in 2040

- Highly volatile

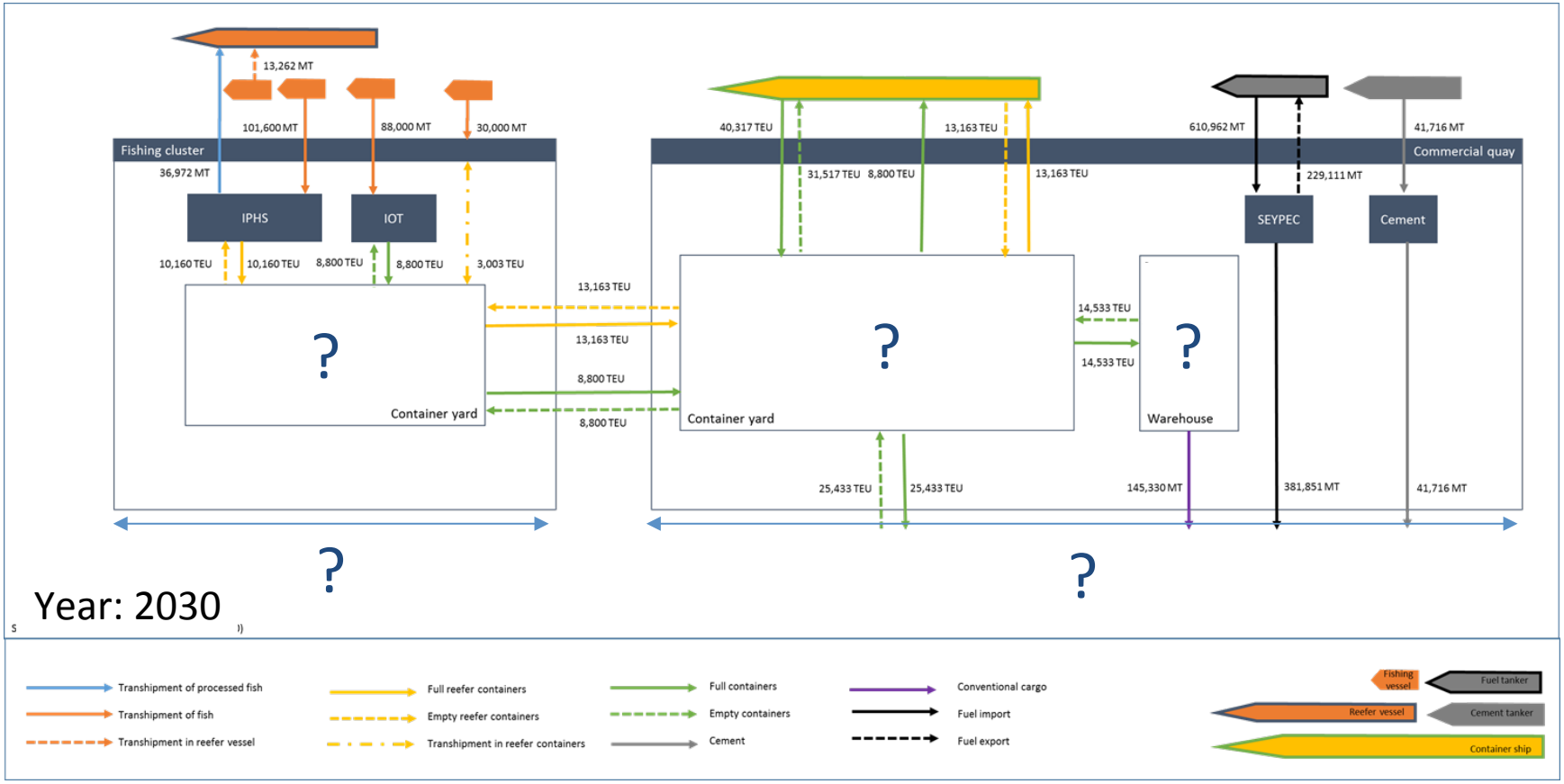


Feasibility study for the rehabilitation and extension of the commercial port

2. CAPACITY ASSESSMENT

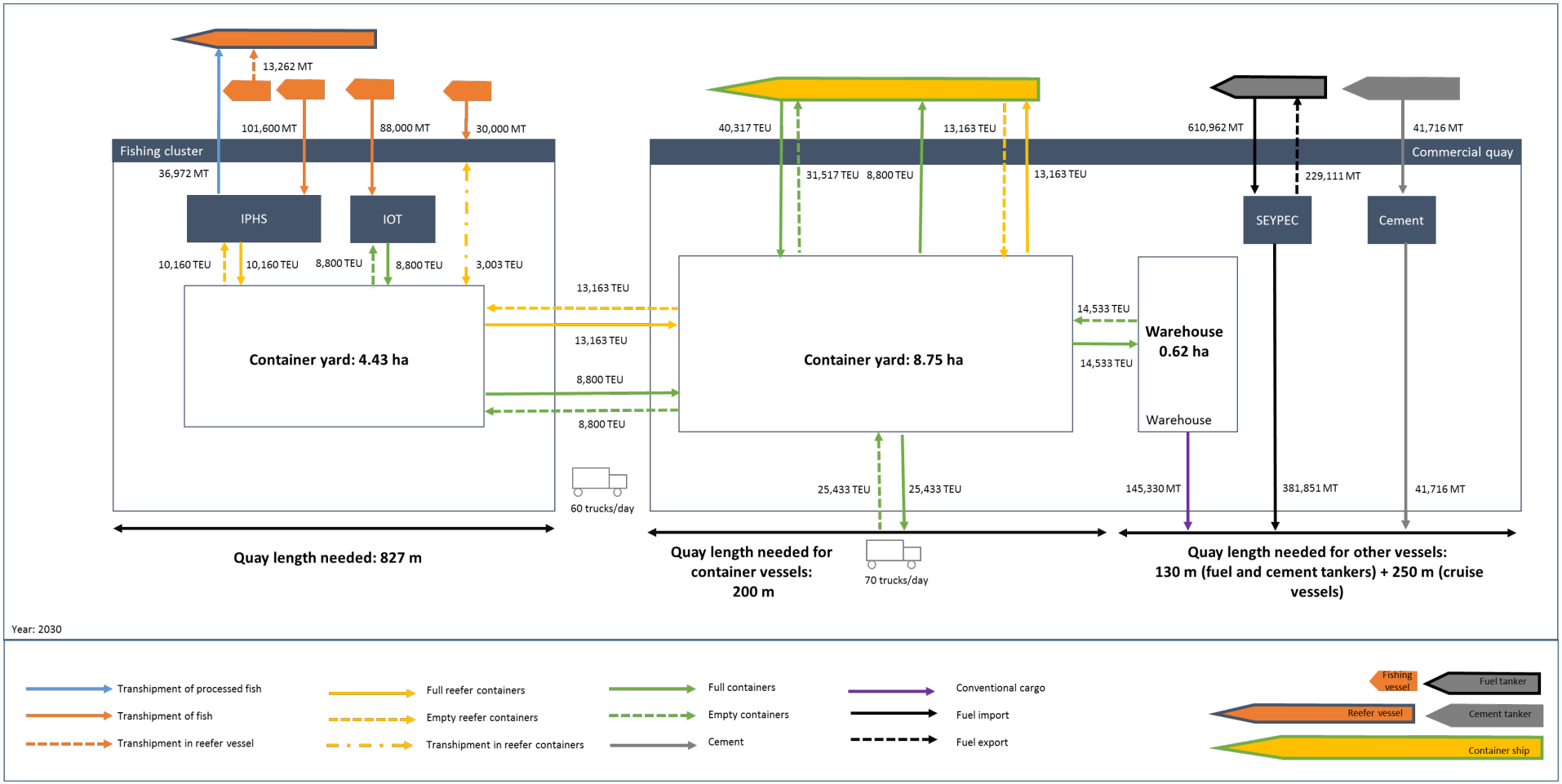
Approach

Capacity assessment based on a schematic cargo flow analysis



Overall capacity need

Quay length and container yard needed at port Victoria

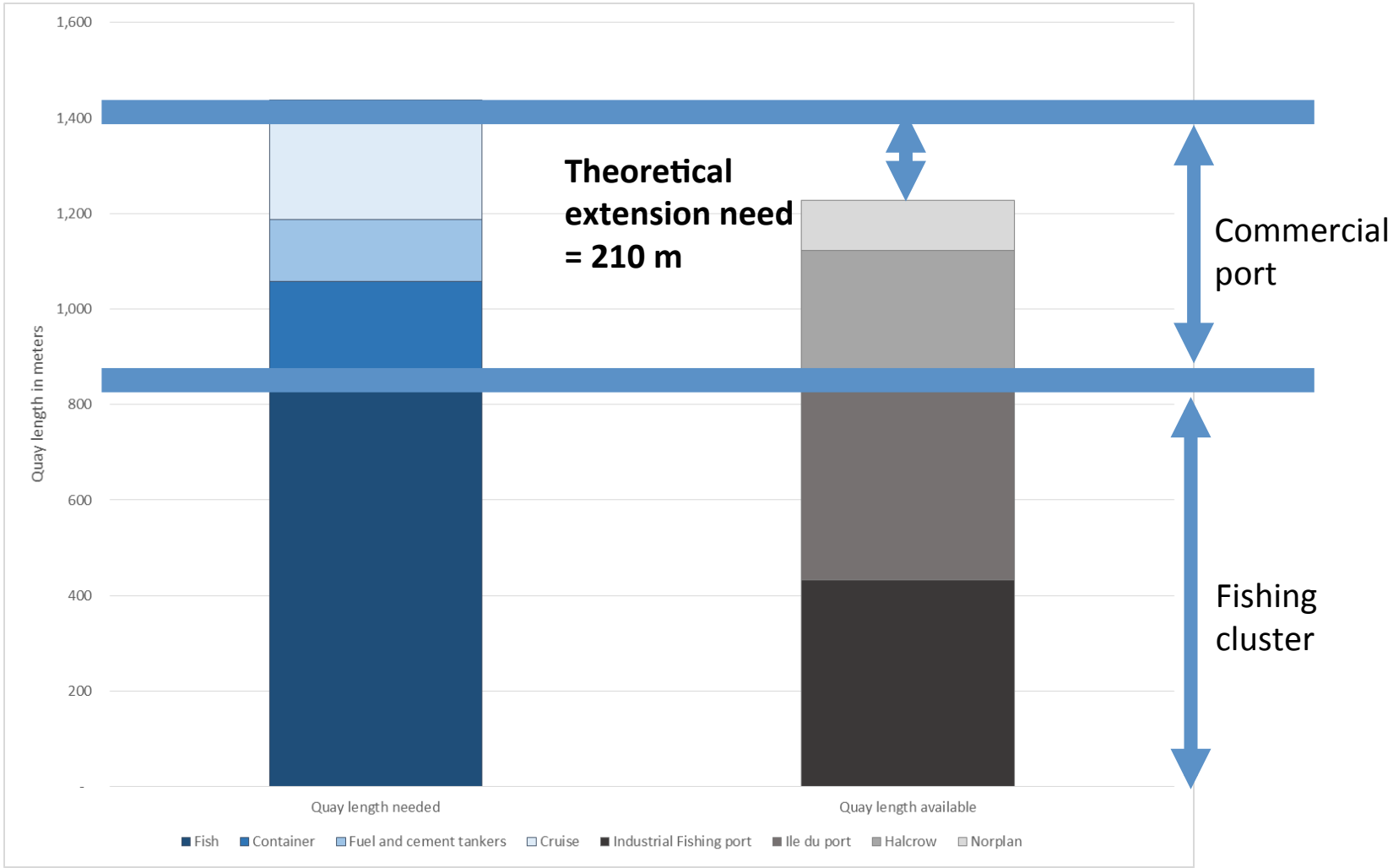


Current capacity

Capacity at all locations is assessed

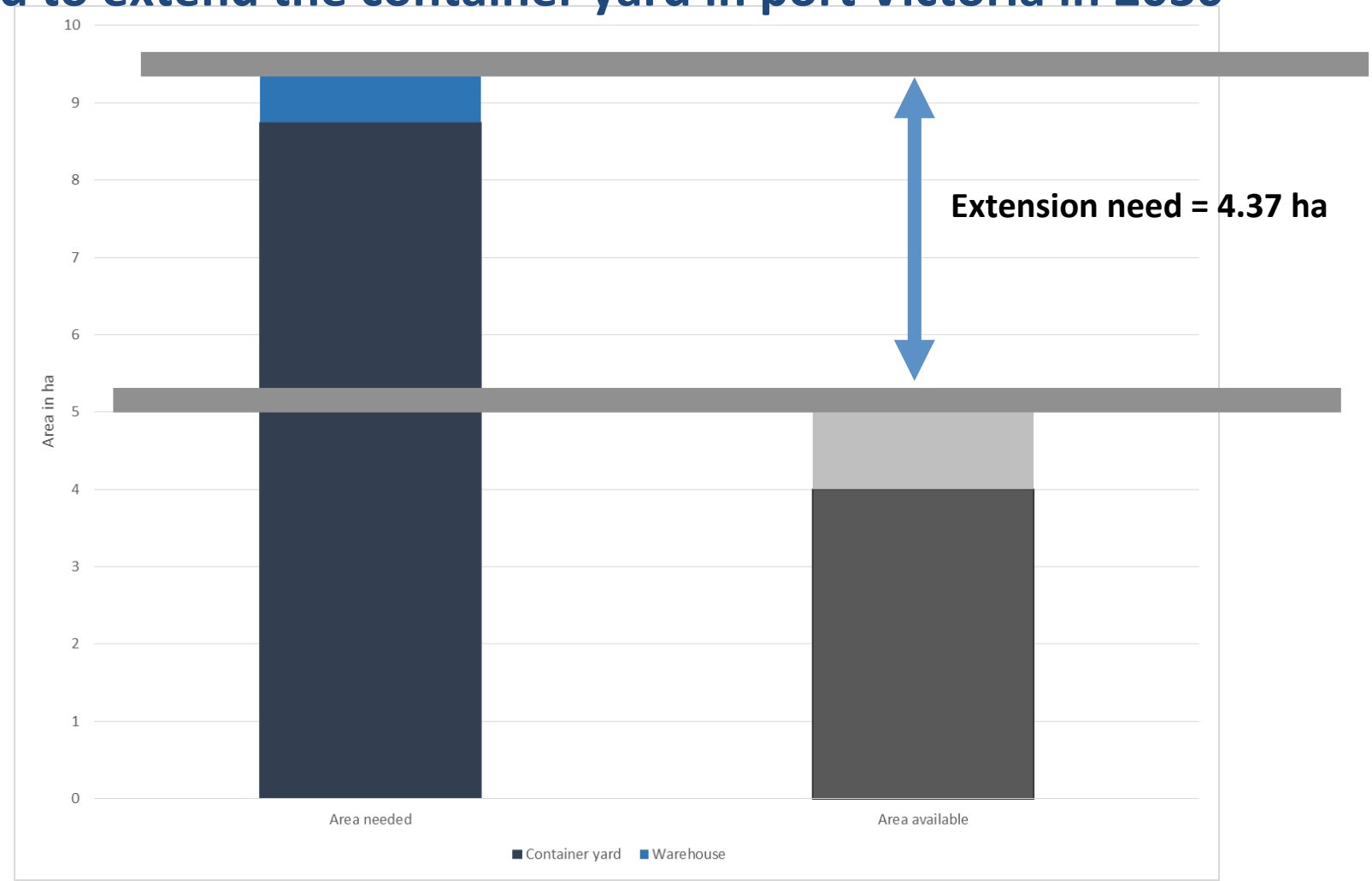
Comparison of current and needed capacity – Quay length

Need to add a large container berth in port Victoria in 2030



Comparison of current and needed capacity – Area

Need to extend the container yard in port Victoria in 2030

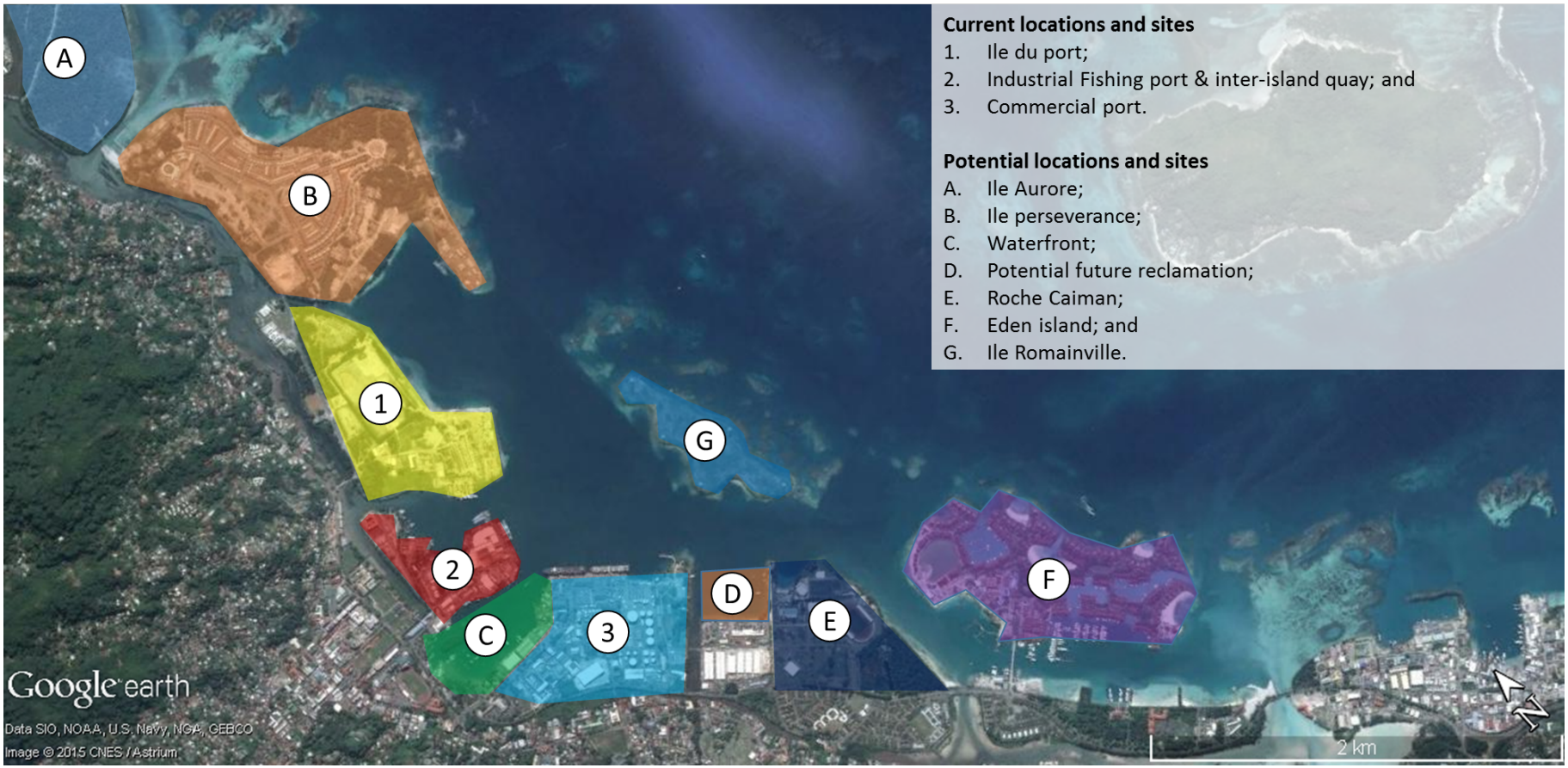


Feasibility study for the rehabilitation and extension of the commercial port

3. LOCATION ANALYSIS

Approach

Different locations are assessed based on their potential for development



Current locations and sites

1. Ile du port;
2. Industrial Fishing port & inter-island quay; and
3. Commercial port.

Potential locations and sites

A. Ile Aurore;
B. Ile perseverance;
C. Waterfront;
D. Potential future reclamation;
E. Roche Caiman;
F. Eden island; and
G. Ile Romainville.

Results

Current location is the preffered location

The Current location is considered the most suitable location for commercial cargo:

- Sufficient capacity to alloacte all fishing activities in the fishing cluster (Ile du port + Industrial fishing port);
- International container operations must be allocated at one location;
- Need for reclamation is minimal;
- Need to reallocate activities is minimal; and
- Potential to extend in the Medium (South-East of Commercial quay) and Long term (further South-East).

Feasibility study for the rehabilitation and extension of the commercial port

4. PREFERRED LAY-OUT

Current situation

Port lay-out of the current location

Commercial quay

Approach
Preferred concept selected based on various criteria

Various concept lay-outs have been assessed based on:

- Potential to address needed capacity;
- Cost efficiency;
- Operational efficiency; and
- Strategic fit.

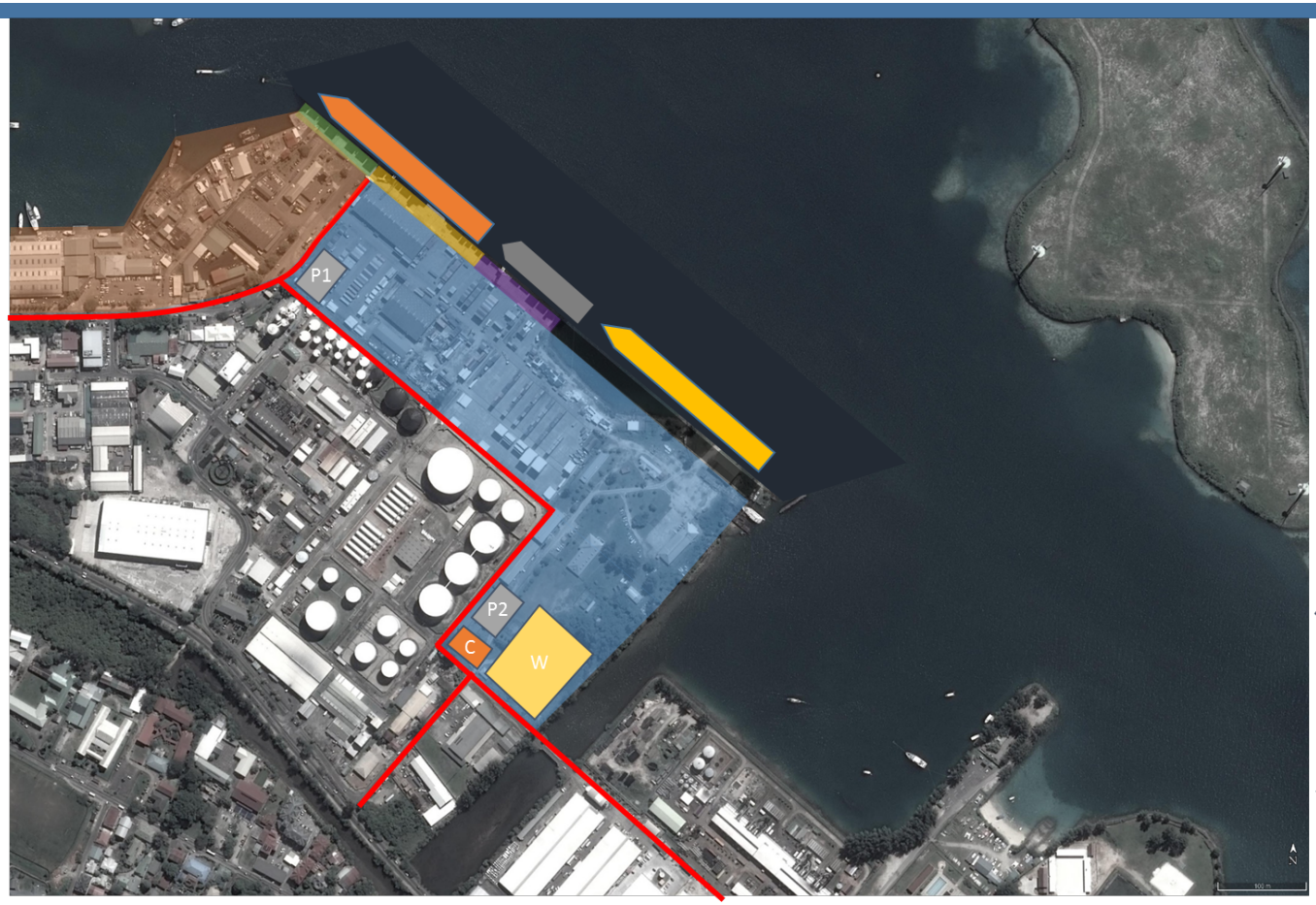
Preferred concept = Extension of Commercial quay with 300 m (South-East Extension)

Extension of existing quay with 300 m
Extension of area with 9 ha

Potential to extend with 300 m in the long-run

Preferred lay-out

Preferred concept = Minor rehabilitation + extension



Commercial quay

Quay

- 110 m for waterfront development
- 155 m for commercial quay
- Norplan quay – 105m
- Extension SE – 300m

Area

- Waterfront area
- Port area 11.5 ha
- P1 Entry parking – 10 parking slots – 720 m²
- P2 Exit parking – 10 parking slots – 720 m²
- W Warehouse – 0.8 ha
- C Customs and other offices – 500 m²
- Roads

Vessels

- Container vessel – 250 m
- Dry and Liquid bulk tanker – 130 m
- Cruise ship – 250 m

Extension of commercial quay => Dedicated to container vessels
Minor rehabilitation of current quay => Dedicated to other vessels

White House, Rotterdam

maritime & transport business solutions

maritime strategy & finance advisors

t | +31 10 2865940
e | info@mtbs.nl
w | www.mtbs.nl

Wijnhaven 3E
P.O. Box 601
3000 AP Rotterdam
The Netherlands

APPENDIX 4: MINUTES OF STAKEHOLDER MEETINGS DURING INCEPTION VISIT

	Date	Meeting	Attendees besides the Consultant	Crucial information and defined key issues by stakeholders
1	14/07/2015	Meeting Seychelles Port Authority	This meeting was chaired by Mr. Lt Col Andre Ciseau (CEO of SPA). Among the SPA's staff was also attending the meeting: Garry Albert, Deputy Chief Executive Officer; Franky Laporte; Senior Project Manager; Ronny Brutus, Business development Manager; Capt. Percy Laporte, Harbour Master; David Bianchi, Director, Business Development; Dean Zelime, Project Manager; Ms. Lina Hoareau, Director Corporate Services and David Bianchi, Director Business Development.	- SPA defines the Africa-Asia trade as a great opportunity to tap in; - SPA defines the cabotage project as an opportunity to attract more vessels; and - KEY OBJECTIVE = Maintain competitive advantage (fishing); and get competitive advantage (container). Key issues: - Poor state port infrastructure; - Actual concession contract with LMS; - New BOT project; and - No sufficient budget to fund investment.
2	14/07/2015	Meeting Ministry of Transport	Meeting with Ministry of Foreign Affairs and Transport. This meeting was chaired by Mr. Joel Morgan, Minister of Foreign Affairs and Transport.	- Rehabilitation and extension of the commercial port is a key priority; - Value for the people of the Seychelles is a key priority Key issues: - No sufficient budget to fund investment - State wants to hold shares in the vehicle that will be responsible for the development and operation of the port.
3	15/07/2015	Meeting Hunt Detel & Co. Ldt	Meeting with Hunt, Deltel & Co td represented by Christophe Houareau, Group General Manager.	- Hunt, Deltel & Co Ltd is a full services company mainly involved in logistic services. Key issues for Hunt, Deltel & Co Ltd: - Poor state port infrastructure; - New BOT project; and - Need for new equipment.
4	15/07/2015	Meeting Land Marine Services	Meeting with Land Marine Ltd represented by Hughes N Adam, Managing Director. Among others, was also attending the meeting: David Dirby and General Manager Operations; Gerry Adam Managing Director of Mahe Shipping Company Ltd shareholder of Land Marine.	- Land Marine Ltd is a joint venture company with the State of Seychelles and is involved in shore-handing, logistics, trading and stevedoring; and - Land Marine Ltd has plans to develop the quay.
5	15/07/2015	Meeting Ministry of Tourism	Meeting with Ministry of Tourism & Culture. This meeting was chaired by Mr. Alain S Ange, Minister of Tourism & Culture. Among others was also attending the meeting: Mrs. Anne Lafortune, Principal Secretary and Sherin Naiken, Chief Executive Officer of the Seychelles Tourism Board.	- Piracy is disappeared in the waters surrounding the Seychelles; and - Moratorium for the development of new hotels.

	Date	Meeting	Attendees besides the Consultant	Crucial information and defined key issues by stakeholders
6	15/07/2015	Meeting Fishing authority	Meeting with the Seychelles Fishing Authority (the "SFA"). Was attending this meeting Mr. Clifford Toussaint, Project Manager and Juan Marimba, Project Officer.	- Trend towards containerization; - Need for a dry dock; and - Need for a ship cleaning facility. Key issues: - Position of dry dock (not in port area);
7	15/07/2015	Meeting IPHS	Meeting with Ile du Port Handling Services Ltd (IPHS) represented by Mr. Arthur de Bretagne, General Manager.	- IPHS is a joint venture company with the State of Seychelles which provides handling services to fishing vessels in connection with complementary services offered by Central Common Cold Store (CCCS) for sorting and sizing of fish); and - We understand that the States of Seychelles has planned to invest USD 1,440,000.00 through SSI by way of a loan granted by Nouvobanq and guaranteed by the State of Seychelles.
8	16/07/2015	Meeting Ministry of Finance	Meeting with the Ministry of Finance, Trade and Investment. The meeting was chaired by Patrick Payet, Principal, Secretary for Finance. Among others, was also attending the meeting: Mrs. Elisabeth Agathine, Director General External Finance.	- The Seychelles are subject to a macro-economic reform plan; - Project finance is the number 1 priority to fund new investments; and - Introduction of a PPP policy foreseen.
9	16/07/2015	Meeting SSI + STC	Meeting with Société Seychelloise d'Investissements (SSI). This meeting was chaired by Veronique Laporte, Chairman.	- SSI is a company wholly owned by the Government of Seychelles which corporate purpose is to be an investment vehicle for the Government and a holding company for all participations of the State of Seychelles in companies; and - SSI owns the State's participations in Land Marine Ltd and Ile du Port Handling Services Ltd. Among others, it must be indicated that Veronique Laporte is also the CEO of the Seychelles Trading Company Limited (STC), that Mr. Conrad Benoiton, Director of SSI is the Chairman of SPA and that Mr. Ronny Brutus, Business Development Manager at SPA, is a director of STC.
10	16/07/2015	Meeting Ministry of Environment	Meeting with the MoE. Meeting was chaired by Ms Elvina Horeau, Acting Director Climate Adaptation and Management Section. Among others was also attending the meeting Mr Hendricks Figaro (Inspector Climate Adaptation and Management Section), Mrs. Nanette Laure (Director General Enforcement and Permit Division), Mrs. Marie-Alise Rosette (Project Officer Environmental Assessment and Permit Section), Mr. Abel Sorry (Assistant Project Officer Environmental Assessment and Permit Section), and Mr. Andre Freminot (Acting Director Standard and Enforcement Section).	- Masterplan for Victoria needs to be the starting point; and - Flooding risks have to be taken into account; Key issues: - Tank farm is a danger for the city; and - Lack of sound risk management in the port of Victoria

APPENDIX 5: MINUTES OF MEETING FOR THE CIVIL SOCIETY

SEYCHELLES PORT AUTHORITY

NEW PORT, VICTORIA

MAHE, SEYCHELLES

REHABILITATION AND EXTENSION OF THE COMMERCIAL PORT

MINUTES OF STAKEHOLDERS MEETING WITH CIVIL SOCIETY

Wednesday 14th September 2016

Prepared by
DAR Environmental Services

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1.7 THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS 4
1.8 DISCUSSION 5
1.9 END OF MEETING 8

1. PURPOSE OF THIS DOCUMENT

1.1 STAKEHOLDERS COMMENTS ARE IMPORTANT IN THE EIA PROCESS

Stakeholders from the civil society were briefed on a proposed project where the Government of Seychelles through the Seychelles Port Authority plans to rehabilitate and extend the Commercial Port.

1.2 ADDRESS FOR COMMENTS

Stakeholders are requested to submit the scoping forms by end of 2016 to:

Mr. Abel Sorry

Environment Assessment & Permit Section

Wastes, Enforcement and Permit Division

Ministry of Environment, Energy and Climate Change

Botanical Gardens

Mont Fleuri

Tel: Mobile +2722369, Office +248 4670500

Email: a.sorry@env.gov.sc

1.3 WELCOME

This document contains the comments of members of the Civil Society who attended the meeting for the proposed Rehabilitation and extension of the Commercial Port.

1.4 INTRODUCTION

The EIA Consultant Mr. Daniel Rosette called the meeting to order at 3:40pm, 40 minutes later than schedule because at 3pm no one had turned up, except for the representatives from the Seychelles Ports Authority who came to give support to this meeting.

He started with a short overview of the proposed project, explaining that the Commercial port due to its age and other shortcomings cannot support the different and diverse activities that are currently happening in the port and there is indication that such activities will increase in the future especially cargo related ones. The European Investment Bank is funding the feasibility study for the project. The project is one where port Victoria also known as new port will be rehabilitated and extended. The plan is to extend the port by 40 meters outwards to sea making the quay 600 meters long, and will have more capacity to service the different vessels that call at Port Victoria. The attendees also got the chance to see the slides depicting how the port will fit within the Victoria Master plan. Mr. Franky Laporte and Allen Chetty from the Seychelles Ports Authority answered most queries put forward by the attendees.

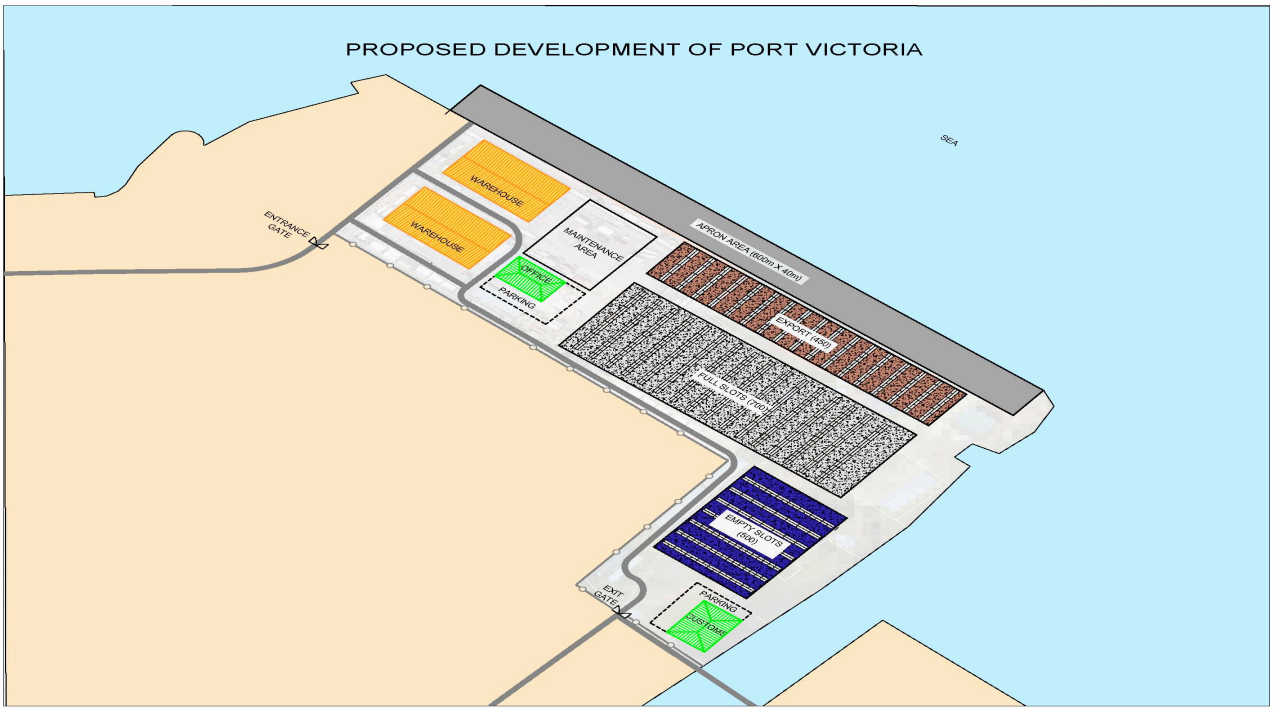
1.5 ATTENDEES

Present in the meeting were:

- Mr. Marcel Rosalie- Citizens Engagement Platform Seychelles (CEPS)
- Mrs. Rose-Marie Elisabeth – CEPS
- Ms. Vanessa Zialor- S4S
- Ms. Magdalena Gorska –S4S
- Mr. Justin Freminot – HASO
- Mrs. Marie Anne Payet- Friends of Prison
- Mr. Vincent Didon – SPA
- Mr. Allen Chetty – SPA
- Mr. Franky Laporte – SPA
- Mr. Dean Zelime - SPA
- Mr. Daniel Rosette - DAR Environmental Services
- Mrs. Sharon Thelemaque - DAR Environmental Services

1.6 THE PROPOSED PROJECT

After considering several options, the SPA option being looked at for implementation is shown below.



1.7 THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

Pursuant to Schedule 1, Regulation 3(1) (b) of the Environment Protection (Impact Assessment) Regulations, 1996, the proposed rehabilitation and extension of the Commercial Port is a prescribed project under Section 15(1) of the Environment Protection Act, 1994 and preparation of an Environmental Impact Assessment (EIA) statement is required when an application is made to the Authority for Environmental Authorisation.

1.8 DISCUSSION

All questions, issues, and comments raised during the interviews, as well as replies provided, are reflected in Table 1, in the format of a Comments and Responses Report.

TABLE 1 – COMMENTS AND RESPONSES MINUTED DURING THE MEETING

Issue/Question/Comments	Commentator	Reply
1. PROJECT		
What will happen with the lighthouse, you mentioned that it will be removed; I think you must bear it in mind that the lighthouse is a National Movement. And that serious thought must be given to it as a part of our history and heritage.	Mr. Marcel Rosalie (CEPS) Also member of the National Monument Board.	The lighthouse itself is not in good condition, it is being affected by waves especially those made by big vessels, for instance by *Cat Cocos*. With the new plan we were thinking of moving the lighthouse a bit further on the side, in other instances we are thinking of doing something that will remind people of the actual/original position of the lighthouse, like putting a plaque, but I want to give the assurance that the Ports Authority has given consideration to the lighthouse but with the new extension it has to be moved. The consultants behind this concept had to take into consideration the commercial capacity of the port, such as yards for storage of the containers and how best to cater for future vessels, which will be bigger. The current port was constructed in the seventies and it has lived its life, we need to do something that caters for the future, as this port was not designed for containers, and the infrastructures are weakening. The new extension will gives 600 meters to work with and is more favorable for it to discharge its functions to the fullest and in the region we want Port Victoria to be more competitive. We have also a land constraint that is also another reason to build the port out to sea.
I am still not clear what will happen to the lighthouse, a national monument, will it be moved or demolished?	Mr. Marcel Rosalie CEPS	We have had several consultative meeting during this process and one issue which came out strongly is how safe the passage between Mahe and Romainville island will be now that the port will be extended, how big will be ships and how to manoeuvre in such tight space. The channel in this area is

		not straight passage, it is rather curve and it takes a lot to manoeuvre tankers and other bigger vessels in this area. But as for the lighthouse, we have been in touch and consult with the Heritage Foundation to decide what best to do with the lighthouse which cannot be renovated and we know that one day we will wake up and see that the lighthouse have fallen. But we need to discuss further what will done.
I understand that development must happen, but what I recommend as the member of the National Monument Board, that the lighthouse is relocated, but again I want to bring to your attention that without the lighthouse there is no Victoria, as we often say the lighthouse is the light to the world.	Mr. Marcel Rosalie	Mr. Rosette stated: I suggest that you guide us on the best way to deal with the lighthouse because once we send the report to EIB, we must be clear on what we do with the lighthouse, after the meeting we will be distributing the scoping form, please use this as a way to guide us further.
What will you do to ensure that the future generation will know how the current port looked? Some sort of documentation or archives or maintain some features.	Mrs. Rosemarie Elizabeth CEPS	We are reiterating the importance of all of your suggestions to be captured in your scoping forms, make all suggestions and please do comment on issues of the sea bed as well.
I still think relocation is not an option, we look at the lighthouse as the light out to the world, and the lighthouse has guided so many ships in here creating the Victoria we know now. Say we decide to move the clock tower to English River; it will have no importance there. That is what I am saying; think carefully of what we do to the lighthouse. It is essential that the lighthouse remain in this vicinity.	Mr. Justin Freminot HASO	We have said that we are still looking at the options and nothing is final yet, yes I mentioned the proposition of Romainville, but we think and with take note that shifting in on the side and in same vicinity is a good option. We understand its value, for example two years ago we spend 400,000 SR in rock armoring to safeguard its structure.
We also know that more women is becoming involved in men's role associated to port activities.	Mrs. Rosemarie Elisabeth CEPS	In port activities I can testify that in the last 12 years that I have been working at the Port, there has been a marked increase in women working there, this is due to their reliability, promptness and they are more careful and tend to take less risk on the job. But with development and new technologies I foresee even more women working on the ports. But even though a lot of

		young women come and do attachment at the SPA, a lot of them are also drawn to the yachting industry, but we do foresee women captains in this industry.
Since the port is being extended, are you planning to have a study on the marine invasive? I have copies of past studies also pertaining to climate change and ecology, I can forward same to you for your consideration as there are recommendations that you might need to consider as well.	Ms. Vanessa Zialot S4S	
What plans do you have for Praslin,?	Mrs. Rosemarie Elizabeth CEPS	For Praslin, with EVE island we built and 180meter quay, 100m was initially designated only for cargo and 78 meters for other activities including passengers services. But we have seen there is greater demend for cargo and we have looked at other possibilities, we have a warehouse that can take up to 100 containers and we are planning for a second one, so we do have long term plans. For passengers facility we do have two local experts Mr. Charles Pool and Mr. Marc D'Offay who are designing a new jetty with capacity for four vessels, the passenger facility has also been designed but we need to construct the port before.
Have you consulted with civil society on Praslin, with regards to the developments?	Mrs. Rosemarie Elisabeth CEPS	Yes we do a lot of consultation with DMCs, boat operators and others, as well as with the District Administrations. We hope that DAs then will spread the information, in the event that we consult with other groups as well, so that is why we welcome your contacts for the inner islands, so that we can meet with them, when need be. An example is with the new facilities at Eve, when we consulted with operators they said the original location was not ideal, so we listened and moved location.
What about the artisanal fishers.	Mr. Marcel Rosalie	Well artisanal fisheries, is a SFA thing,

	CEPS	but we have had attended consultations, notably the greater Victoria plan where artisanal port is currently be developed more and bringing in tourism with the artisanal fisheries.
Are you planning to export labour for the actual project implementation. It is important that you take into considerations the different health and safety issue related to such a project, such as spread of diseases, proper and adequate facilities amongst others.	Mr. Justin Freminot HASO	We have a mix group working on the plan, local as well as international. But with a project of this scale we will have an influx of foreign labour especially Indians or other foreign nationality, we have to ensure that we are prepared and able to cope with the influx so that this does not create negative impacts on social life, health, economy and tourism.

1.9 END OF MEETING

There being no other business the meeting was adjourned at 5:00pm. The EIA Consultant, Mr. Daniel Rosette thanked all participants for their active contribution, especially valuable suggestions with regards to the preservation of the lighthouse which is a national monument and important aspect of our history. He also reminded them that they have 14days t to submit their scoping forms at the Ministry of Environment, Energy and Climate Change.

APPENDIX 6: MINUTES OF MEETING FOR THE MONT FLEURI FISHERS COMMUNITTEE

SEYCHELLES PORT AUTHORITY

NEW PORT, VICTORIA

MAHE, SEYCHELLES

REHABILITATION AND EXTENSION OF THE COMMERCIAL PORT

MINUTES OF MEETING – MONT FLEURI FISHERS COMMUNITY

Wednesday 29th August 2016

Prepared by
DAR Environmental Services

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1.8 DISCUSSION 4
1.9 END OF MEETING 6

1. PURPOSE OF THIS DOCUMENT

1.1 STAKEHOLDERS COMMENTS ARE IMPORTANT IN THE EIA PROCESS

Stakeholders from the Mont Fleuri Fishers Community were briefed on a project where the Government of Seychelles through the Seychelles Port Authority plans to rehabilitate and extend the Commercial Port.

1.2 ADDRESS FOR COMMENTS

Stakeholders are requested to submit any scoping comments through scoping form by 11th September 2016 to:

Mr. Abel Sorry

Environment Assessment & Permit Section

Wastes, Enforcement and Permit Division

Ministry of Environment, Energy and Climate Change

Botanical Gardens

Mont Fleuri

Tel: Mobile +2722369, Office +248 4670500

Email: a.sorry@env.gov.sc

1.3 WELCOME

This document contains the comments of members of the Mont Fleuri Fishers Community who attended the meeting for the proposed rehabilitation and extension of the Commercial Port.

1.4 INTRODUCTION

Stakeholders mainly fishermen from Mont Fleuri were briefed on a proposed project where the Government of Seychelles through the Seychelles Ports Authority plans to rehabilitate and extend the Commercial Port New by at least 40 x 600meters into the sea. The EIA consultant, Mr. Daniel Rosette gave a short overview of the proposed project, explaining that the port cannot support the different and diverse activities that are currently happening in the port and there is indication that such activities will increase in the future especially cargo related ones. The European Investment Bank is funding the feasibility study for the project.

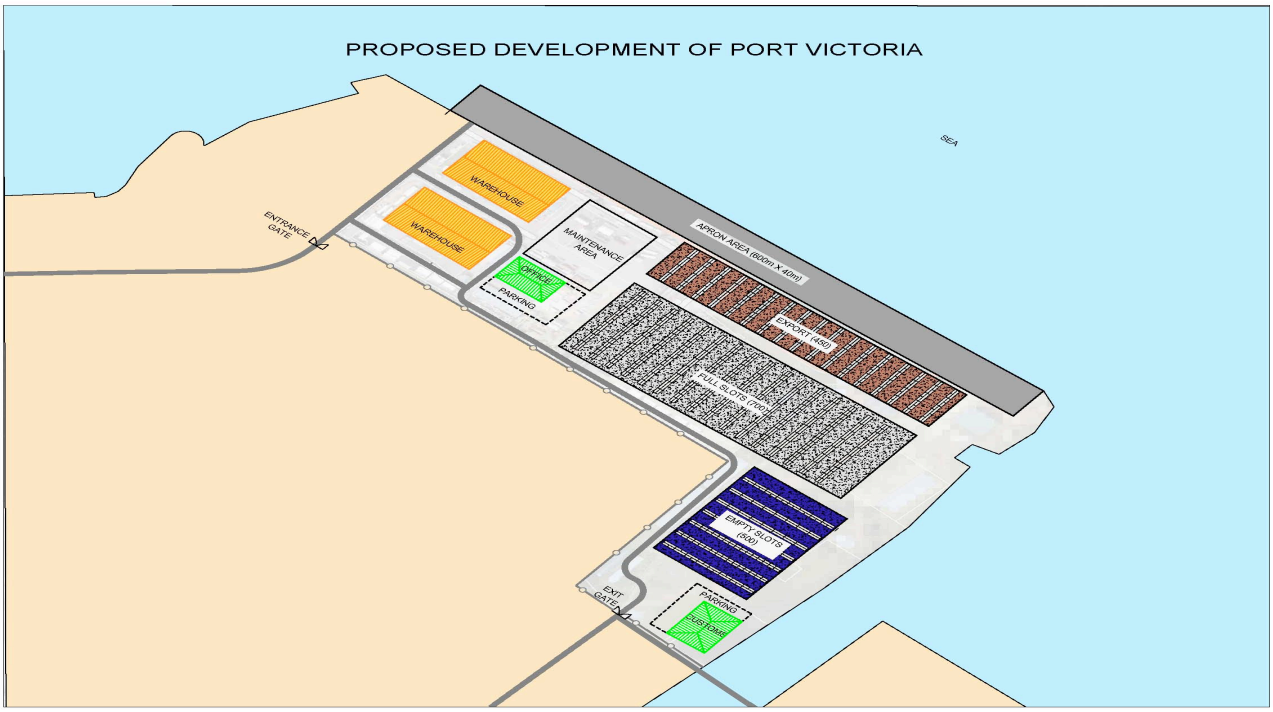
1.5 ATTENDEES

Present in the meeting were:

- Mr. Dereck Monthy – Mont Fleuri Fisher
- Mr. Ricky Charles – Mont Fleuri Fisher
- Mr. Daniel Rosette - DAR Environmental Services
- Mrs. Sharon Thelemaque - DAR Environmental Services

1.6 THE PROPOSED PROJECT

After considering several options, the proposal is to implement the plan as shown below.



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1.8 DISCUSSION

All questions, issues, and comments raised during the interviews, as well as replies provided, are reflected in Table 1, in the format of a Comments and Responses Report.

TABLE 1 – COMMENTS AND RESPONSES MINUTED DURING THE MEETING

Issue/Question/Comments	Commentator	Reply
The way I see, only our passage will be affected. We use this passage for our transactions mainly to buy ice and buy *"la bwet"* and when we need to land Marine Charter with our catch to go to the market	Mr. Ricky Charles	What about going around the lighthouse? Going round the lighthouse will mean using more fuel, which is a core expense for us.
Since so many vessels frequent this area and since the work will be	Mr. Ricky Charles	The harbormaster as well as the Seychelles Maritime Safety

quite challenging, how will things be in this area?		Administration and Marine Police I suggest will be working together, to ensure smooth implementation of the project.
From my understanding, dredging work will be held in a way which will affect our direct passage into town. As we sell our catch at the Victoria Market, we normally enter close to the Marine Charter and unload our catch near the Nation office, where a truck transport us to the market, now while work is on the way we will need to unload here at Mont fleuri which will cost us more in terms of transportation fees.	Mr. Dereck Monthy	We have taken note
Since we usually fish behind the Ste Anne island, we will not be affected by the project in anyway on our way to our fishing location, however since we have to buy ice at Oceania, we will be affected, as if we go around Romainville island we will use more fuel, we do get concession on fuel but frankly it is not a lot. If only ice at Providence could be sold all day. They normally close at 1pm and we often have to go to Oceania.	Mr. Dereck Monthy	
Will there be any obstruction for bigger vessels such as cargo vessels.	Mr. Ricky Charles	The Ports Authority will manage the area to ensure the channel can still be used while work is being undertaken.
We do not have any problems with this, we are happy that our country is developing but we feel that we are assisted more, as you can see here we do not have proper facilities such as a store, because the number of thefts, everything is lost here even though we are close to a Police station. As soon as we dock, we have to unload our engine, life jackets and even our catch; it is not easy to carry an engine every day. Like the port is being extended I would like to ask the authorities to look into our condition. For example	Ricky Charles	

why not give us an area within the ex Coast Guard at Bois de Rose, so that we could have store facilities with security, we do not mind paying as long as our stuff are safe, an engine costs 42 000 rupees, and that is lot of money. Sometimes I leave my boat at English River but even there, there are no proper docking facilities, recently I cut my feet and I could not work for three weeks, I got nothing no assistance, I hope that the authorities would look into our situation. We do not have basics such as toilet and shower facilities. This building is being dilapidated no one is using it and I just wish that it could be renovated and given to us as storage, of course we are prepared to pay for it.	
We welcome this project, as we know our country needs to develop. We know also that many shipping vessels call to Port Victoria, especially cargo and cruise ships. But we also ask the authority to listen to us small traditional fishermen; in this case we want to still have access to areas mentioned. Please note also that some fishermen fish close by especially in the vicinity of the lighthouse.	M r. Dereck Monthy
The authorities must also look into the impact of dredging as you see here the lagoon is full of silt, when it is low tide we cannot go fishing like today it is a beautiful day, we have "*labwet*" we have fuel, we have ice unfortunately we cannot move, as it costs to repair damages to our fibre glass boat. Therefore I am calling to the authorities to think about de silting the mangroves to ensure our safe passage.	Mr. Ricky Charles

1.9 END OF MEETING

There being no other business the meeting was adjourned at 9:05am. The EIA Consultant, Mr. Daniel Rosette thanked and invited Mr. Charles and Mr. Monthy to attend a stakeholder's consultation meeting which will be held on Wednesday the 14th of September 2016 at CEPS from 3pm.

APPENDIX 7: TERMS OF REFERENCE FROM ENVIRONMENT DEPARTMENT

TERMS OF REFERENCE FOR THE PREPARATION OF AN ENVIRONMENTAL IMPACT ASSESSMENT (EIA) STATEMENT UNDER THE ENVIRONMENT PROTECTION (IMPACT ASSESSMENT) REGULATIONS, 1996

REHABILITATION & EXTENSION OF THE COMMERCIAL PORT OF VICTORIA

MINISTRY OF ENVIRONMENT ENERGY & CLIMATE CHANGE
WASTE ENFORCEMENT AND PERMITS DIVISION
ENVIRONMENTAL ASSESSMENT AND PERMITS SECTION
BOTANICAL GARDENS
P. O BOX 445
VICTORIA

Terms of Reference for the preparation of an

Environmental Impact Assessment (EIA) Statement
For Apartments

APPLICANT: SEYCHELLES PORTS AUTHORITY

PROPOSED DEVELOPMENT: EXTENSION & RENNOVATION THE COMMERCIAL PORT OF VICTORIA.

LOCATION: PORT VICTORIA

PREAMBLE

Pursuant to Schedule 1, Regulation 3(1) (b) of the Environment Protection (Impact Assessment) Regulations, 1996, Schedule 1, hotels, restaurants, tourism, residential are prescribed project under Section 15(1) of the Environment Protection Act, 1994 the preparation of an Environmental Impact Assessment (EIA) statement is required when an application is made to the Authority for Environmental Authorization.

DEGREE OF DETAIL

In preparing the EIA, it is the applicants' responsibility to address the impacts of the proposal to the degree necessary to enable the Authority to be informed of all relevant impacts of the proposal. The level and nature of investigations should reflect the type and scale of impacts.

It should be noted that the preparation of Terms of Reference for an EIA does not indicate approval or support in any way, nor does it indicate approval in principle.

CONTENTS

The EIA produced to accompany the application is to address the issues set out below and should generally follow the format as suggested in this document.

1. Executive Summary

An executive summary of no more than five pages must be included. This should be written as a non-technical summary which provides an overview of the EIA report in simplified layman's terms. The aim of the Executive Summary is the listing of key Impacts, strategies to be employed to manage the impacts and performance indications for auditing purposes.

A section of the Executive summary should include a **Socio-Economic Impact Assessment;** As a result of the findings of the EIA and addressing issues raised in the stakeholder consultation in the preparation of the Scoping Report, all the measures to be taken by the developer to mitigate impacts that will have **direct bearings on the existing residents** should be summarized in this section. This should include detailed scheduling of works so as to have minimal disturbances to the livelihoods of the community.

2. Alternatives to the project

Describe any prudent and feasible alternatives to the proposed development investigated during the planning process, including alternative locations for such a development, with an overview of the consequences in each case. Discussion should include the reason for choice of the preferred option, and the likely situation and use of the site if the project does not proceed.

3. Terms of Reference

The Terms of Reference and accompanying letter of transmission provided by the Ministry of Environment Energy & Climate Change must be included in the EIA documentation.

4. Scoping comments

A list of all the stakeholders consulted (scoped) for the project including copies of all their comments and concerns (scoping verification forms) should be attached in the EIA Report.

5. Policy, Legal and Administrative Framework

Outline the pertinent regulations standards and policies governing environmental quality, health and safety, protection of sensitive areas, protection of endangered or threatened species as well as infrastructure development and land use control at the national and local levels in relation to the proposed project.

6. Description of the Proposal

State the objectives of the proposal and why it is needed, the type of development proposed, including information on:

- Location of the site (including map) and a site plan (that is the nominated positions or areas for the development, and the location and identification of all facilities on the site;
- A superimposed master plan of existing land uses and proposed future uses.
- Details of storm water management to show all the networks and pathways for the whole development;
- Service requirements for electricity, potable water supply and drainage, including volume of water needed for the whole development and **assurance from service provider that this additional demand can be met;**
- Water and energy conservation measures to be employed by the development: water and energy saving technologies should be used by the establishment, this should be ***explicitly*** explored;
- Area of land required for the various types of development; describe land tenure; present tenure, land uses, right of ways, ownership and encumbrances of the proposed site.
- Describe town planning provisions affecting the land;
- The nature of any residential community to be created on site, and

- Distances to boundaries.

Provide details of the development including:

- Construction timetable including the working hours;
- Quantities, nature and sources of materials required for fill, aggregate for construction, and transport routes and methods;
- Extent and methods of excavation, extent of earthmoving and methods and dredging, sites of spoil disposal and containment, machinery and equipment to be used;
- Machineries and equipment to be used;
- Project implementation plan which shall include a communication plan to be adopted during the construction phase;
- Landing areas for unloading and loading of construction materials including stock pile locations on site;
- Assess the impacts of the extraction and transportation of all the construction materials to the site; This would include the need for additional road maintenance and any temporary road improvements or intersections necessary for the haulage; Detail self regulation measures to ensure compliance with legal load limits and to minimize haulage of constructional materials during periods of wet weather;
- Building design limitations and standards (e.g. height, elevations, materials, architectural criteria, buildings design on pillars or stilts, structural improvement to discourage entry of birds, climate change, aesthetic value and buffer/set back distances from water bodies);
- Details of construction techniques to be employed for the whole project (e.g. piling, dredging etc.)
- Details of the manner in which the proponent proposes to accommodate the workforce, both during construction and operational phase; the timing and location of the workers accommodation (the number of workers to be accommodated); and
- A detailed Construction Environmental Management Plan -CEMP for the project must be submitted once the contractor for the project has been identified. The plan must include established mitigative measures, systems and procedures to be employed during the construction phase of the development. The CEMP must indicate which component of the project will be implemented first and last with the associated time frame.
- Assess how the project will interfere with other activities and businesses that are present within the vicinity of the proposed project.

- Key milestones (including assigned responsibilities) will have to be indicated. A project implementation plan has to be submitted prior to the commencement of construction works.

State and discuss pollution management strategies and control measures to be used, including:

- Measures to be taken to prevent any spillage of oil and diesel onto the access road during the construction and operational phases; remedial measures to be taken should there be any spillage; and
- Control measures to be taken during construction to minimize dust, sedimentation, noise, and air as well as water pollution.

The following details relevant to the proposed site and surrounding area should also be described:

- Past and current usage of the site and its surrounding area;
- Approvals required for the project and expected program for approval applications.

7. Description of Environment and Assessment of Potential Impacts

Topography

- Describe the proposed site in relation to the catchments system, watersheds and any waterways on or near the site; calculate the approximate areas and their estimated discharge; table showing the various channels draining these watersheds with their discharge capacities must be included; including gullies, depressions, valley, cliffs, and rocky reliefs.
- Describe the area surrounding the proposed site including information on: buffer distances; aesthetic and landscape values; structures or archaeological areas of cultural, historical, religious, heritage or social importance; and
- Provide details on the overall environmental protection measures incorporated in the design, siting, layout, landscaping, and rehabilitation and associated works to minimize impacts on the environment.

Hydrology

- Provide a description of existing surface drainage patterns, flows, likelihood of flooding and present water uses;
- All existing flow paths, water retention and buffer zones should be mapped and presented on a comprehensive site map;
- A detailed hydrological assessment of the parcel must be carried out;
- Details of the generated runoff and discharge potentials must also be provided;
- A master plan and drainage plan showing all existing watersheds influencing the area of interest and proposed drainage alignment, location of conduits, culverts etc. (drainage network), as well as analysis on amount of water generated on site and from the watersheds and proposed techniques to effectively drain excess water;
- Describe impacts on water quality associated with storm water runoff and other critical conditions taking account the measures proposed to mitigate such impacts; Specific references should be given to the processes of siltation and the effects of these on the marine environment and the littoral zone especially during the construction phase of the proposed project;
- Assess the impacts that will be generated by erosion induced by storm water run-off and sediment wash down, existing water courses, and propose mitigative measures for those;
- Provide an erosion and sedimentation control plan as part of the management plan;
- Discuss anticipated flows of water to and from the project area under critical conditions, including the consequences of failure (under such conditions) of proposed pollution control works;
- Details of temporary drainage and sediment control measures during the construction phase must be provided;
- Details on how surface water will be captured and discharged at the designated parking areas must be provided; and
- Details of the proposed road alignment including the anticipated back and fill works to be implemented must be provided.

Climate

- Describe the existing climatic conditions of the area including average rainfall per year, prevailing wind patterns, and susceptibility to disaster caused by natural events pressure levels.
- A description of the tidal and wave movements that affects this area.

Soils and Geology

- A description of the areas to be disturbed; and
- Likely influences of the geological features on water quality in the area, particularly if disturbed during construction.

Visual Impact

- Predict the visual impacts (particularly of the hillside from the coastal areas) that might be generated by the development and propose ways to minimize such impact;
- Submit proposed colour scheme and artistic impression of the villas in line with integrating it with the natural landscape.

Waste Management

- Describe management of solid waste for the development;
- Waste disposal requirements including solid waste treatment, removal and transportation; and
- Provide details of the amount of waste water to be produced as well as the Sewerage treatment system to be used.
- Describe management/disposal of waste oil for the development.

Pest Control/ use of Chemicals

- A management plan should be submitted for the control of midges, mosquitoes, rats, dogs, cats, birds, plant pest and any other vermin/ pest. Specifying the extent of problem and method of control; give an overview of pesticide applications to be used and indicate types and class to be used; storage, method of control.

Fauna/Flora

- A detailed description of fauna and flora present in the area, and at a regional scale, and a statement of the potential impacts of the proposal on the terrestrial and aquatic fauna and flora; a description of other fauna and flora present or likely to be present in the area;
- Any rare, endemic or endangered species, their habitat requirements and sensitivity to changes;
- Occurrence, distribution and requirements of migratory species;
- Define measures to minimize risk of introduction of fauna and flora from overseas through transportation of materials, specifically in containers; and
- Highlight the measures to be taken in order to improve the habitat value of the site.

Transportation

Road network

- Any adverse effect of the development on the road network and the costs of measures to minimize those effects.
- Information is required on traffic generated by private and commercial movement during both the construction and operational phases of the development (including details of any staging);
- Should the movement of any very heavy and/or over-dimension loads be proposed, details about the intended routes to be used shall be given.
- Details relating to road access and parking facilities must in accord with the requirement of the Department of Transport and the Seychelles Land Transport Agency.

Health and Safety Issues

- State the procedures required for expatriate if they will be working on the project, like screening for any illnesses such as typhoid and other communicable illnesses that could trigger an epidemic;
- Define health and safety measures that should be put into place by contractors on site; and

- Develop a disaster and emergency contingency plan for the construction and operational stage for the development.

Water Quality

- Assess the existing water quality of the sea and its expected quality during the future operation of the proposed development. This study should include parameters such as Total Suspended Solids (TSS), Dissolved Oxygen (DO), pH, chlorophyll concentration etc.

Air/Noise

- Noise- Define the areas of impact and measure and discuss ambient noise levels in all areas likely to be affected by the development. Indicate nearby land uses, dwellings which could be affected by the proposal. Where nearby residents are potentially affected by the proposal, list all noise sources and describe areas where noisy activity could be expected to occur as a result of the proposal. Provide details of proposed mitigation measures to be undertaken to minimize noise impacts on the surrounding environment;
- Air- Information on existing air quality should be provided for those air pollutants expected to be emitted by the proposed development, in particular, the impacts of dust nuisance, should be detailed. Provide details of proposed mitigation measures to be undertaken to minimize dust emissions during the construction phase and operation phase; and
- Burning- Define the site for the burning activities taking into account the proximity to residential areas, scale of burning required, materials to be burned, measures to ensure containment, emergency measures to be in place.

Socio-Economic

Discuss the following;

- Evaluate the socio-economic impacts including costs and benefits to local economies; effects on employment; and implications for future development in the locality and also discuss how a training programme could be implemented for recruitment of locals;
- A Land Use survey needs to be carried out in the area of influence to determine potential impacts on the different uses;
- Visual intrusion of the proposal upon the existing appearance and views of surrounding areas;

- Discuss the social impacts of the proposal (both during construction and operational phase) on

social infrastructure of the area, including schools, health care services, housing, recreation, police and emergency services; and

- The effects of the proposal on other property owners, including developments in the area; effects of the proposal on the population growth rate of the region; implications of the proposed development future development in the local area.

8. Environmental Management

In respect of impacts identified which need to be controlled, an environmental management program incorporating an **Environmental Management Plan,** whereby, Monitoring and Reporting is included. Where practicable the costs of monitoring programs should be estimated and responsibility for monitoring programs specified. References should be made to relevant legislation and standards.

An Environmental management plan should detail any:

- Habitat enhancement projects or rehabilitation measures;
- maintenance schedules;
- erosion and sediment management strategies;
- pollution control and waste management methods;
- A management and administration plan outlining strategies and procedures in the event of an emergency.

Monitoring programs should; ensure safeguards are being effectively applied; identify any unpredicted impacts requiring remedial measures; and measure any differences between predicted and actual impacts. The reporting program should detail; steps to be taken to correct detrimental effects identified by monitoring; and procedures for reporting on monitoring programs and proposed recipients of reports.

The Environment Management Plan (EMP) should cover for the construction and operation phases of the resort. It should specifically detail all proposed environment monitoring to be undertaken in liaison with respective authorities.

The EMP must be included in the contractual clauses of the main contract and related sub- contract.

The EMP should make provision for the monitoring process to be conducted on a regular basis and should provide the necessary **auditing methods/template of forms** for this as part of the Environment Impact reporting of monitoring to be done.

It is stipulated that an Environment Officer (EO) should be appointed, with consent of the Environment Department for the duration of the Planning and Construction period that will inspect and ensure compliance with the EMP on a daily basis. The EO must liaise on a regular basis with the responsible Authorities and provide a monthly monitoring report to the Authority.

Monthly environmental audits (entailing site inspection, review of monitoring records, reports, plans and other records) should be undertaken and submitted in monthly meetings with proponent/agent, developer, contractor and responsible authorities in the form of a monitoring report.

9. Conclusions and Recommendations

As a result of the findings of the EIA, present a balanced overview of the proposal's net impact and provide recommendations on the proposal. This should include the identification of any alterations to the proposal considered to further mitigate environmental impacts.

10. Consultation

In preparing the EIA, the applicant/consultant should consult affected and interest groups. A focus group meeting should be organized before the handing in of the final draft of the EIA report. This meeting should include authorities such as the Seychelles Fishing Authority (SFA), the Seychelles Maritimes Safety Authority (SMSA), the Providence Industrial Estate Authority, the Department of Health, the Planning Authority, Department of Transport, Environment Department and the Department of Energy and Climate Change. The EIA should detail any public comment sought from and any consultation conducted with any affected groups (e.g. community, environmental, industry) in developing the proposal and preparing the EIA. **Issues as raised during the scoping phase for the EIA should be addressed in the report and satisfactorily dealt with.**

Early consultation is beneficial in helping to ensure that a development will cause a minimum of undesirable effects and in reducing delays in the latter stages of planning and design.

11. Copies of Report

Upon completion of the environmental impact assessment statement, a total of **three (3) hard copies and one (1) digital copy on CD ROM (preferably in Acrobat PDF format)** of the report are to be submitted to the Authority – Wildlife Enforcement and Permits Division, as part of any application.

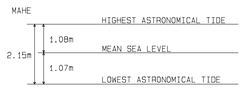
APPENDIX 8: BATHYMETRY PORT VICTORIA

JDN Pre Project surveys	Other Data used
KTT-070117-01 run lines every 20m	

GEODETIC PARAMETERS

Spheroid	:	WGS84
Length of Semi-major Axis	:	6378137.000 m
Inverse Flattening	:	298.257223563
Projection	:	UTM Zone 40
Central Meridian	:	57 Deg. E
False Easting	:	500000 m
False Northing	:	1000000 m
Scale Factor	:	0.9996

DATUM RELATIONSHIPS



SCALE (at A1)

1/ 2000

80 40 0 80 160

NOTES

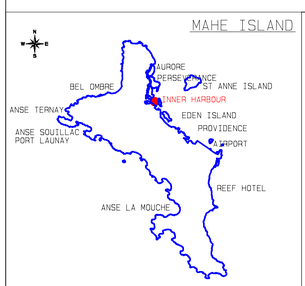
1-SOUNDINGS REDUCED TO LOWEST ASTRONOMICAL TIDE (LAT). ALL VALUES ARE IN METRES.
2-BATHYMETRIC DATA REDUCED BY REFERENCE TO OBSERVED TIDES AT COASTGUARD
3-POSITIONING SYSTEM: C-NAV SF2050 + LBM LICENSE .
4-SBE ECHO SOUNDER: KONGSBERG EA400 (200Khz).
5-HEAVE COMPENSATOR: TSS DMS2.25 (KATITI ONLY)
6-TIDE GAUGE: VALEPORT 740
7-SURVEY VESSEL: KATITI & ZODIAC (COASTGUARD).

LEGEND

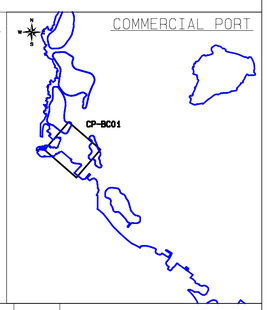
Existing Coastline

Contour lines every 1m

MAHE ISLAND



COMMERCIAL PORT



Rev	Issue Date	Prepared By	Checked By	Discipline Approval	Engineering Approval	Project Approval	MLUH Approval	Description of Revision
00	28/03/2007	A. D'haese	A. D'haese	A.Steffen	B. Malherbe	B. Malherbe		Issued for approval

Client: SEYCHELLES MINISTRY of LAND USE and HABITAT

Contractor: JAN DE NUL DREDGING LTD

Title

SEYCHELLES
2006/2007 SURVEY OPERATIONS

COMMERCIAL PORT

BATHY DRAWING
PRE PROJECT SURVEY
END OF WORK REPORT

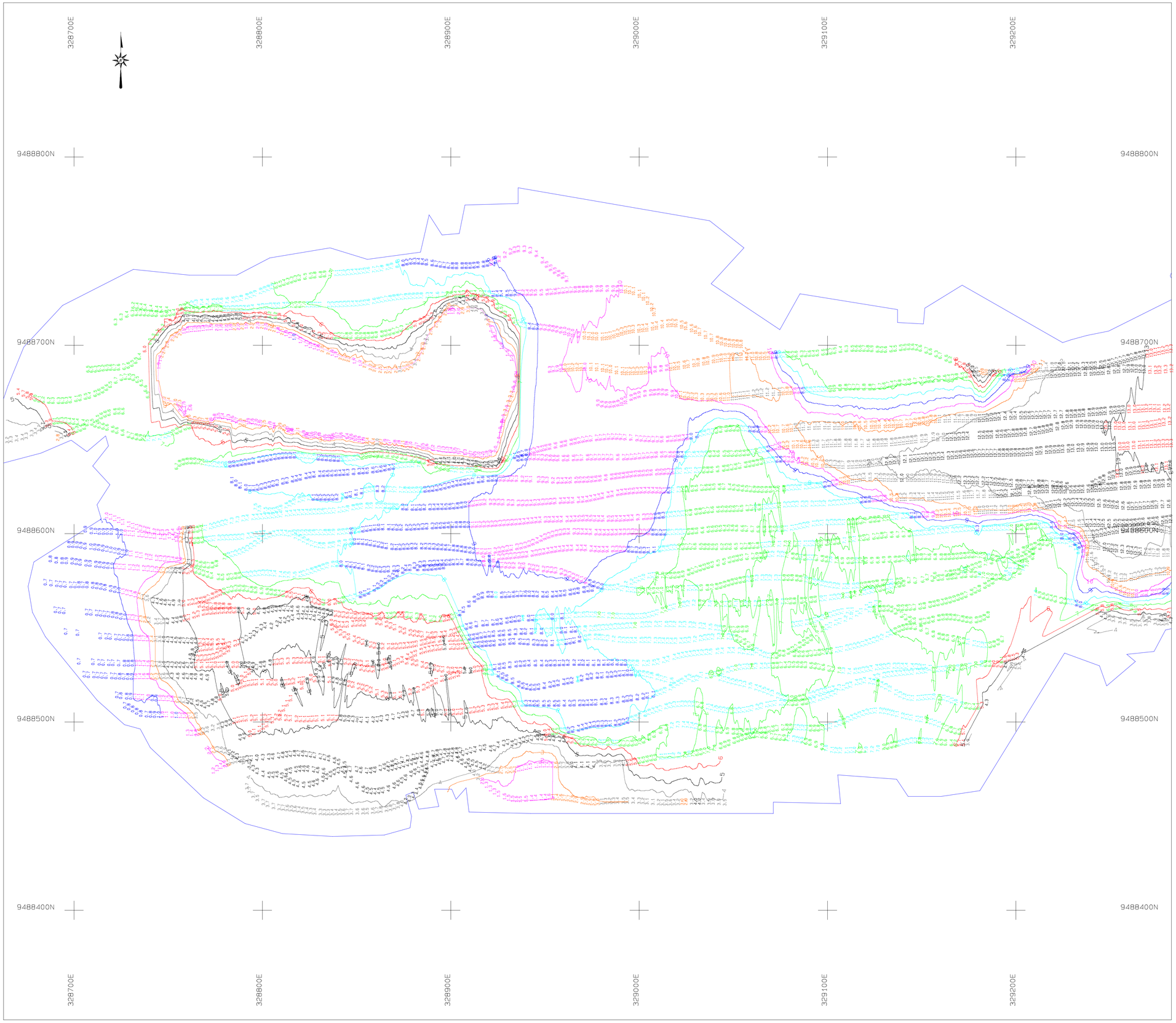
Scale: 1/2000
A1 Size

JDN Drawing No: B-SEY-0166-00

Client Number: CP-BC01-01-00

File Name : .DWG

C:\SEYCHELLES\06 Mauritius\SEY-0081 up to SEY-0100\SEY-0087\SEY-0087.prs

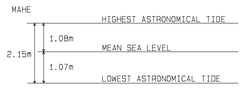


Pre Project Surveys		Other Data used
TKK-061219-01	run lines 10, 30, 50, ...	
TKK-061220-01	run lines 20, 40, 60, ...	
ZOD-070111-02	Shallow area & toeline island	

GEODETIC PARAMETERS

Spheroid	:	WGS84
Length of Semi-major Axis	:	6378137.000 m
Inverse Flattening	:	298.257223563
Projection	:	UTM Zone 40
Central Meridian	:	57 Deg. E
False Easting	:	500000 m
False Northing	:	1000000 m
Scale Factor	:	0.9996

DATUM RELATIONSHIPS



SCALE (at A1)

1/ 1000

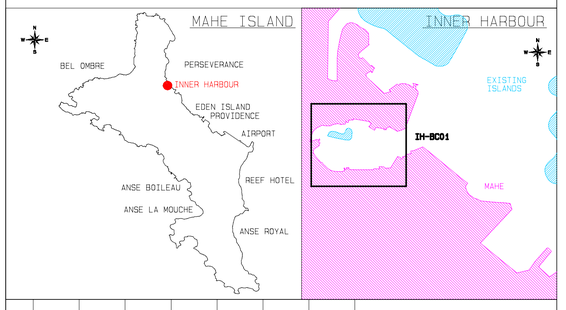
40 20 0 40 80

NOTES

1-SOUNDINGS REDUCED TO MEAN SEA LEVEL (MSL). ALL VALUES ARE IN METRES.
2-BATHYMETRIC DATA REDUCED BY REFERENCE TO OBSERVED TIDES AT INNER HARBOUR (COASTGUARD).
3-POSITIONING SYSTEM: C-NAV SF2050 + LBM LICENSE .
4-SBE ECHO SOUNDER: KONGSBERG EA400 (200Khz & 38Khz).
5-HEAVE COMPENSATOR: NOT USED
6-SURVEY VESSEL: KATITI & ZODIAC (COASTGUARD)

LEGEND

Existing Coastline
Survey Area
Survey Lines
Actual toeline of island inside the harbour
Contour lines every 1m



Rev	Issue Date	Prepared by	Checked by	Discipline Approval	Engineering Approval	Project Approval	MLUH Approval	Description of Revision
00	11/01/07	A. D'haese	A. D'haese	A.Steffen	B. Malherbe	B. Malherbe		For information only

Client: LOGO — Seychelles Ministry of Land Use and Habitat

Contractor: LOGO — Universal Dredging and Reclamation Co

Title

SEYCHELLES
2006/2007 SURVEY OPERATIONS

INNER HARBOUR / YACHT CLUB

BATHY DRAWING
PRE PROJECT SURVEY
COMPLETED 11/01/2007

Scale: 1/1000
A1 Size

UDRC Drawing No: B-SEY-0045-00

Client Number: IH-BC01-xx-xx

File Name : .DWG

D:_SEYCHELLES\06 -Requests\SEY-0021 up to SEY-6040\SEY-0021\SEY-0021.pro

APPENDIX 9: HIGHTENED STORM SURGES ON SMALL ISLANDS DEVELOPING STATES

Heightened storm surges will expose millions to catastrophic flooding

In addition to its direct impact on coastal lands and water supplies, sea level rise will dramatically increase exposure to storm surges among coastal populations. In 2008, the World Bank's Development Research Group assessed the likely impact of sea level rise on storm surge vulnerability in 84 coastal developing States across five regions.[11] They found that storm surge exposure due to global warming would result in "large, globally pervasive potential impacts."[12] A 10% increase in storm surge intensity would subject more than 25% of the territory assessed, and 52 million additional people, to the risk of inundation. The additional 125,000 km^2 at risk of flooding includes more than 29,000 km^2 of agricultural land and nearly 15,000 km^2 in urban areas,[13] with a striking concentration of impacts on "highly vulnerable large cities at the low end of the international income distribution."[14]

Notably, the conclusions of the World Bank report are exclusive of impacts on the small island developing States most profoundly threatened by sea level rise.[15] For SIDS in the Pacific and Indian Oceans, sea level rise, catastrophic flooding and storm surges present a serious threat to their very existence. Outlying islands in some nations are already being evacuated; according to IPCC projections, many of these island nations are likely to disappear by the end of 21st century.

Climate change will lead to greater food insecurity and potential supply shocks

Through these and other mechanisms, climate change poses profound risks to food security in many regions. Projected population and economic growth will double food demand by 2050, increasing the threat of food insecurity, even in the absence of climate change, with many developing countries experiencing serious poverty and food insecurity due to localized high population growth rates, poor socio-economic capacity and continued natural resource degradation.[16] As the FAO reported to the High Level Conference (HLC) on World Food Security in June 2008:

> Climate change will superimpose itself on these existing trends, significantly increasing production risk and rural vulnerability, particularly in regions that already suffer from chronic soil and water resource

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[11] Dasgupta, S., Laplante, B., Murray, S., Wheeler, D., 2008: Sea Level Rise and Storm Surges: A Comparative Analysis of Impacts in Developing Countries. Policy Research Working Paper 4901, World Bank, Washington, DC, 43 pp.

[12] Id. at 33.

[13] Ibid. at 13.

[14] Ibid. at 34.

[15] Ibid. at 6.

[16] FAO, 2008: Climate Change Adaptation and Mitigation: Challenges and Opportunities for Developing Countries, Doc. No. FAO/HLC08/Inf 2, at 1. Prepared for the High Level Conference on World Food Security (Rome, 3 – 5 June 2008) (hereinafter HLCWFS).

APPENDIX 10: ANALYSIS OF SEA LEVEL RISE AND COASTAL FLOODING IN THE SEYCHELLES DUE TO CLIMATE CHANGE

V. RESULTS.

5.1. Background of sea level rise and coastal flooding scenarios in the Seychelles islands. Current and future projections for years 2025, 2050 and 2100.

Throughout its history, the earth has warmed up and cooled over and over again, but in the last century other force began to influence the Earth's climate: the human race. The IPCC Third Assessment Report concluded: "There is new and stronger evidence that most of the global warming observed over the last 50 years is attributable to human activities (IPCC, 2001).

In the next 100 years, we expect a rapid sea level rise due to climate change with several negative impacts on the environment and society. Countries with low-lying coastal plains, where a high proportion of the population lives and fundamental economic activity develops, are very vulnerable. Therefore, many governments are taking prevention and climate change adaptation measures (Seychelles 2009a, 2009b; Payet, 2007).

Mean sea level rise in recent decades is a result of thermal expansion of the ocean due to global warming and the melting of continental and polar ice caps. The sea level rise is not globally uniform, regional patterns may be influenced by changes in atmospheric and oceanic circulation.

Leuliette et al. (2004), based on the analysis from satellite data in the period between 1992 and 2010, conclude that the variations in sea level can range from 1-3 mm per year with a standard error of 4-5 mm per year. However, an increase from 3 to 6 mm per year is estimated for the southern Indian Ocean, as shown in Figure 5.1.1.

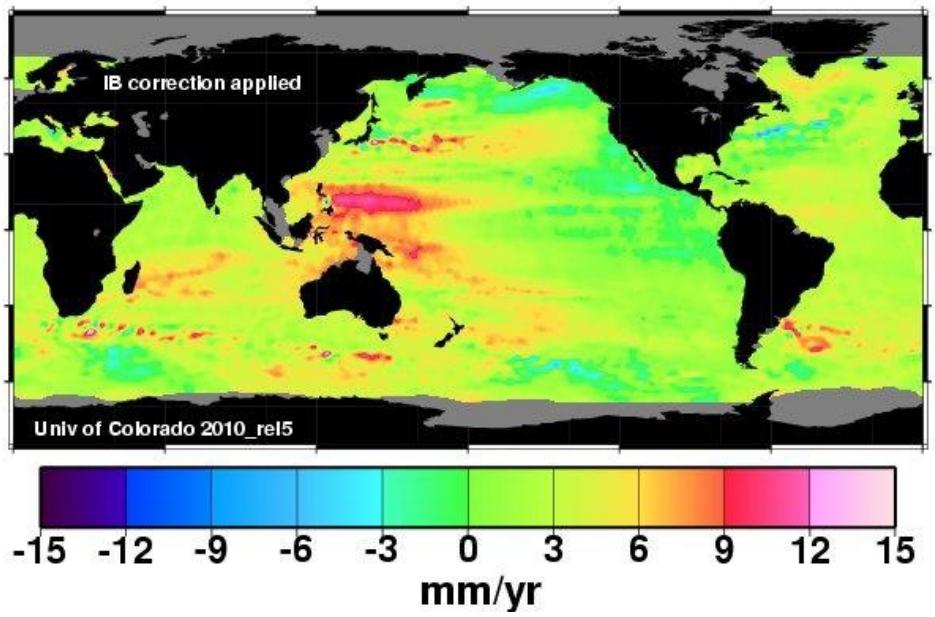

Figure 5.1.1. Sea level rise trend. Local trends are calculated with a least-squares fit of 10-Day, 1-degree resolution grids of sea level. A trend, bias, annual, and semi-annual terms are fit simultaneously. These trends have been determined for only an eighteen-year (1992 - 2010)

period, and reflect the impact of decadal scale climate variability on the regional distribution of sea level rise.

Disasters associated with coastal dynamics are generally because of the ignorance of extreme natural processes of rapid development or those related to longer cycles when planning land use, or due to so-located settlement for historical factors.

Extensive documentation about the places that are often affected by coastal flooding due to extreme events was consulted as a starting point for the selection of points of interest and analysis. However, there is no continuous record of this flooding or parameters of the waves lapping the shore (wave height) because of the lack of measurement equipment. Such data would serve to verify the results obtained in this study.

La Digue is frequently affected by coastal flooding in areas of Anse Grave and Anse source d'Argent. In Praslin, the greatest damage occurs on the south coast of the island from Anse Kerlan and Anse Consolation. The damage caused by the Tsunami of 2004 resulted in severe flooding on the north coast in Cote D'or, Volbert Anse, Anse Petit Cour and Anse Possession.

In Mahe Island, the most frequent floods occur in the area from Anse Aux Pins to Anse Marie-Louise on the east coast of the island but they are also common in North East Point. The airport is stricken 2 and 3 times per year by the wave strength and resulting high tide. Moreover, on the west coast of the island, there are reports of severe floods in coastal areas of Anse la Mouche, Anse Boileau, but less frequently on the East Coast. In all cases there are reports on floods that reach up to 50 meters inland, which result in significant damage to roads and buildings, as well as coastal erosion.

A detailed study of the temporary and spatial changes of tropical cyclones on the Seychelles islands was carried out by Chang-Seng (2007), while previous studies of Xie and Annamalai (2001), Hoareau (1999) and Webster, Holland, Curry, and Chang (2005) show that the increased hurricane activity in the southeast Indian Ocean may be associated with global warming.

An important result was obtained by S. D. Chang-Seng (2005) during the analysis of the mechanisms of tropical cyclones such as their structure and variability in the Indian Ocean based on warnings from La Reunion Tropical Cyclone Centre and the use of NCEP-4D model. It was determined that these events have a cycle from two to ten years with quasi-biennial oscillation and thermosaline circulation in the ocean, respectively.

Detailed information on return period analyzes of tropical cyclones, information sources, their statistics, tracks, distribution of wind patterns, study area and reports on flooding in the Seychelles islands can be found in the first report.

Coastal flooding caused by storm surges are the result of the action of different factors such as waves generated by wind (wind setup), waves generated by bottom friction (wave setup), tide and upwelling (storm surge) in the case of tropical cyclones. First report gave an approach to the possible areas to be flooded as a result of these events in high granite coasts and low sedimentary environments such as beaches.

It is very difficult to model this physical phenomenon. Accurate information on waves, digital elevation models and historical information on flooding are required to validate the results, tides and estimates or MSL rise scenarios. A combination of the above factors is adopted to determine areas of coastal flooding on the Seychelles Islands (Figure 5.1.2).

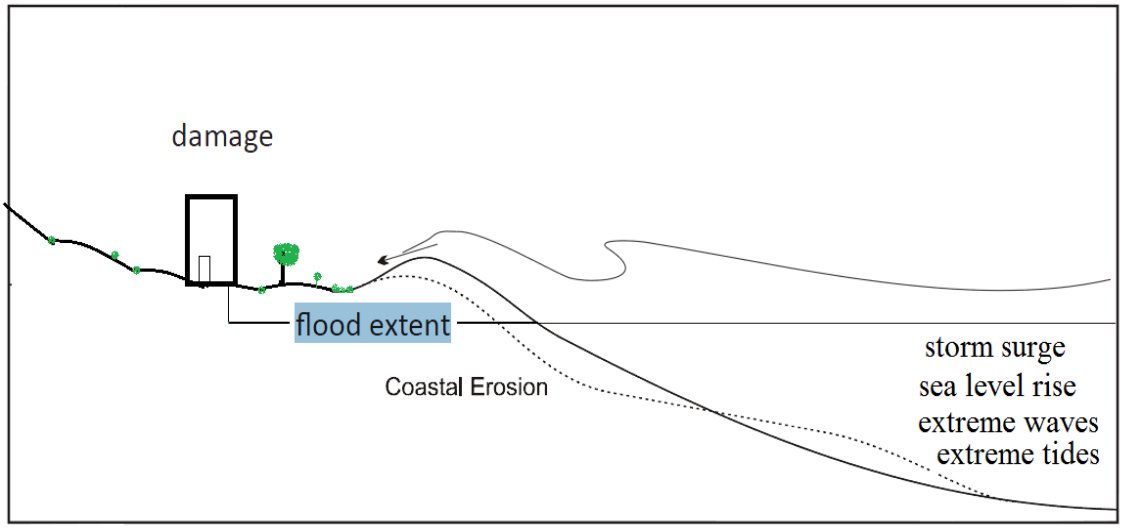

Figure 5.1.2. Natural causes and hazard drivers for coastal flooding and coastal erosion hazards.

All the events causing coastal flooding were analyzed (Section 2.7 of the first report) just to emphasize that Seychelles is located between 500 and 600 km from the belt of tropical cyclones in the Indian Ocean, therefore, the swell waves cause the greatest damage.

The sea level rise when waves break on shore (wave run-up) and the flooding in the coastal zone is an additional value that affects the astronomical tide, storm surge and waves. The natural barriers such as corals, beaches and mangroves contrast, since they dissipate wave energy and reduce flooding. A graphical representation can be seen in Figure 5.1.3.

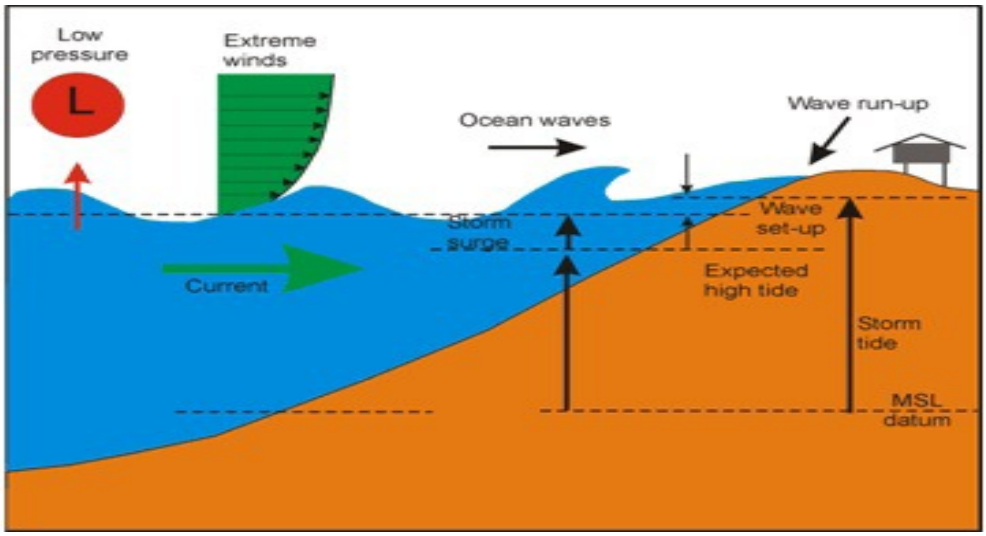

Figure 5.1.3. Storm-tide= expected high tide+storm surge (low barometric pressure/onshore winds) + wave set-up in the surf zone. Final inundation height = storm tide + wave run-up.

The internal physical processes and the behaviour of the waves near the coast are set out in more detail in section 3.5 of the first report as well as the assessments in priority sectors requested to the expert group and specialists from Seychelles environment department.

The storm surge occurs because of the existence of low pressure and winds that produce an abnormal sea level rise above the astronomical tide. In the first report permanent flooding was analyzed, for example, mean sea level rise scenarios for the years 2025, 2050 and 2100 proposed by Chang-Seng (2007). Chang-Seng took as a starting point the results from the scenarios with high emission range and high climate sensitivity (A1) compared to B2 scenarios for the same area of study, giving a future sea level rise of 8 cm, 17 cm and 40 cm for the above-mentioned years. Another scenario was taken on the basis of IS92A and P50 in which the IPCC gets a global average rise of 1 meter by 2100.

Beach North of Mahe (next to Russian Castle), swell waves frequently produce coastal flooding in this coastal sector raising the road. There is strong evidence of intense coastal erosion. There is also a protection seawall in front of the road between the short stripe beach and the road on the same dune.

The general orientation of the coastal sector of Anse Royale is approximately North to South; therefore the waves that come from North East direction, from May to November, hit the coast at an angle of 45 degrees approximately. The other wave direction of significance is North West from November to May.

At present, the coastal sector after the church is too eroded (Figure 5.1.4). This erosion process has increased due to the rock on the dune beach, the seawall in South part of the church combined with other factors as increasing of the swell wave, high tide and reduction of the source of sediment.

Figure 5.1.4. Examples of erosion in South part of Anse Royale.

Figure 5.1.5 shows the wave height of a storm with East direction wave. In particular, the energy is uniformly distributed to this sector, however close to the coast it causes a significant decrease of the wave heights after the wave breaker.

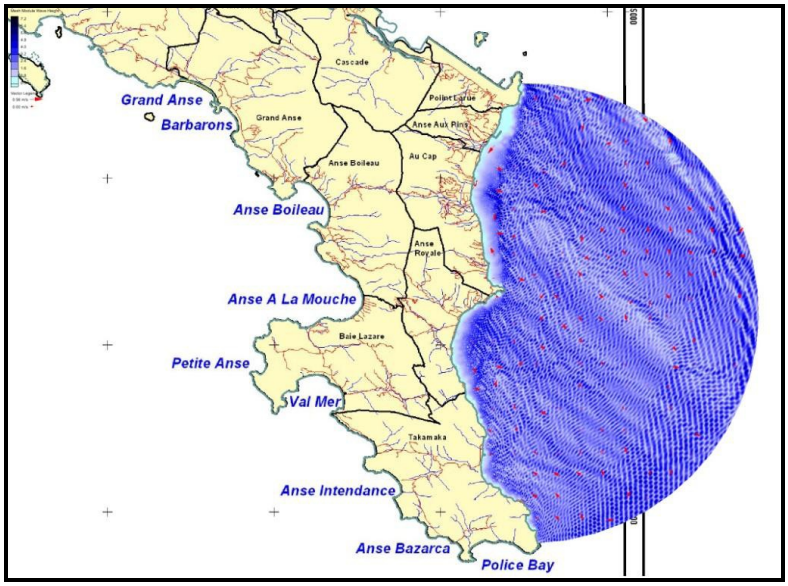

Figure 5.1.5. Spatial distribution of wave height in the coastal sector including Anse Royal, Mahe. Simulation of storms with south-easterly waves.

In the Figure 5.1.6 is shown that the wave fronts of a storm from the South-East direction. It may be noted that the waves almost reach the coast at an angle of 45 degrees. It is precisely the angle at which the maximum transport of sediments in the northern direction occurs. Thus, a little wave refraction is produced by the waves that arrive to the coast from South East.

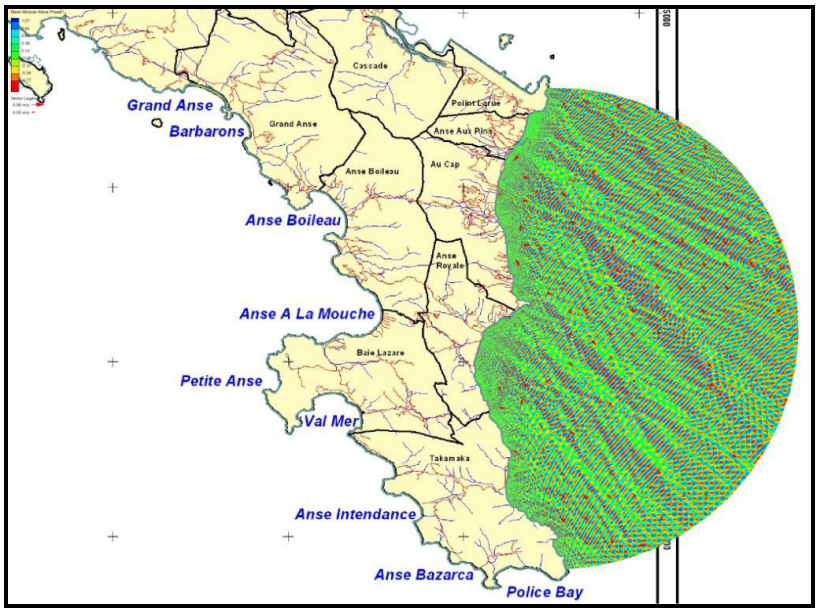

Figure 5.1.6. Wave front in the coastal sector including Anse Royal, Mahe. Simulation of storms with south-easterly waves.

Because of the economic importance of Victoria, a study on the behaviour of currents and waves from deep water was carried out, showing a wave reduction because of the existence of artificial islands throughout the coastal sector while the areas of the airport and Providance, which are unprotected, are more affected by the impact of waves.

The coastal sector of Anse Royale was also analyzed because of the investment proposal, identifying erosion processes in the southern portion of this area due to prevailing winds from the northeast from May to November and the effect of waves with 45-degree angle in respect of the coastline and drift currents in the same direction, increased by rock fill on the beach dune and wall building on the coastline, which affect coastal dynamics.

It is important to make it clear that the scenarios mapped in the three islands have some inaccuracies because of the quality and out of dating of topographic information. For special studies and vulnerability assessments, it is essential to increase the accuracy of the information in all the lowlands with high concentration of population, housing, lands and facilities of the main economic sectors.

As a result of an objective analysis of different scenarios of sea level rise and the corresponding magnitudes in terms of flooded area, it was agreed to disregard the scenarios of 8 cm and 17 cm (2025 and 2050) for the islands of Mahe and Praslin.

On the island of Mahe, these scenarios would result in a permanent estimated damage of 1.7 km^2 and 1.97 km2 in 2025 and 2050 respectively, being the most significant those observed in the low coastal strips of Barbarons, Grand Anse and Port Launay in the west of the island. The east coast near Victoria and artificially filled zones remain as submerged areas since they are not included in the DEM topography.

On the island of Praslin, the same scenarios would affect an area of 0.05 and 0.15 km^2 respectively, being visible only on the coastline without impacting any economic and social element in the coastal areas of Anse Kerlan, Anse Volbert, Anse and Anse Possesion Madge. The comparative values of the scenarios analyzed and selected for Mahe and Praslin are shown in Table 5.1.1.

On La Digue Island, although the digital model used was at the scale 1:2000, it has the weakest topographic information on the three studied islands, mainly at levels below 2 meters above sea level. There are no reports on damage in the permanent flooding scenarios of 8 cm, 17 cm, 40 cm and 1 m projected for the years 2025, 2050 and 2100 respectively, due to the inaccuracy of digital relief model. Therefore, it was decided to disregard them in further vulnerability and impact analyses.

Selected scenarios for vulnerability analysis

- **Mahe and Praslin Island**

Map of MSL rise scenario of 40 cm.

Map scenario rise of 1 meter.

Map of current scenario for extreme event with a 100-year return period.

Map of future scenario (2100) (40cm) for extreme event with a 100-year return period

Map of future scenario (2100) (1m) for extreme event with a 100-year return period

• **La Digue Island**

Map of current scenario for extreme event with a 100-year return period.

Map of future scenario (2100) (40cm) for extreme event with a 100-year return period.

Map of future scenario (2100) (1m) for extreme event with a 100-year return period.

Selected scenarios for impact analysis

• **Mahe and Praslin Islands**

Map of future scenario (2100) (1m) for extreme event with a 100-year return period.

Map of future scenario (2100) (1m) for extreme event with a 100-year return period.

• **La Digue Island**

Map of current scenario for extreme event with a 100-year return period.

Map of 1-meter rise scenario.

New scenarios are incorporated into previously selected and indicated permanent and temporary scenarios, taking into account MSL rise projections and higher tide recorded by the National Meteorological Office of Seychelles in Point La Rue, which is 1.2 meters on sea level. The future MSL rise scenario of 1 meter and the effect of an extreme event with a 100-year return period were modelled.

The latter stages were modelled to have a vision of increased vulnerabilities and impacts associated also with the effect of the tide for further analysis.

Table 5.1.1 Affected areas in the three islands for different scenarios of climate change and extreme events

Scenarios	Mahe U	Praslin U	La Digue U
Scenario 8 cm (2025)	1.70	0.05	
Scenario 17 cm (2050)	1.97	0.15	
Scenario 40 cm (2100)	2.44	0.52	
Scenario 1 m (2100)	3.95	1.72	
Current Scenario Extreme Event	12.79	6.94	1.4600
Scenario Event 40cm PR100 (2100)	13.52	7.06	1.5500
Scenario Event 1m PR100 (2100)	14.97	7.47	1.9300

5.2 Socioeconomic vulnerability.

5.2.1. Current vulnerability.

Considering the available data, a group of 10 variables, with their corresponding indicators, was selected for each of the potential flooding districts that make up the Mahe, Praslin and La Digue islands in the current scenario.

Table 5.2.1, shows the list of variables classified by components as recommended by UNFCCC, 2004. The starting information is then formed by a matrix of 10 indicators for each of the 24 districts involved1. In Annex A, Table 1 shows the original data matrix, while in Annex B the selected indicators are described in detail.

After a descriptive and exploratory analysis, the statistical technique used was, within factor analysis, the one corresponding to main component analysis (ACP) to evaluate socio-economic vulnerability to coastal flooding.

The primary objective of the ACP is to reduce the dimension of the problem and create synthetic indicators by reducing the number of variables without losing much information.

Table 5.2.1. List of component variables

Exposure	Surface
	population
	Housing
	road Infrastructure
	Population Density
Sensitibity	economic dependence
	Density of beds
	Family economic capacity
Adaptation Capacity	Highway and road communication network required
	Natural protection

Source: Prepared by the authors based on UNFCCC, 2004.

Table 5.2.2. Cumulative variance by factors shows the first result of the ACP, yielding a new set of data, which are linear combinations representative of the original matrix.

Table 5.2.2 Cumulative variance by factors

Factor	Own values	% of total variance	% of cumulative variance
1	4,9530	49,530	49,530
2	1,6690	16,690	66,221
3	1,0411	10,411	76,633
4	0,9920	9.920	86.554
5	0,6380	6.380	92.935
6	0,2891	2.891	95.827
7	0,2333	2.333	98.160
8	0,1081	1.081	99.241
9	0,0392	0.392	99.633
10	0,0366	0.366	100.000

Source: Prepared by the authors

Factor I: Pressure of habitat on coastal areas

For the magnitude of the eigenvalues, the first three factors (greater than 1.0) are considered to be interpreted on condition that, as a whole, total 76.6% of the cumulative variance between the coastal areas from the different districts, exceeding the minimum value recommended by various authors for studies within the social sciences. It is further appreciated that the first factor in itself accumulates a high level of representation.

The first factor (Factor I) is the most important because it explains about half of the total cumulative variance (49.5%) and summarizes the effects of the habitat. Then comes the second factor (Factor II) with less importance (16.7% of total variance) which synthesizes the

socioeconomic status of the population, and the third factor (Factor III), with 10.4% shows the pressure on facilities related to tourism.

This factor comprises seven out of the 10 original variables, which provide an general panorama of the habitat characteristics in the coastal zone (Table 6.2.3) and, thus quantifying its indicators the negative effect (damage) in terms of area, population, housing, roads and family economic capacity through the variable low-income family1, highway and road communication network required and the presence of natural protection of the mangrove ecosystem. The latter two are considered as variables of response capability, which has an inverse behavior for exposure and sensitivity.

Table 5.2.3. Pressure of habitat

Number	Variables	Load
1	Affected area	-0,8622
2	% Of population affected	-0,8886
3	% Of housings affected	-0,9245
4	Roads affected	-0,7881
8	Low-income family	-0,8411
9	Highway and Road communication network required	-0,7785
10	Presence of natural protection	0,5932

Source: Prepared by the authors

The values of the factorial loads are polarized into positive and negative values. In terms of pressure of habitat on coastal areas, this factor establishes the different exposure of the population and its habitat in coastal areas to flooding due to extreme events and the low presence of coastal protection.

The negative correlation covers most of the variables which provide some idea of a set of lowlands districts which are potentially prone to be affected on its surface, thereby affecting the people, their houses and roads and where there are families living in the area closer to the coast with free usufruct housing tenure.

The positive correlation (0.5932) of a single variable with the factor, represents the low response capability of the districts from the little natural protection against the rise of sea level.

A review of most significant factor scores are shown in Table 5.2.4. The values are lower than -1.0 in the lowland districts of Grand Anse Praslin and La Digue, and Port Glaud in the West region, all of them are characterized by values higher than the national average. The rest, though with moderately strong values, are mainly located in Baie Lazare, Cascade, Grand Anse Mahe, Takamaka, Belombre, Glacis and Au Cap.

Meanwhile, another group of significant values (higher than 1.0), are Saint Louis (1.38779) and Plaisance (1.07349). Both belong to the central region and are characterized by very low to no natural protection. To the previously mentioned are added Les Mamelles and Bel Air, and the districts of the eastern region, Pointe Larue, Anse Aux Pins, Inglés River and Beau Vallon, among others.

Tabla 5.2.4. Pressure of habitat

Order	Region	District	Scores
1	Praslin	Grand Anse Praslin	-2,63795
2	Praslin	Baie Sainte Anne	-1,99908
3	La Digue	La Digue	-1,62143
4	Western	Port Glaud	-1,01136

Source: Prepared by the authors

Factor II: Socioeconomic status of the population.

The second factor, which only includes the indicators of population density and economic dependence and define the socioeconomic status of the population, show very similar values, and negatively correlate with the factor (Table 5.2.5). In terms of socioeconomic status, a higher concentration of population in coastal areas with the added burden of an inactive population or reliance on available workforce reinforces the conditions of fragility.

Table 5.2.5. Socio-economic Status

Nro.	Variables	Cargas
1	Population Density	-0,8466
2	Economic dependence	-0,8410

Source: Prepared by the authors

A review of coastal lowlands in different districts with scores less than -1.0 is shown in Table 5.2.6. The areas with the combination of high population density and high economic dependence are mainly located in Plaisance, Anse Aux Pins and Roche Caiman, with strong values. Afterwards follow Mont Fleuri, Anse Etoile and Glacis, although with less significant values.

Table 5.2.6. Low social and economic status			
Order	**Region**	**District**	**Scores**
1	Central	Plaisance	-2,1196
2	East	Anse Aux Pins	-1,3918
3	Central	Roche Caiman	-1,3465
Source: Prepared by the authors			

Factor III: Pressure of tourism related facilities

The variable density of hotel beds is negatively associated with the factor and with a very high value (Table 5.2.7). Beau Vallon district is predominantly hotel infrastructure building; the remaining districts have moderately strong values.

Table 5.2.7. Pressure of hotel facilities		
Nro.	**Variables**	**Loads**
7	Density of beds	-0,9793
Source: Prepared by the authors		

This factor, with 10.4% of total variance, groups the districts having a higher pressure in low-lying areas due to the hotel facilities that are located there, considering the indicator number of beds per unit area adjacent to the sea. In this case only Beau Vallon has a significant score (-4.2548), followed by Au Cap, albeit with a less significant. The rest of the districts, although with tourist facilities in low-lying areas, do not have a very marked connotation.

To define vulnerability in coastal areas of the different districts by using a synthetic index, the result of the ACP was used, where each of the three factors is an independent synthetic index from three viewpoints. Assuming that only the first factor can determine the index, given the importance of the contribution of this component to the ultimate goal, a first approximation to vulnerability is obtained. Finally we proceeded to combine all factors in an overall panorama, which adds all the factor scores and avoids further loss of information because it combines the three factors into a single one.

The relationship of the factors for each of the districts is shown in Annex A, Table 2. In it you can observe the values (scores) assumed as individual synthetic indices and the global index with its corresponding qualitative value.

Later this index underwent a process of stratification to identify and qualify the vulnerable strata of each factor. It is very important to note that the outcome is not a fixed rate. It only responds to very specific conditions from a specific information base and should not be extrapolated to other situations. In fact, it is a stepwise and cumulative process, requiring the input of new information to keep it updated.

According to stratification, for factor I, based only on 7 indicators, the most critical areas, Figures 5.2.1 and 5.2.2, (with vulnerability between very high and high) make 11 and are located in the Grand Anse Praslin, Baie Sainte Anne, La Digue, Port Glaud, Baie Lazare, Cascade, Grand Anse Mahe, Takamaka, Belombre, Glacis and Au Cap districts. The rest classified as medium

vulnerable (Anse Boileau, Mont Fleuri, Anse Etoile, Roche Caiman and Anse Royale) and low vulnerable, the lowland areas of the remaining eight districts).

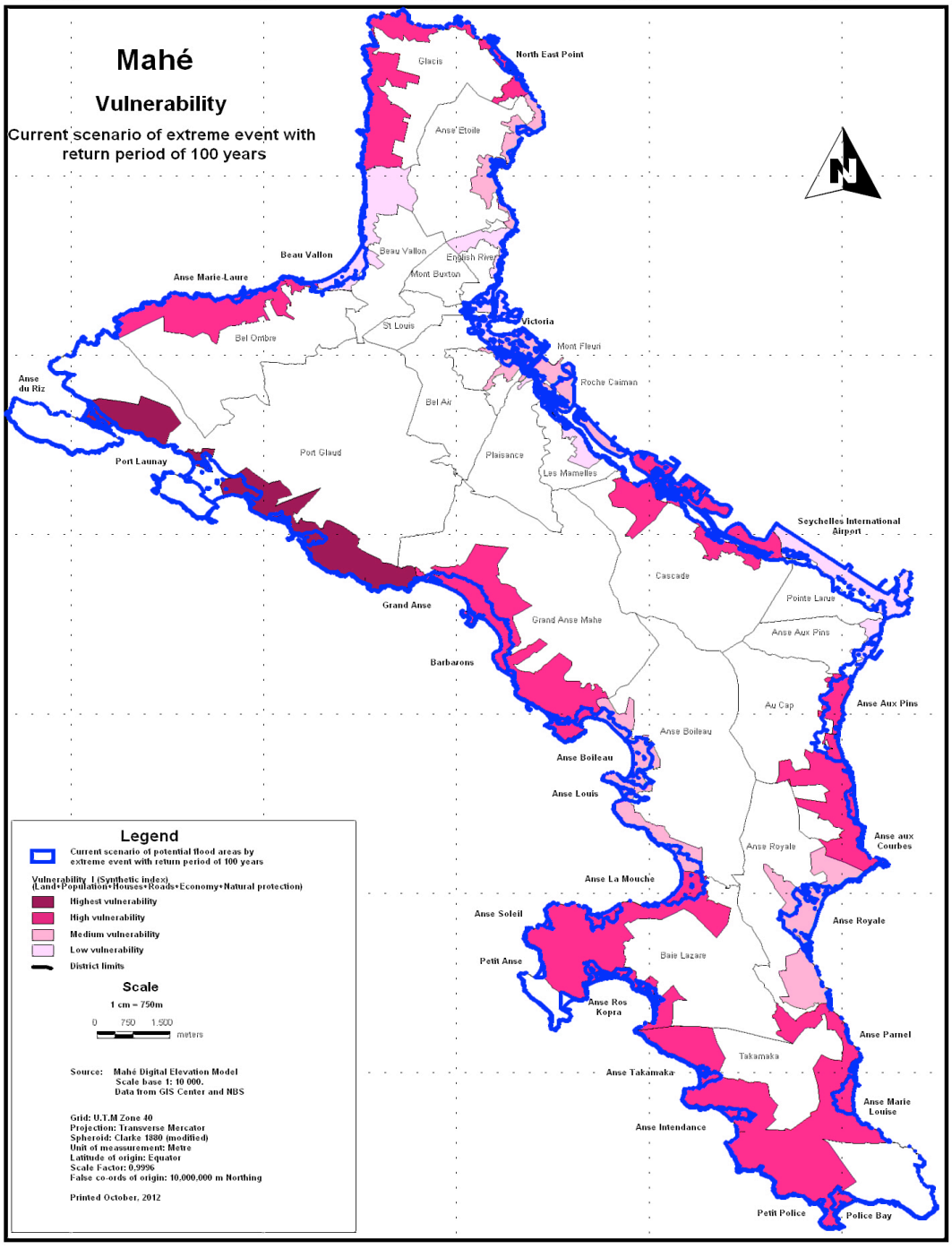

Figure 5.2.1 Vulnerability (factor I) in a current scenario of an extreme event with a return period of 100 years. Mahé Island.

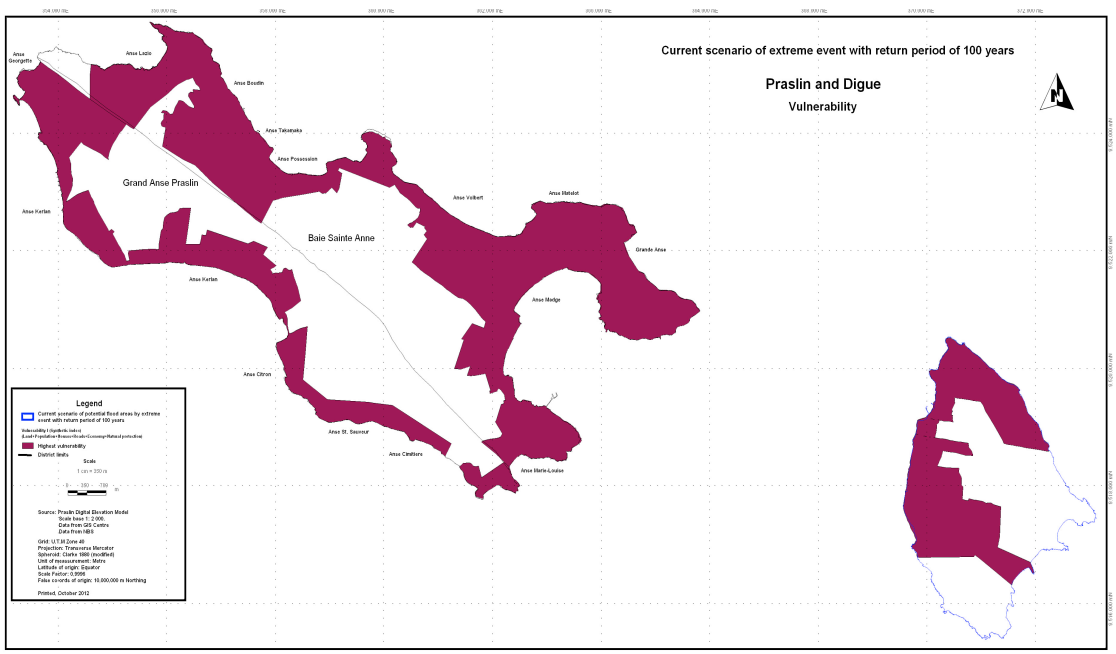

Figure 5.2.2. Vulnerability (factor I) in a current scenario of an extreme event with a return period of 100 years. Praslin and La Digue Islands.

According to factor II and to two inherent indicators / indicadores propios, the greater vulnerability is mainly located in low-lying areas in the districts of Plaisance, Anse Aux Pins, Roche Caiman, Mont Fleuri, Anse Etoile, Glacis, Anse Boileau, English River, Belombre, Au Cap, Cascade and Grand Anse Praslin, while Grand Anse Mahe, Anse Royale, Les Mamelles, Beau Vallon, Baie Sainte Anne, Port Glaud, Baie Lazar, La Digue and Takamaka classify as medium vulnerability areas.

According to factor III, as the only indicator considered, are Beau Vallon, Au Cap, Baie Lazare, Les Mamelles, Grand Anse Mahe, Belombre, La Digue and Mont Fleuri with very high and high values. Meanwhile, Port Glaud, Glacis, Takamaka, Grand Anse Praslin, Anse Aux Pins, Anse Etoile, Anse Royal, Anse Boileau and Baie Sainte Anne are considered medium vulnerability districts.

From the view point of global vulnerability, districts with greater vulnerability were: Beau Vallon, Grand Anse Praslin, Baie Sainte Anne and La Digue (Figure 6.2.3 and Figure 6.2.4). As you can notice, the most vulnerable coastal areas both in the first factor and in the global factor have a high degree of coincidence, being the only difference that Beau Vallon stands out for its importance regarding tourism-related facilities.

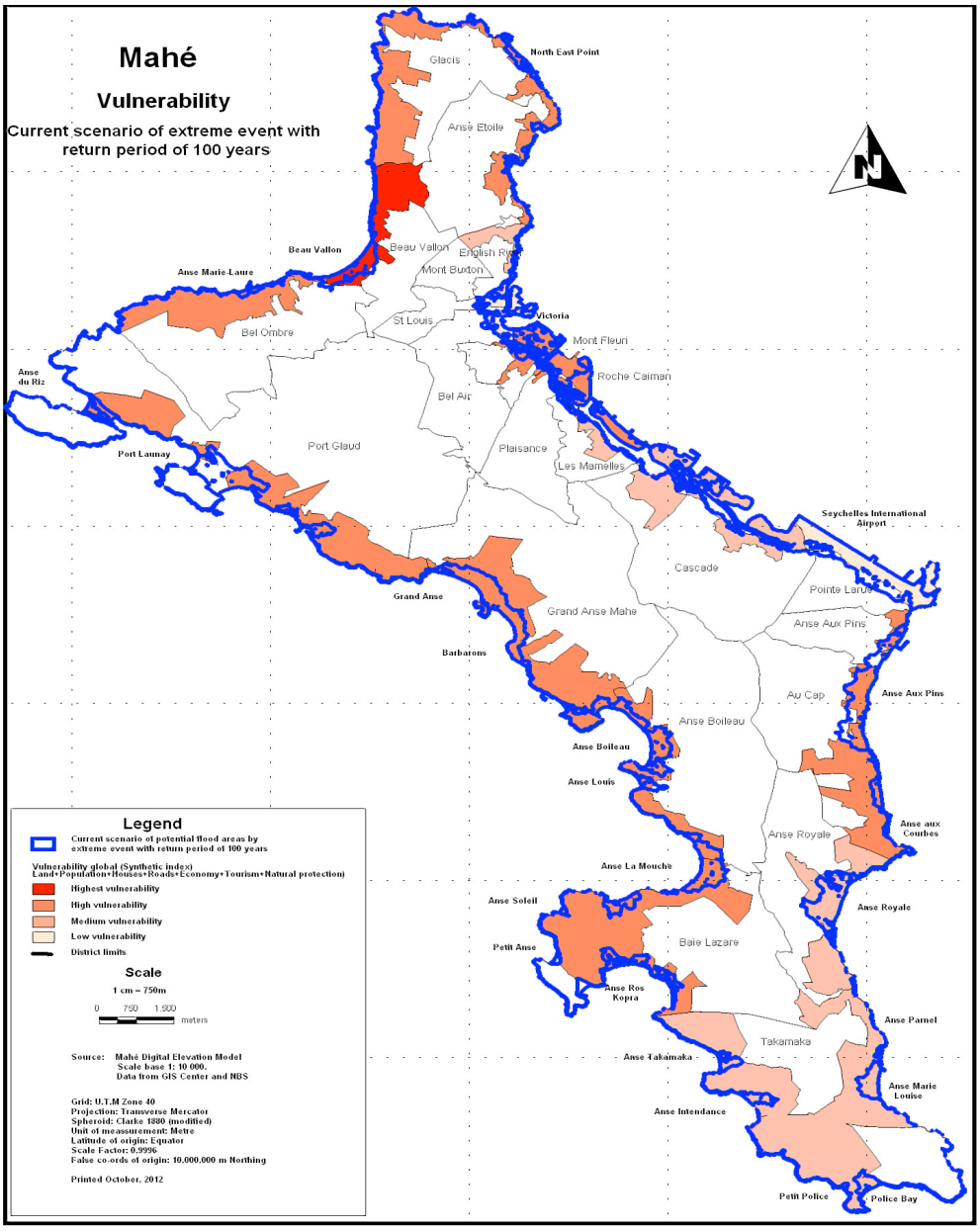

Figure 5.2.3. Global vulnerability in a current scenario of an extreme event with a 100- year return period. Mahé Island.

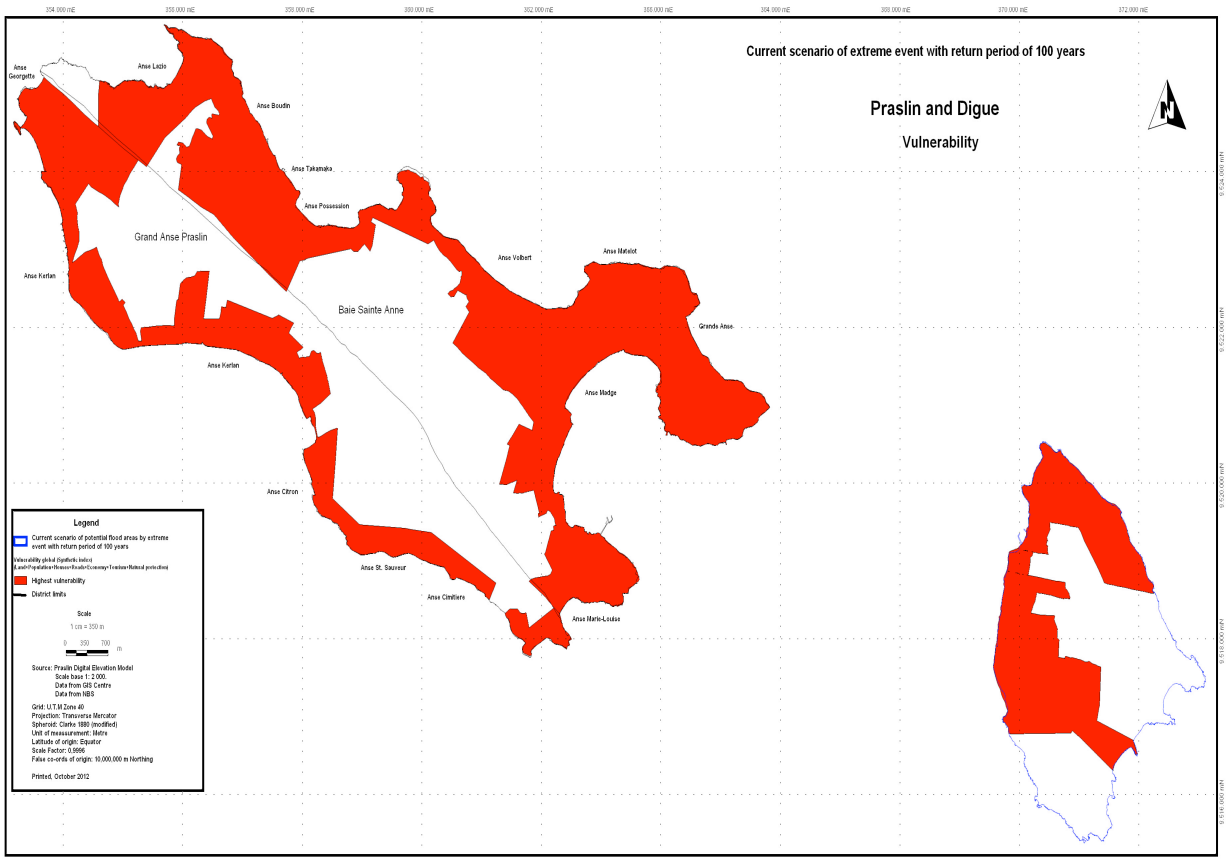

Figure 5.2.4 Global vulnerability in a current scenario of an extreme event with a 100 year return period. Praslin and La Digue islands.

The unavailability of economic indicators outside the family, limits the results in this sector. Consequently it is obtained by analyzing low areas in the Pointe Larue district that have low vulnerability only due to its flooded surface and to the absence of population, housing and hotel facilities.

It is worth observing that the relations must be established between the degree of vulnerability and the number of inhabitants living there. This analysis shows that in coastal areas of districts within a similar vulnerability category, the number of inhabitants at risk differs. If we calculate the weighted mean index assumed by coastal population, the highest vulnerabilities are concentrated in the East, West and North regions and in the districts of Mahe and La Digue, Baie Sainte Anne and Grand Anse Praslin . Annex A in table 3 shows the global vulnerability for all regions in coastal districts, with the vulnerability index, the coastal population and the weighted mean index for the coastal population.

In regional analysis, we can notice that high and moderate vulnerability values

are found in the Central, East, North and West regions of Mahé, while lower values with negative effect on surface and economic objectives (not included in the analysis), are located in Pointe Larue (International Airport), the commercial area of Saint Louis and Old Pier of Bel Air. Praslin and La Digue are highly vulnerable and are the most affected in terms of population.

For the spatial distribution of vulnerability indicators, consult the album of maps.

Classification

To complement this, we applied a multivariate classification technique (cluster analysis or cluster), which worked on the factors resulting from the prior analysis of ACP to group coastal districts with similar characteristics and standardizing them. We used the k-means method to combine the observations, the squared Euclidean distance to calculate the distance between clusters and the discriminant analysis technique to verify and validate the accuracy of the results.

This procedure aims to group lowland districts as homogeneous as possible according to indicators of origin; each group is a "type" of which all its features are known.

The result of the multivariate classification analysis identified four types of coastal districts, which are characterized according to the original variables of the study:

1. In a first group (Cluster 4) are those districts that in their lower areas have no population, housing, and hotel infrastructures exposed to seasonal flooding, further characterized by a fluctuating level of damage in road infrastructure and a road saturation level also variable with no significant level of coastal protection in presence of mangrove vegetation. Within this group classified Pointe Larue, specifically the International Airport area, Bel Air and St. Louis, all three having in common exposure problems in its surface area.

2. A second group (Cluster 1) includes 14 districts, which according to the order of exposure to flooding are Cascade, Grand Anse Mahe, Baie Lazare, Au Cap, Takamaka, Anse Boileau, Roche Caiman, Anse Royale, Mont Fleuri, Glacis, Belombre, English River, Anse Etoile and Les Mamelles and the low areas of which are quite a large contrast in terms of population, housing, in families with free housing tenure[1], road infrastructure and hotel infrastructure, also with significant number of population density and economic dependence.

As it is a large group, it includes small hot spots that contrast with the rest of the group to which it belongs, for example, Roche Cayman shows the least damage in the highway and road communation network with no saturation, so it has a greater capacity to guarantee the circulation and exchange of goods and services and with no tourism, or Les Mamelles, with minor damages regarding surface area, population and housing.

3. A third group (Cluster 2), is characterized by having the highest population density and the highest density of hotel beds in the coastal area, highlighting Beau Vallon for the tourism sector, with very high overall vulnerability and Plaisance in terms of population density, for its relationship between population / area and its significant economic dependence. Anse Aux Pins is also included because it is a densely populated area.

4. The last group (Cluster 3) is formed by four districts that were very vulnerable in the first factor (Grand Anse Praslin, Baie Sainte Anne, La Digue and Glaud Port) which in addition to having all the greater surface area, show the highest proportions of damage of exposed surface, population, housing, roads, population density values and point to concentrate families with free housing tenure. There is mangrove vegetation, especially in Port Glaud and Grand Anse Praslin and La Digue. Low values regarding road sufficiency are predominant, which denotes a road infrastructure with less capacity as it is saturated, and in terms of responsiveness, it does not guarantee an adequate road infrastructure for the population living in the district.

According to information available, the results obtained from synthetic indexes and from this classification, we identified some damages that must be turned into concrete actions. Many coastal districts grouped in different clusters share a common problem and require adaptation measures similar in some cases and in others different, which should be evaluated from the point of view of cost-effectiveness and its effect on the environment.

Elements potentially at risk in the current scenario

As the whole analysis of the flood strips or stretches are the result of data from the DEM and the validity of the results is directly proportional to the quality of the original model, the fact of not knowing the magnitude of the inaccuracies (which by others are always present due to the process of generalization) we cannot define up to what extent errors may propagate. Consequently, as to face uncertainty, it is necessary to quantify estimates of elements at risk within a range of values for any severe flooding and not to provide absolute figures. This range of values is defined by the spatial relations between the scenario and the enumeration areas (EAs) defined within the coastal zone.

La Digue, for scenarios of rising mean sea level (MSL) is excluded due to the deficiency of DEM (as mentioned in the Materials and Methods section).

For the current scenario, which includes only extreme events with a 100 year return period, vulnerability assessment with a temporary damage of 12.79 km^2 in Mahé, showed that the overall proportion of affected population and housing is between 4989 and 7479 people and between 1269 and 1936 houses respectively.

In Praslin, with the damage of 6.94 km2 as a result of these events, between 2474 and 3294 inhabitants and between 792 and 1037 houses could be affected.

According to not geo-referenced census information, provided by the National Bureau of Statistics, it summarizes the quantification of information on the population and housing in temporarily potentially flooded areas corresponding to areas adjacent to the coast line. As Table 4 in Annex A shows, the average population and housing increase as the categories of vulnerability get higher.

According to the population potentially exposed today in areas more adjacent to the coast (from rough estimates of the population in the EAs analyzed), the annual risk probability up to 2100 is shown in Table 5, Annex A. It allows to observe in an approximate way, how many inhabitants could be considered at risk year after year until 2100, based on current exposure and assuming no adaptation action is undertaken as per recommended calculation of RESPONSE Project (UK, 2003-2006), with background history in Nicholls, RJ (1995).

If the coastal area actually experienced population growth without addressing local adaptation conditions, in case of occurrence of the same elevation of the sea level, this additional amount of people would also be at risk and as environmental scenarios and sea level are not static, the impact would be greater.

Furthermore, from a thorough job reviewing the use of available land (in digital format and not geo-referenced), an analysis made allows to evaluate the vulnerability profile that characterizes the three islands. The inventory of such elements has been added and is shown in Table 6, Appendix A.

The basis for the analysis comprised the overlapping of land use, the political-administrative division of the districts and enumeration areas (EAs) adjacent to the coast, as well as temporary flood areas in a current scenario, with a 100-year return period, to determine the elements that are potentially at risk within the different categories of vulnerability.

The inventory of elements potentially at risk includes a broad spectrum of physical, geographic and socioeconomic elements. From a total of 178 enumeration areas (EA) defined in Mahé according to the most recent census of population and housing, information on land use was available only in five districts. Therefore, the inventory could not be completed and the other two islands were reviewed in full.

Both in Mahé, Praslin and La Digue, the analyzed variables are associated with natural elements such as forest reserves, coastal protection, landscaping and mangrove; regarding elements associated with socio-economic variables were considered constructions for tourism, educational facilities, sports, medical and transportation, day care centers, nursing homes, shops, offices, public buildings, fire, electrical plants, waste treatment plants, the small industry, telecommunication stations, water plants, airports, agricultural areas as well as urban areas, present population and population density.

According to the list in Table 6, the main aspects which are most damaged in Mahé, are medium and low density populated areas, shops, offices and public buildings, tourism areas, coastal protection and green areas.

In Praslin, the highest incidence are coastal protection and green areas, tourism areas, areas with low and medium population density, businesses, different kinds of offices and public buildings.

Finally in La Digue, the highest incidence is in coastal protection and green areas and tourism, in populated areas with medium population density and in commercial facilities, various offices and public buildings.

5.2.2. Future vulnerability.

According to the result of the analysis that A. Alvarez et.al reached in 2011, in relation to potential flood areas and by virtue of the magnitude of the damage, scenarios of 8 cm to 17 cm by 2025 and 2050 are excluded from the analysis of vulnerability for the islands Mahé and Praslin, due to the minimal level of damage observed, and La Digue which has also problems with the Digital Elevation Models (DEMs) and is excluded from the analysis for different scenarios on climate change.

To estimate future vulnerability in different districts, the estimated vulnerability from the current situation was considered, to which the exposure of vital elements such as basically population and housing, reported in each enumeration area (EA) for the worst case scenario, the year 2100, is superimposed.

From current vulnerability, with its high exposure determinants, high sensitivity and low adaptive capacity, considering the uncertainties in mapping and projected flood height, we estimated the level of exposure in the different districts, which might be translated into terms of irreversible vulnerability, if no appropriate measures to avoid that situation are taken.

Under the criterion that the flood area will be gradually increasing compared to the current situation, damage is the result of "gross" calculations that provide insight in approximate proportion to the sum of population and housings exposed within each district, from the information collected in AE obtained from the 2010 Census, (NBS, 2012).

From estimates of future vulnerability, set for 2100, absolute and total population and housing data are used to compare their dynamic of hazards through future scenarios.

Under the term population, increasing pressure population within a small coastal surface area, which represents the strengthening of the coastal zone, which in itself, is already stressed by habitat.

The results for the four scenarios are the following:

• Future scenario of 40 cm MSL (Mean Sea Level) rise for the year 2100

Under this scenario a permanent damage is expected in terms of a surface of 2.44 km2 for Mahé and 0.52 km2 for Praslin respectively.

In Mahe, the total proportional sum of damage in terms of population ranges from 258 to 1096 people and up to 223 housings. Meanwhile in Praslin, the total proportional sum reaches 293 inhabitants and a maximum of 91 housings.

• Future scenario of 1 meter MSL rise for the year 2100

Under this scenario, Mahé has a damage of 3.95 km2, with a population between 967 and 2366 inhabitants and between 162 and 559 housings respectively, as a total potential proportion.

In Praslin, the scenario of hazard reaches 1.72 km2, the estimated proportion of inhabitants damaged ranges between 244 and 953 and 73 to 299 housings.

• Temporary flooding scenario due to extreme events for year 2100, with a return period of 100 years and 40 cm sea level rise.

Under this scenario, Mahé shows a potential hazard in terms of surface area of 13.52 km2, with a range of affected population between 5569 and 8,152 inhabitants and houses damaged from 1387 and up to 2115.

In Praslin, total affected areas by floods is of 7.06 km2 with a range of 2490 up to 3333 inhabitants and housings raging from 797 up to 1049.

In La Digue (1.55 km^2), from 987 up to 1038 inhabitants could be affected and from 293 to 308 houses as well.

• Temporary flooding scenario due to extreme events in year 2100, with a return period of 100 years and 100cm sea level rise.

In Mahe, there is an estimated affected area of 14.97 km^2, which totals a proportion of affected inhabitants ranging from 6478 up to 9168 and from 1628 to 2354 housings.

In Praslin, out of 7.47 km^2 of affected area, between 2707 and 3478 inhabitants are expected to be affected as well as between 879 and 1092 houses.

In La Digue (1.93 km^2), the proportion of potential population affected is within the range of 1081-1148 inhabitants and between 323 and 342 houses.

Figures 5.2.5 and 5.2.6 show the distribution of the estimated population in this future scenario due to extreme events in the three islands.

ANNEX A

Table 1. Matrix of original data.

REGION	NAME	Affected area	Affected Population	Affected housings	Affected roads	Population Density	Economic Dependence	Density of beds	Low income families	Highways and road communication network required	Natural Protection
East	Takamaka	4.24	33.20	28.89	31.54	86.36	41.48	13.07	2.34	0.37	11.89
Central	Saint Louis	0.75	0.00	0.00	14.07	0.00	0.00	0.00	0.00	0.80	0.44
Central	Roche Caiman	3.66	60.71	38.72	1.82	1882.92	41.25	0.00	5.76	0.89	1.53
West	Port Glaud	6.66	74.69	64.60	42.64	86.13	39.61	15.87	1.89	0.29	15.31
East	Pointe Larue	6.39	0.00	0.00	27.34	0.00	0.00	0.00	0.00	0.51	2.37
Central	Plaisance	0.04	4.36	5.26	19.02	3510.64	55.66	0.00	1.89	0.54	0.00
Central	Mont Fleuri	2.33	35.07	38.42	21.81	1429.08	46.58	64.36	5.40	0.48	1.40
Central	Les Mamelles	0.13	9.56	9.21	12.11	756.68	31.44	94.96	0.54	0.56	0.09
West	Grand A. Mahe	5.08	41.27	38.00	46.29	342.60	47.02	62.53	1.98	0.44	7.34
North	Glacis	1.10	62.95	58.26	34.59	834.37	44.66	33.20	3.96	0.48	1.88
Central	English River	0.68	22.14	18.69	21.22	1467.61	31.59	25.28	2.70	0.61	0.00
East	Cascade	6.46	46.85	46.20	37.36	832.57	37.48	0.00	4.68	0.27	4.05
North	Belombre	0.82	45.47	43.97	65.30	682.31	41.92	52.61	3.42	0.27	1.16
Central	Bel Air	1.87	0.00	0.00	36.70	0.00	0.00	0.00	0.00	0.42	0.44
North	Beau Vallon	1.82	19.44	17.79	27.49	459.29	35.99	514.91	1.80	0.54	1.14
West	Baie Lazare	4.75	47.67	46.66	38.99	303.89	37.16	81.45	3.60	0.32	11.41
East	Au Cap	4.38	41.08	48.98	36.69	597.80	41.27	130.97	1.71	0.60	5.94
East	Anse Royale	3.48	21.35	21.65	17.06	356.43	41.49	13.62	2.34	0.64	4.59
North	Anse Etoile	0.64	34.53	35.19	39.74	1528.14	44.93	28.14	3.78	0.44	0.09
West	Anse Boileau	3.87	39.07	39.34	24.00	804.41	44.96	6.16	3.24	0.65	7.53
East	Anse Aux Pins	1.23	21.14	23.68	29.75	2608.97	44.84	51.28	0.54	0.61	0.39
Praslin	Grand A. Praslin	18.32	81.75	106.17	103.92	275.52	45.16	53.35	20.25	0.19	10.66
Praslin	Baie Ste. Anne	14.43	80.62	69.38	121.21	218.80	35.04	47.70	19.80	0.12	0.09
La Digue	La Digue	6.87	62.04	54.92	185.47	208.14	44.68	36.45	8.37	0.16	10.25
Central	Mont Buxton	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 2. Partial indexes by factor and global vulnerability index.

Districts	Synthetic Index (Factor 1)	Synthetic Index (Factor 2)	Synthetic Index (Factor 3)	Synthetic Índex (Global Factor)	Global vulnerability
Beau Vallon	0.649114	0.22863	-4.25481	-3.37707	MA
Grand Anse Praslin	-2.63795	-0.01007	0.194327	-2.45369	MA
Baie Ste. Anne	-1.99908	0.30167	0.36219	-1.33522	MA
La Digue	-1.62143	0.441556	-0.073683	-1.25356	MA
Au Cap	-0.002221	-0.152339	-0.808452	-0.963012	A
Glacis	-0.163001	-0.726917	0.0571204	-0.832798	A
Mont Fleuri	0.188576	-0.882801	-0.069812	-0.764037	A
Port Glaud	-1.01136	0.367281	0.0506028	-0.593476	A
Bel-Ombre	-0.17679	-0.20482	-0.17105	-0.55266	A
Baie Lazare	-0.490458	0.393809	-0.437047	-0.533696	A
Grand Anse Mahe	-0.220404	0.0135406	-0.322969	-0.529832	A
Anse Aux Pins	0.804035	-1.39186	0.233726	-0.354099	A
Anse Etoile	0.283869	-0.863887	0.236563	-0.343455	A
Plaisance	1.07349	-2.11965	0.744706	-0.301454	A
Roche Caiman	0.403891	-1.3465	0.791477	-0.151132	A
Anse Boileau	0.0882418	-0.381956	0.341294	0.0475798	M
Cascade	-0.400378	-0.01781	0.501956	0.083768	M
Takamaka	-0.184365	0.522144	0.08285	0.420629	M
Anse Royale	0.463122	0.116252	0.241388	0.820762	M
Les Mamelles	0.991397	0.221287	-0.376453	0.836231	M
English River	0.800036	-0.338497	0.438123	0.899662	M
Bel Air	0.949178	2.00391	0.69132	3.64441	B
Pointe Larue	0.824709	2.10637	0.789573	3.72065	B
Saint Louis	1.38778	1.72065	0.757058	3.86549	B
Mont Buxton	0.00000	0.00000	0.00000	0.00000	--
Source: Elaborated by the authors					

Table 3. Regional summary of global vulnerability.

Region	Coastal sector in the district	Current level of vulnerability	Current level of vulnerability	Estimated current coastal population	Current weighted mean index
Central	Mont Fleuri	A	0.18858	1199	226.1
Central	Roche Caiman	A	0.40389	1962	792.4
Central	English River	M	0.80004	929	743.2
Central	Bel Air	B	0.94918	0	0.0
Central	Les Mamelles	M	0.99140	255	252.8
Central	Plaisance	A	1.07349	165	177.1
Central	Saint Louis	B	1.38779	0	0.0
Central	Mont Buxton	Non-exposed	0.0000	0	0.0
				4510	274.0
East	Cascade	M	-0.40038	1999	-800.4
East	Takamaka	M	-0.18437	938	-172.9
East	Au Cap	A	-0.00222	1739	-3.9
East	Anse Royale	M	0.46312	890	412.2
East	Anse Aux Pins	A	0.80403	814	654.5
East	Pointe Larue	B	0.82471	0	0.0
				6380	14.9
North	Belombre	A	-0.17679	1686	-298.1
North	Glacis	A	-0.16300	2413	-393.3
North	Anse Etoile	A	0.28387	1629	462.4
North	Beau Vallon	MA	0.64911	801	519.9
				6529	72.7
West	Port Glaud	A	-1.01136	1921	-1942.8
West	Baie Lazare	A	-0.49046	1720	-843.6
West	Grand A. Mahe	A	-0.22040	1282	-282.6
West	Anse Boileau	M	0.08824	1567	138.3
				6490	-732.7
Praslin	Grand A. Praslin	MA	-2.63795	3047	-8037.8
Praslin	Baie St. Anne	MA	-1.99908	3931	-7858.4
				6978	-7948.1
La Digue	La Digue	MA	-1.62143	1713	-2777.5
Source: Elaborated by the authors					

Table 4. Quantification of elements at risk in the coastal area of the current scenario (for the current global vulnerability).

DISTRICT	NA	Group <=14	Group 15-64	Group >=65	Housings G	Housings M and B	Type I Housings	Type II Housings	Free Housings
Very high average vulnerability	67	523	1684	154	551	108	521	141	132
Beau Vallon	6	155	589	57	189	30	198	20	20
Grand A. Praslin	19	736	2075	212	739	167	719	197	210
Baie Ste. Anne	30	802	2888	215	864	162	788	245	206
La Digue	12	398	1184	131	410	71	377	103	93
High average vulnerability	110	331	1053	119	367	47	382	33	34
Grand A. Mahe	8	346	872	64	301	29	304	26	22
Belombre	12	343	1188	155	412	71	433	53	38
Glacis	14	484	1668	261	594	47	583	61	44
Baie Lazare	11	333	1254	133	361	58	347	73	40
Au Cap	12	368	1231	140	479	41	501	19	19
Port Glaud	14	448	1376	97	327	128	390	66	21
Anse Aux Pins	5	176	562	76	207	28	226	11	6
Plaisance	1	48	106	11	39	16	51	3	21
Mont Fleuri	9	281	818	100	317	42	345	13	60
Roche Caiman	14	461	1389	112	544	12	549	6	64
Anse Etoile	10	349	1124	156	455	48	468	37	42
Medium average vulnerability	49	226	785	82	225	57	240	42	29
Anse Royale	6	177	629	84	210	47	217	44	26
Anse Boileau	13	370	1081	116	329	125	387	62	36
English River	4	142	706	81	178	14	183	10	30
Les Mamelles	2	45	194	16	46	25	69	2	6
Takamaka	8	180	663	95	187	56	193	49	26
Cascade	16	444	1435	101	402	76	393	87	52
Low average vulnerability	3	0	0	0	0	0	0	0	0
Pointe Larue	1	0	0	0	0	0	0	0	0
Saint Louis	1	0	0	0	0	0	0	0	0
Bel Air	1	0	0	0	0	0	0	0	0

NA= Numeration area; Group=Age group ; G=Good technical condition; M and B= Mediocre and Bad technical condition; Type 1= Stone constructions; Type 2= Wooden/Metal constructions; Free housings= Free housing tenure

Source: Elaborated by the authors

Table 5. Estimated population at risk by the year 2100.

	Current vulnerability	Districts	Current exposed population	Annual population at risk
Factor 1	MA	4	10612	117
	A	7	11777	130
	M	5	7247	80
	B	8	2964	32
	Current vulnerability	**Districts**	**Current exposed population**	**Annual population at risk**
Factor 2	MA	3	2941	32
	A	5	7737	85
	M	13	21922	241
	B	3	0	0
	Current vulnerability	**Districts**	**Current exposed population**	**Annual population at risk**
Factor 3	MA	1	801	9
	A	7	9594	106
	M	9	17150	189
	B	7	5055	56
	Current vulnerability	**Districts**	**Current exposed population**	**Annual population at risk**
Global	MA	4	9492	95
	A	11	16530	165
	M	6	6578	66
	B	3	0	0

Source: Elaborated by the authors

Table 6. Inventory of potentially physical, geographical and socio-economic elements at risk.

Natural and socio-economic elements	Amount of numerated áreas		
	MAHE (*)	PRASLIN	LA DIGUE
High population density	4	1	
Medium population density	26	17	6
Low / very low density	21	25	
Offices, commercial and public buildings	20	6	6
Tourism	16	23	9
Coastal and green areas protection	15	10	12
Mangrove vegetation	7	4	
Education	4	1	1
Health facilities	3		1
Day-care centers, residential homes for the elderly	3	1	
Forestry reserve	1	3	
Agriculture	1	5	2
Industry	1	2	2
Sports		5	3
Water plants			2
Telecommunications			1
Airports		3	
Power Plants		2	
Fire stations		1	
Waste treatment plants		1	
Total	122	110	45
Source: Elaborated by the authors			

(*) Incomplete information

ANNEX B

NAME OF INDICATOR	Potentially flooded area (SPI)
CATEGORY	Indicator of exposure
GENERAL DESCRIPTION	The indicator estimates, for each district, exposing the areas closest to the coast according to the temporary damage of their surface area in a current scenario due to flooding as a result of severe weather events with return periods of 100 years (specifically hit by coastal flooding due to the super elevation of waves and surge).
OBJECTIVE	Compare the temporary damage in terms of area in the coastal zone within each district.
CALCULATION FORMULA AND DEFINITION OF VARIABLES	It is calculated according to the following formula: $$SPI = \frac{SInund}{SInundTot} * 100$$ Where: SInund = is the measured flooded area (in km2) within each district, susceptible to be affected by flood due to extreme events in the current scenario with a return period of 100 years. SInundTot = measured total flooded area (in km2) from all districts.
UNIT OF MEASUREMENT	%
DATA SOURCE	Preliminary hazards analysis of sea level rise and coastal flooding in Seychelles Islands. Climate Change for the current scenario and projection for the years 2025, 2050 and 2100. Alvarez, Pérez and Cutié, 2011: Mapping results obtained.
GEOGRAPHIC SCOPE	Adjacent coastal areas in the districts
METHODS	Mapping measurements in a GIS environment, in terms of area, as a consequence of the superposition of damage resulting from current temporary flooding (with return period of 100 years).
SCALE	Display range
LIMITATIONS	Depending on the accuracy of Digital Elevation Models (DEM) and planar mapping used to obtain the derivative flood stretch for its use in the disaggregation of other indicators to be obtained by means of mapping measurements.
OBSERVATIONS	Only the current scenario was considered, with return period of 100 years, since it involves a greater damage in terms of area in the socioeconomic and environmental conditions of the district, even temporarily.

NAME OF INDICATOR	Potentially affected population (PSA)
CATEGORY	Indicator of exposure
GENERAL DESCRIPTION	The indicator estimates, the population living in the coastal area and subject to the danger of temporary flooding due to the scope of flodding due to the super elevation of waves and surge).
OBJECTIVE	Compare the temporary damage in terms of space concentration of the population in low areas in the coastal areas of districts.
CALCULATION FORMULA AND DEFINITION OF VARIABLES	It is calculated according to the following formula: $$PSA = \frac{PobZ}{PobD} * 100$$ Where: *PobZ* = is the coastal population within each district susceptible to be affected by flood due to extreme events in the current scenario, with a return period of 100 years. *PobD* = total population in the district.
UNIT OF MEASUREMENT	%
DATA SOURCE	National Bureau of Statistics. Population and housing census, 2010.
GEOGRAPHIC SCOPE	Coastal area and its surroundings
METHODS	Numerical calculation
SCALE	Display range
LIMITATIONS	
OBSERVATIONS	Only the current scenario was considered, with return period of 100 years, since it involves a greater damage in terms of area in the socioeconomic and environmental conditions of the district, even temporarily.

NAME OF INDICATOR	Economic dependence (ED)
CATEGORY	Indicator of sensitivity
GENERAL DESCRIPTION	It is the relationship between the economically inactive population (0-14 and 65 and over) and the economically active population (15-64 years) using international cutoff points of the inhabited area and expresses the amount of busy people who have that hold 100 people inactive, so that the greater economic dependence, there is more fragile.
OBJECTIVE	Estimate the economic dependence or burden that inactive population represents for the available workforce in the inhabited area.
CALCULATION FORMULA AND DEFINITION OF VARIABLES	It is calculated according to the following formula: $$PSA = \frac{PobZ}{PobD} * 100$$ Where: NoPEA = = Part of the non-working population living in the areas closest to the coast (age groups 0-14 and 65 and over) and not seeking work, as well as students, the elderly, housewives, pensioners and disabled. PEA = Part of employed and unemployed people who are looking for work and make up the labor force available in the coastal area (age group 15-54).
UNIT OF MEASUREMENT	%
DATA SOURCE	National Bureau of Statistics. Population and housing census, 2010.
GEOGRAPHIC SCOPE	Coastal area and its surroundings
METHODS	Numerical calculation
SCALE	Display range
LIMITATIONS	It depends on the accuracy of the mapping used.
OBSERVATIONS	Although not all working-age population works at present, it gives an idea of the burden that the available labor force has to endure for the production of goods and services.

NAME OF INDICATOR	Potentially damaged houses (*VPA*)
CATEGORY	Indicator of exposure
GENERAL DESCRIPTION	The indicator allows showing the space concentration of housings in the district, located in an area highly prone to temporal flooding, regardless of the construction material used and of the technical conditions of housings.
OBJECTIVE	Estimate the level of exposure, from the viewpoint of habitability in the area actually inhabited of the district.
CALCULATION FORMULA AND DEFINITION OF VARIABLES	It is calculated according to the following formula: $$VPA = \frac{VivZ}{VivD} * 100$$ where: VivZ = Number of households in the coastal area within each district susceptible to be affected by flood due to extreme events in the current scenario, with a return period of 100 years. VivD = Total housings in the district.
UNIT OF MEASUREMENT	%
DATA SOURCE	National Bureau of Statistics. Population and housing census, 2010.
GEOGRAPHIC SCOPE	Coastal area and its surroundings
METHODS	Numerical calculation
SCALE	Display range
LIMITATIONS	
OBSERVATIONS	It is assumed that the higher the concentration of housings in a danger zone, the higher the vulnerability of people inhabiting in them.

NAME OF INDICATOR	Households with low economic income (HBC)
CATEGORY	Indicator of sensitivity
GENERAL DESCRIPTION	From the families living in the area closest to the coast with free housing tenure, this indicator is assumed as an approximation to the financial fragility of households as they depend, for their welfare and safety, on the permanence of both the job and the employer in the area, in cases where they are provided free under this modality. The remaining houses are also considered (without any employer involved) the rent of which are also free.
OBJECTIVE	Estimate the fragility, from the viewpoint of household, considering the condition of housing tenure.
CALCULATION FORMULA AND DEFINITION OF VARIABLES	It is calculated according to the following formula: $$HBC = \frac{VivfreeZ}{Vivfreetot} * 100$$ where: VivfreeZ = Number of families with free housing tenure within the area closest to the coast Vivfreetot = Total housings provided to families with free housing tenure within the nearshore areas of all districts
UNIT OF MEASUREMENT	%
DATA SOURCE	National Bureau of Statistics. Population and Housing Census 2010
GEOGRAPHIC SCOPE	Coastal area and its surroundings
METHODS	numerical calculation
SCALE	National
LIMITATIONS	Display range
OBSERVATIONS	It is assumed that the higher the percentage of free tenure housings in an area of greater sensitivity to danger, especially with some degree of labor dependency, the higher the exposure and vulnerability and are also the least able to adapt. The indicator suggests that low-income families are those living under this condition.

NAME OF INDICATOR	Density of hotel beds (DC)
CATEGORY	Indicator of sensitivity
GENERAL DESCRIPTION	The indicator allows showing the spatial concentration of beds or accommodations in hotel facilities (regardless of the type of institution) that favor human pressure in all coastal areas within each district.
OBJECTIVE	Quantify hotel beds occupied per area unit adjacent to the coast.
CALCULATION FORMULA AND DEFINITION OF VARIABLES	It is calculated according to the following formula: $$DC = \frac{BedsH}{AreaZ} * 100$$ where: *BedsH*= Number of beds or accommodations per hotel facility located in the coastal area of each district with temporary flood hazard with a return period of 100 years. *AreaZ*= Area (in km2) in the coastal zone
UNIT OF MEASUREMENT	beds/km^2
DATA SOURCE	Mapping hotel infrastructure points from the 2002Census, delivered by GIS Unit Department of Environment (Climate and Environmental Services) Preliminary results hazards analysis of sea level rise and coastal flooding in Seychelles Islands. Climate Change for the current scenario and the projection for the years 2025, 2050 and 2100. Alvarez, Perez and Cutié, 2011
GEOGRAPHIC SCOPE	Coastal area and its surroundings.
METHODS	Mapping measurements, by superimposing hotels in the coastal area on the stretch of temporary flood with a return period of 100 years.
SCALE	Display range
LIMITATIONS	Not updated information on hotel infrastructure (2002) and relying on the accuracy of the resulting flood fringe.
OBSERVATIONS	Considering the importance from the economic viewpoint of tourism for the country, it is considered appropriate to compare the pressure of hotels located all along the coast.

NAME OF INDICATOR	Highways and roads potentially affected (*VPA*)
CATEGORY	Indicator of exposure
GENERAL DESCRIPTION	The indicator provides evidence of damage in the adequate road infrastructure for the population living within the coastal zone, in a flood hazard area.
OBJECTIVE	Contrast the exposure of the road network in the coastal area of each district.
CALCULATION FORMULA AND DEFINITION OF VARIABLES	It is calculated according to the following formula: $$VPA = \frac{LViashab}{LViasD} * 100$$ where: LVíashab = Length (km) of main and secondary roads within the actual inhabited area of each district with temporary flood hazard for the corresponding return period of 100 years in the current scenario. LVíasD = Length (in kms) of main and secondary roads in each district.
UNIT OF MEASUREMENT	%
DATA SOURCE	Climate and Environmental Services (GIS unit department of environment) Preliminary results of hazards analysis of sea level rise and coastal flooding in Seychelles Islands. Climate Change for the current scenario and projection for the years 2025, 2050 and 2100. Álvarez, Pérez y Cutié, 2011.
GEOGRAPHIC SCOPE	Affected area in the district
METHODS	Mapping measurements, by superimposing the length of road infrastructure in the coastal zone within the stretch of temporary flooding.
SCALE	Display range
LIMITATIONS	Outdated information on highway and road length (2002) and relying on the accuracy of the resulting flooding fringe.
OBSERVATIONS	It is assumed that an affectation on the roads, albeit temporary, is a condition that disables population mobility.

NAME OF INDICATOR	Population density (PD)
CATEGORY	Indicator of sensitivity
GENERAL DESCRIPTION	The indicator provides evidence that the spatial concentration of the population encourages damage in all coastal areas within each district.
OBJECTIVE	Quantify the people living on the inhabited coast per area unit.
CALCULATION FORMULA AND DEFINITION OF VARIABLES	It is calculated according to the following formula: $$DP = \frac{PobZ}{AreaZ}$$ where: PobZ = Population in the coastal zone. AreaZ = Area of the coastal zone (in km2)
UNIT OF MEASUREMENT	inhab/km^2
DATA SOURCE	National Bureau of Statistics. Population and Housing Census 2002 and Population and Housing Census 2010.
GEOGRAPHIC SCOPE	Area affected in the district
METHODS	numerical calculation
SCALE	Display range
LIMITATIONS	
OBSERVATIONS	It is assumed that the higher the density, the more fragile the population tends to be, especially when the concentration is higher on the coast or in areas close to it.

NAME OF INDICATOR	Index for the highway and road communication network required (ISV)
CATEGORY	Indicator of adaptability [-]
GENERAL DESCRIPTION	It is an indicator that articulates the district population and area with the functionality of highways and roads (both main and secondary) and represents the capacity of the road network to ensure the circulation and exchange of goods and services. According to (UNAM, 2004), is a more sophisticated indicator than road density as the denominator artifice allows to overcome the variables that represent the variable sizes of population and area.
OBJECTIVE	Representing the responsiveness of road network in each district to guarantee transport services.
CALCULATION FORMULA AND DEFINITION OF VARIABLES	It is calculated according to the following formula: $$[-]ISV = \frac{LViasD}{\sqrt{PobD * Areahab}} * 100$$ where: LViasD = Length of roads (in km) per district. PobD = Total population of the district. Areahab = real inhabited district area (in km2) [-] = The negative position is to indicate the negative value of the indicator: Higher values = unsaturated infrastructure = greater adaptability.
UNIT OF MEASUREMENT	index
DATA SOURCE	Climate and Environmental Services (GIS unit Department of Environment) National Bureau of Statistics. Population and Housing Census 2002 and Population and Housing Census 2010.
GEOGRAPHIC SCOPE	affected district area
METHODS	numerical calculation
SCALE	Display range
LIMITATIONS	Outdated information on the length of highways and roads (year 2002).
OBSERVATIONS	It is assumed that districts with low values have a low-capacity road infrastructure as roads are saturated, and from the viewpoint of responsiveness, it does not guarantee an adequate supply of road infrastructure for the population living in the district.

NAME OF INDICATOR	**Proportion of natural protection (PPN)**
CATEGORY	Indicator of adaptability [-]
GENERAL DESCRIPTION	It tries to represent, although in an approximate manner, the responsiveness in the district, considering the presence of mangrove vegetation as a natural protective barrier against sea level rise.
OBJECTIVE	Compare the adaptability of different districts in relation to coastal protection.
CALCULATION FORMULA AND DEFINITION OF VARIABLES	It is calculated according to the following formula: $$[-]PPN = \frac{AreaM}{AreaMtot} * 100$$ where: AreaM= mangrove area (in km2) in each district AreaMtot= total mangrove area (in km2) [-] = The negative position is to indicate the negative value of the indicator: Higher values = more protection = greater adaptability.
UNIT OF MEASUREMENT	%
DATA SOURCE	Climate and Environmental Services (GIS unit department of environment).
GEOGRAPHIC SCOPE	District
METHODS	numerical calculation
SCALE	Display range
LIMITATIONS	No information is available regarding the health condition of mangroves
OBSERVATIONS	It assumes all the mangrove vegetation to be in good health and to fulfil its protective function.

APPENDIX 11: ECOPORTS SELF DIAGNOSIS METHOD

EUROPEAN SEA PORTS ORGANISATION ASBL / VZW
ORGANISATION DES PORTS MARITIMES EUROPEENS ASBL / VZW

ECOPORTS

Self Diagnosis Method (SDM)

Important! Please note that any fields that are left unaswered are considered as negative answers by the system.

A: Environmental Policy

ENVIRONMENTAL POLICY DOCUMENT

A.1	Does the Port have an Environmental Policy?	Y ○ N *
	IF YES,	
A.2	Is the Policy signed by Chief Executive / Senior Management?	✓ Y ● N
A.3	Is the Policy communicated to all relevant stakeholders? [A.3]	✓ Y ● N
A.4	Is the policy communicated to all employees? [A.4]	✓ Y ● N
A.5	Is the policy publicly available on the Port's Website?	○ Y ● N

	Does the Policy include reference to:	
A.6	Major objectives?	● Y ○ N
A.7	Publication of an Environmental Report?	✓ Y ○ N
A.8	The identification and control of the port's Significant Environmental Aspects?	✓ Y ○ N
A.9	Continual improvement?	✓ Y ○ N
A.10	Prevention of pollution?	✓ Y ○ N
A.11	Training employees in environmental issues?	✓ Y ○ N
A.12	Introduction/maintenance of an Environmental Management System?	✓ Y ○ N
A.13	Reduction of resource consumption?	✓ Y ○ N
A.14	Improvement of environmental standards beyond those required under legislation? [A.14]	✓ Y ○ N
A.15	Environmental management of main aspects within the port area (including Tenants and Operators)?	✓ Y ○ N

ENVIRONMENTAL POLICY SCOPE

	Does the Environmental Policy make reference to the following issues?	
A.16	Implementation of ESPO Environmental Policy and Guidance Documentation?	✓ Y ○ N
	Does the Environmental Policy refer to the following issues?	
A.17	Sustainable Development?	✓ Y ○ N
A.18	Corporate Social Responsibility (societal integration)?	✓ Y ○ N

ENVIRONMENTAL ASPECTS OF PORT ACTIVITIES

A.19	Does the Port have an inventory of relevant environmental legislation and regulations related to its liabilities and responsibilities? [A.19]	✓ Y ● N *
A.20	Are there procedures to maintain and update the Inventory?	✓ Y ○ N

A.21	Does the Port have an inventory of Significant Environmental Aspects* for the port area?	○Y ◉N *	
	If YES, does the Inventory consider effects from the following:		
A.22	Bunkering	✓Y ○N	
A.23	Dredging	✓Y ○N	
A.24	Marine engineering	✓Y ○N	
A.25	Ship building and repair	○Y ○N	N/A
A.26	Shipping & Navigation	✓Y ○N	
A.27	Land traffic	✓Y ○N	
A.28	Waste Management	✓Y ○N	
A.29	Cargo Handling Operations: Chemicals	✓Y ○N	
A.30	Cargo Handling Operations: Containers	✓Y ○N	
A.31	Cargo Handling Operations: Dry Bulk	✓Y ○N	
A.32	Cargo Handling Operations: General cargo	✓Y ○N	
A.33	Cargo Handling Operations: Hazardous Cargo / Oil, Gas and petroleum products	✓Y ○N	
A.34	Cargo Handling Operations: Liquid bulk (non Oil)	✓Y ○N	
A.35	Cargo Handling Operations: Perishable goods	✓Y ○N	
A.36	Cargo Handling Operations: Ro-Ro	✓Y ○N	
A.37	Cargo Handling Operations: Vehicles / Trade cars	✓Y ○N	
A.38	Cargo Storage: Chemicals	✓Y ○N	
A.39	Cargo Storage: Containers	✓Y ○N	
A.40	Cargo Storage: Dry Bulk	✓Y ○N	
A.41	Cargo Storage: General cargo	✓Y ○N	
A.42	Cargo Storage: Hazardous Cargo / Oil, Gas and petroleum products	✓Y ○N	
A.43	Cargo Storage: Liquid bulk (non Oil)	✓Y ○N	
A.44	Cargo Storage: Perishable goods	○Y ○N	N/A
A.45	Cargo Storage: Vehicles / Trade cars	✓Y ○N	
A.46	Port based industry: Aggregate industry (sand, gravel, cement)	✓Y ○N	
A.47	Port based industry: Chemical & pharmaceutical plants	✓Y ○N	
A.48	Port based industry: Fish market and processing	✓Y ○N	
A.49	Port based industry: Agrofood Industries	✓Y ○N	
A.50	Port based industry: Metal ore processing and refining	✓Y ○N	
A.51	Port based industry: Oil refineries and petroleum processing plants	○Y ○N	N/A
A.52	Port based industry: Power stations	✓Y ○N	
A.53	Port based industry: Steel works	✓Y ○N	
A.54	Port based industry: Waste reception, treatment and processing	✓Y ○N	
A.55	Fisheries & Aquaculture	✓Y ○N	
A.56	Coastal Engineering: Piers & breakwaters	✓Y ○N	
A.57	Coastal Engineering: Coastal & flood defence	✓Y ○N	
A.58	Coastal Engineering: Port development (sea) [A.58]	✓Y ○N	
A.59	Coastal Engineering: Port development (land) [A.59]	✓Y ○N	
A.60	Maintenance of Port Installations	✓Y ○N	
A.61	Military Use	✓Y ○N	
A.62	Recreation and tourism: Cruise Ships	✓Y ○N	
A.63	Recreation and tourism: Marinas	○Y ○N	N/A
A.64	Recreation and tourism: Commercial and leisure activities	✓Y ○N	
A.65	Recreation: Watersports	✓Y ○N	
A.66	Past Activities [A.66]	✓Y ○N	
A.67	Emergency situations	○Y ✓N	
A.68	Environmental incidents	○Y ✓N	

Does the Inventory consider aspects from the activities of the following tennants and operators?

A.69	Suppliers	Y N
A.70	Logistics operators	Y N
A.71	Building contractors	Y N
A.72	Service contractors	Y N
A.73	Industry	Y N

Does the Inventory consider the following key aspects?

A.74	Emissions to Air	Y N
A.75	Emissions to water	Y N
A.76	Emissions to soil	Y N
A.77	Emissions to sediments	Y N
A.78	Changes in terrestrial habitats	Y N
A.79	Changes in marine ecosystems	Y N
A.80	Noise	Y N
A.81	Waste [A.81]	Y N
A.82	Resource (water, energy, ...) consumption	Y N

OBJECTIVES AND TARGETS

A.83	Have objectives and targets for environmental improvement been defined?	Y N *
A.84	Have these objectives been communicated?	Y N
A.85	Does the port have quantitative objectives?	Y N
A.86	Has the port defined targets for its objectives?	Y N

RESOURCES AND BUDGET

A.87	Does the Port have a budget specifically for Environmental Management? [A.87]	Y N *

If YES, is funding from the buget allocated to:

A.88	Environmental training of employees?	Y N
A.89	Control of environmental impact?	Y N
A.90	Emergency response and prevention?	Y N
A.91	Environmental Monitoring?	Y N
A.92	Stakeholder engagement and outreach activities?	Y N
A.93	Environmental Reporting (including entries to Port's Website)?	Y N

B. Management Organisation & Personnel

B.1	Does the Port have a representative responsible for managing environmental issues? [B.1]	Y N *

If YES, does the representative:

B.2	Report to Senior Management?	Y N
B.3	Co-ordinate environmental management throughout the Port?	Y N
B.4	Respond to internal and external enquiries?	Y N
B.5	Ensure compliance with environmental policy?	Y N
B.6	Have responsibility for implementation/maintenance of an EMS?	Y N
B.7	Monitor current environmental issues and legislation?	Y N
B.8	Are the Environmental Manager's responsibilities documented?	Y N

B.9 Are the environmental responsibilities of other key personnel documented?	☑Y ○N *
If Yes, which of the following methods are used?	
B.10 Responsibilities specified in Job descriptions	☑Y ○N
B.11 Specified in written procedures	☑Y ○N
B.12 Reporting procedures documented	☑Y ○N

C. Environmental Awareness and Training

C.1 Are all employees aware of the importance of compliance with environmental policy?	☑Y ○N *
C.2 Are all employees aware of the potential environmental impacts of their work activities?	☑Y ○N *
C.3 Are all employees aware of their responsibility to conform to the environmental policy and management objectives?	☑Y ○N *
C.4 Are all employees aware of the objectives, actions and programs carried out by the port in order to improve its environmental performance?	☑Y ○N *
C.5 Does the Port authority have an environmental training program for its employees?	☑Y ○N *
C.6 Is the environmental training fitted to employees' activities and responsibilities (i.e. training requirements identified)?	☑Y ○N *
C.7 Are environmental issues included in induction programmes for new employees?	☑Y ○N *

D. Communication

D.1 Does the port publish a publicly available environmental report?	☑Y ○N *
D.1a Does the Report conform to standard practice of the Global Reporting Initiative?s (GRI) Sustainability Reporting Framework?	☑Y ○N

D.2 Are there procedures to communicate environmental information internally between the key environmental personnel?	☑Y ○N *
If YES, which communication tools are used?	
D.3 Oral/ Informal Communication	☑Y ○N
D.4 Electronic Media	☑Y ○N
D.5 Internal Newsletters	☑Y ○N
D.6 Seminars & briefings	☑Y ○N
D.7 Staff / Management Working Groups	☑Y ○N
D.8 Specified reporting procedures for problems or opinions	☑Y ○N

D.9 Are there procedures to exchange port environmental information with Stakeholders including external parties?	☑Y ○N *
If YES, which communication tools are used? (Identify as appropriate)	
D.10 Attending Coastal fora and Coastal management groups?	☑Y ○N
D.11 Handbooks/Brochures?	☑Y ○N
D.12 Complaint procedures?	☑Y ○N
D.13 Local liaison committees?	☑Y ○N
D.14 Newsletters?	☑Y ○N
D.15 Port Website?	☑Y ○N
D.16 Press/Media releases?	☑Y ○N
D.17 Port 'Open Days' for local groups (e.g. families, schools)?	☑Y ○N
D.18 Periodic, special reports?	☑Y ○N

E. Operational Management

E.1 Have environmental management programs and action plans been prepared to achieve each objective?	☑Y ○N *
If YES, do the management programs and action plans specify the following:	
E.2 Agency/person responsible for the action (Who will do it?)	☑Y ○N
E.3 Duration and / or frequency (When and How often it will be done?)	☑Y ○N
E.4 Method or standard operating procedure to be used (How it will be done?)	☑Y ○N

E.5	Are there methods to deal with non-compliance with internal and external standards?	✓Y ○N *
	If YES, do these methods:	
E.6	Identify problems?	✓Y ○N
E.7	Determine causes?	✓Y ○N
E.8	Initiate preventative and corrective action?	✓Y ○N

E.9	Is there an Environmental Management Manual for the port?	○Y ○N * N/A
	If YES, does the manual include the following:	
E.10	Environmental policy statement?	✓Y ○N
E.11	Organization of environmental management within overall port management framework?	✓Y ○N
E.12	Key environmental roles and responsibilities?	✓Y ○N
E.13	Objectives and Targets?	✓Y ○N
E.14	Management program ?	✓Y ○N
E.15	Records and monitoring programs?	✓Y ○N
E.16	Reference to site(s) emergency plans?	✓Y ○N
E.17	Reference to environmental control documentation and records?	✓Y ○N

	Have the following elements been specified for port environmental records	
E.18	Officer / Manager responsible for their maintenance?	✓Y ○N *
E.19	Classification of information and the time period for review/updating?	✓Y ○N *
E.20	Access and confidentiality?	✓Y ○N *
E.21	Review and update procedure?	✓Y ○N *

F: Emergency Planning

F.1	Does the Port have an Emergency and Contingency Plan?	●Y ○N *
	If YES, does it include the following potential environmental consequences and actions to be taken in the event of:	
F.2	Explosion	●Y ○N
F.3	Fire	●Y ○N
F.4	Floods / storms	○Y ●N
F.5	Oil / chemical spill on land	✓Y ○N
F.6	Oil / chemical spill on navigable water	✓Y ○N
F.7	Shipping accident or incident	✓Y ○N
F.8	Vandalism / terrorism	●Y ○N
F.9	Vehicular accident or incident	○Y ○N

	Does the Plan specify:	
F.10	Responsibility and role of Port Authority personnel?	✓Y ○N
F.11	Responsibility and role of tenants and operators?	✓Y ○N
F.12	Responsibility and role of ship agents?	✓Y ○N
F.13	Responsibility and role of external agencies?	✓Y ○N
F.14	Communication procedures (who to call, and when)?	✓Y ○N
F.15	Control and containment procedures?	✓Y ○N
F.16	Location and type of equipment (on and off site?)	✓Y ○N
F.17	Location and skills of trained personnel (on and off-site)?	✓Y ○N
F.18	Communication procedures with Government Departments, NGOs, local community, media and other interested parties?	✓Y ○N
F.19	Responsibility for follow-up and reporting	✓Y ○N

G. Environmental issues and Monitoring

ENVIRONMENTAL ISSUES

G.1 From the following list of issues, please rank the top 10 priorities of the port (where 1=the most important). Click and select priority in sequence and please provide a minimum 3 and a maximum of 10 answers.

✓ Air quality	Antifouling paints	✓ Bunkering
✓ Cargo Spillage (handling)	Climate change	Conservation areas
✓ Contaminated land	Dredging: operations	Dredging: disposal
Dust	Energy Consumption	✓ Garbage/ Port waste
Habitat/Ecosystem loss (water)	Habitat/Ecosystem loss (land)	✓ Hazardous cargo (handling/storage)
Industrial effluent to water	Industrial emissions to air	Light pollution
Noise	Odours	Pollution from rivers
Port development (land related)	Port development (water related)	Sediment contamination (marine)
✓ Ship discharge (ballast)	✓ Ship discharge (bilge)	✓ Ship discharge (sewage)
Ship exhaust emissions	✓ Ship waste	Soil contamination (land)
Rain water treatment	Relationship with local community	Vehicle exhaust emissions (including cargo handling)
Water quality		

MONITORING

G.2 Does the port have an environmental monitoring program?	○Y ○N *
If YES, does the program address the following:	
G.3 Air quality	●Y ○N
G.4 Water quality	●Y ○N
G.5 Soil quality	○Y ●N
G.6 Sediment quality	○Y ●N
G.7 Terrestrial habitats	○Y ○N N/A
G.8 Marine ecosystems	○Y ○N N/A
G.9 Noise	○Y ✓N
G.10 Waste	✓Y ○N
G.11 Carbon footprint	○Y ✓N
G.12 Energy consumption	✓Y ○N
G.13 Water consumption	✓Y ○N
G.14 Has the port identified Environmental Performance Indicators (EPIs) to monitor trends in environmental performance? (e.g. addressing operational performance and impact on environmental condition)	✓Y ○N *
G.15 Is the Port's Environmental Management Programme monitored? (The activities and objectives of the program itself).	✓Y ○N *
If YES, are the following components monitored?	
G.16 Correct application of standard operating procedures?	✓Y ○N
G.17 Effectiveness of standard operating procedures?	✓Y ○N
G.18 Compliance with Environmental Policy and follow up?	✓Y ○N
G.19 Compliance with legislation and corrective action?	✓Y ○N
G.20 Incidents and follow up?	✓Y ○N
G.21 Inventories (waste, materials, fuels and energy use)?	✓Y ○N
G.22 Training information?	✓Y ○N
G.23 Achievement of Targets?	✓Y ○N

H: Review and Audit

H.1 Has an Environmental Audit been conducted?	Y ○ N *
If YES, did the Environmental Audit examine:	
H.2 Port Authority (Corporate) Management and Business approach to Environmental issues?	Y ○ N
If YES, did the environmental audit examine:	
H.3 Compliance (Regulation)?	Y ○ N
H.4 Environmental Issues?	Y ○ N
H.5 Specific activities?	Y ○ N
H.6 Suppliers & Operators?	Y ○ N
H.7 Environmental Management Standard Accreditation?	Y ○ N
Was the Audit conducted by:	
H.8 Local Government?	Y ○ N
H.9 Own staff?	Y ○ N
H.10 External consultants?	○ Y N
H.11 Environmental Enforcement Agency?	Y Y N
Was the audit conducted to the specification of:	
H.12a ISO14001	Y ○ N
H.12b EMAS	○ Y N
H.12c PERS	○ Y N
H.13 Is there a procedure to review the Port's Environmental Management Program?	Y ○ N *
IF YES, does the procedure specify:	
H.14 Who carries out the review?	Y ○ N
H.15 How often the review will be conducted? [H.15]	Y ○ N
H.16 Organisational structures?	Y ○ N
H.17 Administrative and managerial procedures?	Y ○ N
H.18 Activities, operations and effects under Port Authority responsibility?	Y ○ N
H.19 Documentation, reports and records?	Y ○ N
H.20 Reporting of environmental performance?	Y ○ N
H.21 Costs and benefits?	Y ○ N

I. Green Services

A. PROVISION OF ONSHORE POWER SUPPLY (OPS)

I.1 Is OPS available at one or more of the berths?	○ Y N * required
If YES,	
What type of OPS is available?	
I.2 a. High voltage?	○ Y N
I.3 b. Low voltage?	○ Y N
Is OPS provided through:	
I.4 a. Fixed installation(s)?	○ Y N
I.5 b. Mobile installation(s)?	○ Y N
I.6 How many berths can be served simultaneously	No
I.7 How many annual ship calls use OPS electricity?	No

What type of commercial vessels use OPS?

I.8 a. Inland navigation vessels — ○Y ✓N

I.9 b. Sea going Container vessels — ○Y ✓N

I.10 c. Sea going Cruise vessels — ○Y ✓N

I.11 d. Sea going RoRo or ROPAX vessels — ○Y ✓N

I.12 e. Sea going Tankers — ○Y ✓N

If NO,

I.13 Does the port plan to offer OPS during the next 2 years — ○Y ✓N

B. PROVISION OF LIQUEFIED NATURAL GAS (LNG)

I.14 Is LNG bunkering available in the port today? — ○Y ✓N * required

If YES,

I.15 Have LNG bunkering procedures been implemented in the port? — ○Y ✓N

I.16 How many vessels are bunkered with LNG per year — N/A

How is LNG bunkered in the port?

I.17 Through a non mobile installation? — ○Y ✓N

I.18 By trucks? — ○Y ✓N

I.19 By barge? — ○Y ✓N

Is it allowed to bunker LNG simultaneously with the following operations:

I.20 Loading/unloading of cargo? — ○Y ✓N

I.21 Embarking/disembarking of passengers? — ○Y ✓N

I.22 Other ship supply operations? — ○Y ✓N

I.23 LNG bunkering of other ships in the vicinity? — ○Y ✓N

If NO,

I.24 Are there currently ongoing LNG bunkering infrastructure projects in the port? — ○Y ✓N

I.25 Do plans exist for the development of LNG bunkering facilities during the next 2 years? — ○Y ✓N

C. APPLICATION OF ENVIRONMENTALLY DIFFERENTIATED PORT DUES

I.26 Does the port differentiate dues for 'Greener' vessels? — ○Y ✓N * required

If YES,

Which of the following schemes are used as qualifying criteria:

I.27 a. Environmental Ship Index (ESI), — ○Y ✓N

I.28 b. Clean Shipping Index (CSI), — ○Y ✓N

I.29 c. Green Award, — ○Y ✓N

I.30 d. Own developed system, — ○Y ✓N

I.31 e. Other — N/A

Does the rewarding system take into account the following?

I.32 a. Waste management /segregation — ○Y ✓N

I.33 b. Air emissions (NOx, SOx, PM) — ○Y ✓N

I.34 c. Carbon dioxide emissions — ○Y ✓N

I.35 d. Noise — ○Y ✓N

I.36 e. Environmental certification — ○Y ✓N

I.37 f. Other — N/A

I.38 How many ship calls qualify for a reduction on the port dues annually? — N/A

If NO,

I.39 Does the port plan to introduce environmentally differentiated port dues during the next 2 years? — ○Y ✓N