Timor Port: Tibar Bay

Environmental Impact Statement

18-Oct-17

Level 4, 600 Murray St
West Perth WA 6005
Australia

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www.**advisian**.com

Advisian
WorleyParsons Group

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Abbreviations

AAQS	Ambient Air Quality Standards
ADB	Asian Development Bank
ADCI/VOCA	Agricultural Cooperative Development International/ Volunteers in Overseas Cooperative Assistance
AERMOD	Atmospheric Dispersion Modelling System
AMSA	Australian Marine Science Association
ANC	Acid Neutralising Capacity
ANP/ANPM	Autoridade Nacional do Petróleo e Minerais
ANU	Australian National University
ANZECC/ARMCANZ	Australian and New Zealand Environment and Conservation/ Agriculture and Resource Management Council of Australia and New Zealand
APORTIL	Administração dos Portos de Timor-Leste or Port Authority of Timor-Leste
AQG	Air Quality Guideline
AS/NZS	Australian Standards/New Zealand Standards
ASS	Acid Sulfate Soils
AWS	Automated Weather Station
BAP	Biodiversity Action Plan
BAT	Best Available Technologies
BBS	Bita Bina Semesta
CD	Chart Datum
CE	Critically Endangered (IUCN)
CNEFP	Centro Nacional Emprego e Formacao Profissional
CRS	Catholic Relief Services
CSIRO	Commonwealth Science and Industry Research Organization
DBH	Diameter at Breast Height
DBT	Dibutyltin
DD	Data Deficient
DEH	Department of Health
DEP	Noise Regulation Standards 1997
DER	Department of Environment and Regulation
DFBOT	Design, Finance, Build, Operate and Transfer
DHS	Demographic and Health Survey
DNCQA	Direcção Nasional Contolo e Qualidade de Agua or National Directorate for Control and Quality of Water
DNSA/DNSAS	Direcção Nacional Serviço de Agua e Saneamento or National Directorate for Water and Sanitation
DNTPSC	Direcção Nacional de Terras, Propriedade e Serviços Cadastrais or National Directorate for Land, Property and Cadastral Service
DoEE	Department of Energy and Environment (Australia)
DoF	Department of Fisheries
DotE	Department of the Environment
DP	Dynamic Positioning
E	Endangered (IUCN)
EA	Environmental Assessment
EBL	Environment Basic Law

EDTL	Electricdade De Timor-Leste
EFL	Environmental Framework Law
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ELL	Environment Licensing Law
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EPBC	Environment Protection and Biodiversity Conservation
ESL	Ecological Screening Level
ETO	Esperança Timor Oan
EWR	Ecological Water Requirements
FADs	Fish Aggregation Devices
FAO	Food and Agriculture Organization
FEED	Front-End Engineering Design
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GoTL	Government of Timor-Leste
GPS	Global Positioning System
GPs	Good Practices
HFO	Heavy Fuel Oil
HHs	Households
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
HPC	Hamburg Ports Corporation
HPS	High Pressure Sodium
HSE	Health, Safety and Environment
IAAQS	International Ambient Air Quality Standards
IFC	International Finance Corporation
IFC PS	International Finance Corporation Performance Standard
IFO	Intermediate Fuel Oil
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
ISQG	Interim Sediment Quality Guidelines
ITs	Interim Targets
IUCN	International Union for the Conservation of Nature
KBAs	Key Biodiversity Areas
LC	Least Concern (IUCN)
LFS	Labour Force Survey
LOR	Limits of Reporting
LRP	Livelihood Restoration Plan
MAFF	Ministry of Agriculture, Fisheries and Forestry
MAF	Ministry of Agriculture and Fisheries
MARPOL	International Convention for the Prevention of Pollution from Ships
MBES	Multi-Beam Echo Sounder
MBT	Monobutyltin
MDG	Millennium Development Goal
MGO	Marine Grade Oil / Diesel
MMR	Maternal Mortality Rate
MoH	Ministry of Health
MTC/MPWTC	Ministry of Public Works, Transport and Communications
NAGD	National Australian Guidelines for Dredging

NAP	National Action Plan
NAPA	National Adaptation Programme of Action to Climate Change
NC	National Communication
NDPCEI	National Directorate for Pollution Control and Environmental Impact
NEPM	National Environmental Protection Measure
NGER	National Greenhouse Emissions Reporting
NGO	Non-Government Organisation
NPS	National Procurement Commission
NSPMMPI	National System for the Prevention and Management of Marine Pest Incursions
NT	Near Threatened (IUCN)
O&M	Organisation and Methods
PAHs	Poly Aromatic Hydrocarbons
PAH	Project Affected Household
PAoI	Project Area of Influence
PAP	Project Affected People
PASS	Potential Acid Sulphate Soils
PIANC/ROMS	Permanent International Association of Navigation Congresses/ Recomendaciones para Obras Marítimas
PMU	Project Management Unit
PNAs	Protected Natural Areas
PNTL	Polícia Nacional de Timor-Leste or National Police of East Timor
PPA	Private Partnership Agreement
PPE	Personal Protective Equipment
PPP	Public Private Partnership
PPPLU	Public Private Partnership Launch Unit
PSD	Particle Size Distribution
PTS	Permanent Hearing Loss
QA/QC	Quality Assurance/Quality Control
QASSIT	Queensland Acid Sulphate Soils Investigation Team
QNC	Queensland Naturalists Club
RAP	Resettlement Action Plan
RDTL	Democratic Republic of Timor-Leste
SDP	Strategic Development Plan
SEPFOPE	Secretary of State for Vocational Training and Employment
SIA	Social Impact Assessment
SISCa	Serviço Integrado de Saúde Comunidade
SMP	Social Management/Mitigation Plan
SPOCAS	Suspension Peroxide Oxidation Combined Acidity & Sulfur
SSAC	State Secretariat of Arts and Culture
STDs	Sexually Transmitted Diseases
TAA	Titratable Actual Acidity
TBP	Tibar Bay Port
TBT	Tributyltin
TEU	Twenty-Foot Equivalent Unit
ToR	Terms of Reference
TPA	Titratable Peroxide Acidity
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
TSA	Titratable Sulfidic Acidity

TTS	Temporary Hearing Loss
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNTAET	United Nations Transitional Administration in East Timor
V	Vulnerable (IUCN)
WAF	Water and Food
WBCSD	World Business Council for Sustainable Development
WHO	World Health Organisations
WPTL	Worley Parsons Timor-Leste
WWTP	Wastewater Treatment Plant

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1 Executive Summary

Tibar Port is proposed to be developed by the Ministry of Public Works, Transport and Communications (MTC), of the Government of Timor-Leste (GoTL). The GoTL has executed a Concession Agreement with Timor Port SA to Design, Finance, Build, Operate and Transfer (DFBOT) the Tibar Port Project, in Timor-Leste.

The project site is located at Tibar Bay, approximately 10 km west of Dili, the capital city of Timor-Leste. Dili Port, located in Dili is reaching maximum capacity so Tibar Port has been proposed to allow shipping of containers and cargo to continue to increase and expand in the future.

Government licensing and approval of the Port is required under Timor-Leste Decree Law 5/2011 Environmental Licensing Law prior to commencement of construction. In accordance with Decree Law 5/2011, Tibar Port is classified as a Category A project as it may have significant environmental and social impacts, and as such is subject to the preparation of an Environmental Impact Statement (EIS) and Environmental Management Plan (EMP).

Timor Port SA (the concessionaire) is the project proponent and their consultant, Advisian (WorleyParsons TL) have developed and delivered this EIS and the EMP under the guidance and instruction of the National Directorate for Pollution Control and Environmental Impact (NDPCEI) and the Public Private Partnership Unit (PPPU). This EIS and EMP are written to meet the requirements contained in the Concession Agreement Appendix 11, Terms of Reference (ToR) for the Tibar Port Project (IFC, 2016).

Advisian (WorleyParsons TL) have also undertaken the Front End Engineering Design of the project and the EIS team has collaborated with the port design engineers during preparation to ensure that the appropriate impact avoidance and mitigation measures are built into the design. The key design decisions are highlighted throughout the EIS.

The structure and headings of this EIS are consistent with those required under Decree Law 5/2011 Annexure B-4 (ADB, 2014) and therefore do deviate from the sample structure provided in Annexure 1 of the ToR.

The purpose of the Executive Summary is to provide a summary of the key findings and conclusions of the EIS for the Tibar Port Project.

1.1 Purpose and extent of the EIS

The purpose of this EIS is to identify and assess the environmental and social risks and impacts of the proposed Tibar Port Project.

The port project includes the design and construction of the following infrastructure:

- A two-berth quay wall approximately 630 m long;
- Dredging of the quay berth and 600 m diameter turning circle to -16 m CD (Chart Datum);
- Demarcation of a 250 m wide shipping channel;
- Reclamation and soil improvement of the 27.1 ha container terminal; and

- Supporting infrastructure for operation of the port including:
  - vehicle and machinery fuelling station;
  - power supply system;
  - potable water supply system;
  - fire-fighting system;
  - rainwater / stormwater drainage system;
  - waste water treatment plant which includes a sewerage system;
  - solid waste management system;
  - marine navigation aids to mark the port entrance and access channel;
  - offices; and
  - parking lot;

The Tibar Port project comprises four phases of work:

- Pre-construction: Early to mid-2016 including Detailed Design and Procurement;
- Construction of Phase 1A: Phase 1A: Q4 2017, for 2 years to Q4 2019;
- Construction of Phase 1B: Q4 2019 to Q4 2020 (12 months); and
- Operations: Late 2019, for 28 years including Construction of Phase 1B.

The project site is limited to the extent included in the Concession Agreement. This EIS has been developed to address the requirements contained in the Concession Agreement Annexure 11: ToR.

1.2 Brief project description

The GoTL proposes to construct a new port facility in Tibar Bay, 10 km west of Dili. This is being undertaken in order to expand and improve shipping operations in Timor-Leste. In 2015, the GoTL completed a tender for a private partnership to undertake the design, construction, financing and operations of the port for a 30 year timeframe.

The principal function of the port is to take over the increasing volume of container traffic, together with general cargoes, from the existing Dili Port, which will then cease container traffic operations and most cargo operations.

The GoTL is being assisted with the development of the Port by the International Finance Corporation (IFC). The GoTL with the IFC assistance has identified a preferred site for the Port within Tibar Bay, prepared a conceptual port design and the Concession Agreement and ToR for the project.

The project will consist of a 27 ha container terminal. Port construction will require the dredging of a 600 m diameter turning circle within the bay and dredge berth pockets adjacent to a wharf. The project requires construction of the wharf, land reclamation for the container terminal and the associated landside developments.

1.3 Summary of activities carried out in the EIS phase

In order to assess the impacts from pre-construction, construction operation and decommissioning activities of the project, specialist studies were undertaken as part of the EIS. These specialist studies were identified in the ToR and were designed to investigate key aspects of the project activities.

The key aspects investigated include:

Marine habitat and biodiversity

- Metocean study including alteration of the bay and coastal hydrodynamics, tidal changes, erosion and accretion from dredging and reclamation;
- Sea and land degradation from dredge material disposal and bay erosion and sedimentation;
- Seawater quality changes from stormwater runoff, spills and shipping movements;
- Habitat destruction and biodiversity loss from clearing of mangroves, corals and seagrass;
- Habitat degradation from fisheries impact and decline in nursery values, impact on turtles and mammals;
- Potential for impacts from oil, hazardous waste and chemical spills and MARPOL compliance;
- Dredging and dredge material disposal impacts including disposal options, methods and Potential Acid Sulphate Soils (PASS) management; and
- Pests and invasive species potentially introduced to the area by the project.

Terrestrial habitat and biodiversity

- Identification of protected vegetation and distribution in the Concession Area;
- Assessment of Mangrove habitat and the fauna in the mangroves; and
- Determination of bird and mammal species present or likely to be present.

Drainage, water quality and sedimentation

- Water use for port domestic supply, container wash down and supply to ships, source, quality and volumes;
- Wastewater and stormwater assessment to identify treatment and discharge and assess impacts on the marine water quality; and
- Solid waste management and potential impact.

Air quality

- Construction and operation dust and vehicle emissions; and
- Greenhouse gas emissions, climate change impacts and adaptation with estimates of green, blue and black carbon.

Noise

- Port activities assessment of predicted noise levels compared to existing background values.

Socio-economic and social impact assessment

- Land acquisition and physical displacement assessment of number of households and people affected, the land types and land use;
- Economic displacement and loss of livelihoods including loss of subsistence fisheries and use of natural resources including mangroves and mudflats;
- Community impacts from Employment, Training opportunities and compensation;
- Population changes and potential for migration to the area;
- Identification of facilities and infrastructure to be affected by the project including loss of water supply, sanitation and bay access;
- Cultural heritage site impacts including assessing their significance and location; and
- Identify potential safety impacts to the workers and community members.

Traffic

- Impacts from traffic during construction and operations, primarily between Dili and the Port.

1.4 Alternatives considered

There were 8 regional alternative locations by the GoTL and Tibar Bay was selected as the most suitable based on a range of considerations. Within Tibar Bay, 7 possible configurations of port layout were considered. The final chosen site as proposed by this EIS was selected on the basis of operational suitability and engineering design to minimise environmental and social impacts and overall project cost.

The project configuration incorporating the expansion of the existing Dili Port was deemed to be difficult due to the lack of space for expansion. The Environmental and Social impacts are higher at the site west of Dili at Tasi Tolu and at the site in the area of the North-west coast, than they are in Tibar. This is due to the presence of key mangrove and coral habitat along the North-west coast and key bird habitat present at Tasi Tolu.

The site at Tibar Bay was selected in the overall screening as the most suitable.

1.5 Affected environment

Tibar Port is located in Suco Tibar in the sub-district of Bazartete on the north coast of Timor-Leste. The natural environment in Tibar Bay consists of a sheltered bay bordered by mangrove and sandy silt beaches and two rocky headlands at the mouth of the bay. Within the bay, coralline ridges are found, with intertidal seagrass beds and silty mudflat areas. The bay is bounded by low hills to the east and west, with a minor ephemeral drainage, Rihui River draining an upper catchment of approximately 30 km^2.

The area supports important bird species, International Union for the Conservation of Nature (IUCN) listed threatened turtles, dugong and also contains important freshwater springs used for local consumption. There are also fish hatching sites and salt harvesting plots on the eastern end of the bay. Local livestock forage in the mangrove stand that runs along the southern side of the bay. A small jetty is located on the south-western bank which is used for vessel refuelling, oil import and anchoring.

Tibar Bay flows out into the Arafura Sea deep-water strait which is an important migratory channel for large marine mammals including dolphins and whales. Approximately 30 km north-west is the Timor-Leste island of Atauro, an internationally-protected habitat island.

The population of Suco Tibar is approximately 1,800 people and there are two primary schools and one clinic located in the village, adjacent to the project area. The primary occupation of the people in the village is fishing and salt harvesting. There are also old fish hatching sites and salt harvesting plots in the eastern end of the bay. Local livestock currently forage in the mangrove stand that runs along the southern side of the bay, and a small jetty is located in the western bank used for fishing vessel refuelling and anchoring.

1.6 Activities identified in each phase

Key activities that may generate environmental and social impacts have been identified for each of the four phases of the Tibar Port project. These are summarised below:

Preconstruction	Construction	Operation	Decommissioning
Detailed Engineering design and planning. Regulatory compliance and approvals. Procurement of Construction contractor.	Clearing of the site/area – excavation, piling, pouring of concrete foundations and permanent establishment of laydown area, offices and workshops. Building structures in concrete and steel. Dredging and dredge spoil disposal. Reclamation area construction. Establishment of bunds, drainage areas. Haulage of building materials and supplies by truck. Piling and construction of jetty Construction of internal access roads.	Port operation 24 hours a day, 7 days a week. Truck hauling. Waste Water treatment plant operations. Operating port and Maintenance activities (e.g. clearing of sediment from culverts)	Not applicable

1.7 Environmental and social impacts

Environmental and social impacts that may occur as a result of the key activities identified for each phase above have been quantified using a modified 'Significance Assessment Framework'. These impacts vary in magnitude from no change or only a slight discernible change, to a significant change in the status of the environment or social setting. The significance of an impact is determined as a function of the importance or sensitivity of the receiving environment and the magnitude of the impact.

In order to quantify the environmental and social impact of activities associated with the Tibar Port Project, four categories have been used to describe what would constitute acceptable and unacceptable impacts based on duration and scale, using a risk-based impact assessment.

The risk-based impact assessment used on this project classifies the impact before mitigation on a scale from Low to Extreme, as described in the table below. This is to indicated what the impact will be if no mitigation or management measures are adopted at the issuing of the license.

Impact status		Acceptability	Duration
Extreme	Modifications to the project plan will be required for the impact to be acceptable to stakeholders	Impact not acceptable	Impact is permanent and regional
High	Detailed management strategy with mitigation measures required to implement the project with this level of impact	Impact may be partially acceptable	Impact is permanent and local
Medium	Basic management measures required for project implementation	Impact generally acceptable	Impact is short term and local
Low	Brief mention in the EMP document, adequate data for assessment and management	Impact acceptable	Impact is short term and local

No impacts were identified as extreme. The impacts which are considered to be **high** are identified in the table below, with the mitigation measures identified for each in the section which follows. The impacts which are medium or low are described in the main body of this document under Section 9.

There is no decommissioning phase for this project.

Risk ranking	Pre- Construction Impacts	Construction Impacts	Operations Impacts
Extreme	N/A	N/A	N/A
High	N/A	▪ Noise (9.9 Noise and vibration) ▪ Coastal and Marine water quality (9.12 Coastal and marine water) ▪ Terrestrial Fauna (birds) (9.13 Fauna and vegetation (birds)) ▪ Megafauna - Underwater noise (9.14 Marine fauna) ▪ Benthic Habitat (9.15 Marine habitat incl. coral) ▪ Fishing and Habitat use (9.20 Fishing and marine habitat use) ▪ Land Ownership and Land Rights (9.27 Land ownership and land rights) ▪ Natural resources rights (9.28 Natural resources rights) ▪ Cultural Heritage (9.29 Cultural heritage, archaeological and sacred sites)	▪ Noise (9.9 Noise and vibration) ▪ Megafauna - Underwater noise (9.14 Marine fauna) ▪ Land Ownership and Land Rights (9.27 Land ownership and land rights) ▪ Natural resources rights (9.28 Natural resources rights)

1.8 Mitigation and management

Mitigation and management measures have been summarised in the table below. These have been identified as key actions to be implemented to reduce the impact of the identified high impact activities in the impact assessment framework. Mitigation measures for the other aspects are contained under their applicable section in the body of this document.

In order to implement the project mitigation measures, Project Environmental Management Plans have been developed. These are:

- Biodiversity Action Plan;
- Dredge Management Plan;
- Port Marine Spill Contingency Plan; and
- Environmental Management Plan.

The environmental and social impacts for each phase are summarised in the table on the next page

**Stages = P:PreConstruction, C: Construction,*

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
1	P	Desk study Design & contruction of Port	Workplace environment condition	1 - Air Quality	Project Site	1-1 (19)	Consider greenhouse gas performance in the selection of all vehicles and vessels.	-Carbon monoxide ; 1 hour = 40,000 µg/m3 Annual = Max 1 -Nitrogen dioxide ; 1 hour = 200 µg/m3 Annual = 40 µg/m3 -Photochemical oxidants (as ozone) ; 1 hour = 235 µg/m3 -Sulfur dioxide ; 1 hour = 350 µg/m3 24 hour = 125 µg/m3 -Particles as PM2.5 ; 24 hour = 75 µg/m3 Annual = 70 µg/m3 Air Quality §8 EMP §10.4 EIS §9.5.4 EIS §9.8.4	Planning Stage	-	TPSA
2	P	Desk study Design & contruction of Port	Measurment of environmental aspect	1 - Air Quality	Project Site	1-2 (19)	Install Automated Weather Station (AWS) recording daily measurements of: - Station identification number - State and time of record/observation - Air, wet bulb and wet dew point temperatures - Precipitation and evaporation - Relative humidity - Wind speed and direction - Solar radiation - Barometric pressure - Visibility - Cloud cover - Cloud ceiling height, if practicable	-Carbon monoxide ; 1 hour = 40,000 µg/m3 Annual = Max 1 -Nitrogen dioxide ; 1 hour = 200 µg/m3 Annual = 40 µg/m3 -Photochemical oxidants (as ozone) ; 1 hour = 235 µg/m3 -Sulfur dioxide ; 1 hour = 350 µg/m3 24 hour = 125 µg/m3 -Particles as PM2.5 ; 24 hour = 75 µg/m3 Annual = 70 µg/m3 EMP §12.1 EMP §12.28.1	Daily	-	TPSA (D&C)
3	P	Desk study Design & construction of Port	Workplace environment condition	2 - Noise and vibration	Project Site	2-1 (13)	Where practicable, all equipment, plant, machinery and vessel noise emissions shall be rated at maximum 85 dB(A) at 1 metre distance.	Noise §7.1 Hydro §10.2 EMP §10.5 EIS §1.8 EIS §9.9.4	Planning Stage		TPSA

**Stages = P:PreConstruction, C: Construction,*

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
4	P	Desk study Design & construction of Port	Workplace environment condition	2 - Noise and vibration	Project Site	2-2 (13)	Scheduling of noisy tasks for daytime hours	- Tibar Port Project Max Permissible Noise Level (daytime) – - Calculated (DEP Noise Regulations,1997) 68 dB(A) - Residential, Institutional and Educational Receptors 50 – 55 dB(A) - Commercial Receptors 70 dB(A) - Industrial Receptors 7 dB(A) Noise §7.2	Planning Stage		TPSA
5	P	Desk study Design & construction of Port	Workplace environment condition	3 - Sedimentation	Project Site	3-1 (4)	Detailed design to consider sedimentation impacts	EMP §10.8 EMP §12.2	Planning Stage	-	TPSA
6	P	Desk study Design & construction of Port	Workplace environment condition	4 - Water Quality	Project Site	4-1 (17)	Updating trigger thresholds of DMP for turbidity and sedimentation at reference points	DMP §5.1 DMP §6.1	Planning Stage	-	TPSA (D&C)
7	P	Desk study Design & construction of Port	Workplace environment condition	5 - Benthic Habitat	Project Site	5-1 (26)	Identification of coral, seagrass and mangrove locations on engineering drawings and construction plans	EMP §10.12	Planning Stage	-	TPSA
8	P	Desk study Design & construction of Port	Workplace environment condition	5 - Benthic Habitat	Project Site	5-2 (26)	Implement the BAP & establish offset equivalent to 3.5 ha mangrove and 15 ha seagrass	EMP §10.12	Planning Stage	-	TPSA and PMU
9	P	Desk study Design & construction of Port	Workplace environment condition	5 - Benthic Habitat	Project Site	-	NA as there is no marine operation during Pre-Construction Phase	-	-	-	
10	P	Desk study Design & construction of Port	Workplace environment condition	7 - Invasive Marine Species	Project Site	-	NA as there is no marine operation during Pre-Construction Phase		-	-	
11	P	Desk study Design & construction of Port	Workplace environment condition	8 - Marine Megafauna	Offset Area	8-1 (15)	Implement the BAP & establish offset equivalent to 3.5 ha mangrove and 15 ha seagrass	EMP §10.11	Planning Stage	-	TPSA and PMU
12	P	Desk study Design & construction of Port	Workplace environment condition	9 - Underwater noise	Project Site	-	NA as there is no marine operation during Pre-Construction Phase		-	-	
13	P	Desk study Design & construction of Port	Workplace environment condition	10- Lighting	Project Site	-	NA as there is no Construction operation during Pre-Construction Phase		-	-	
14	P	Desk study Design & construction of Port	Workplace environment condition	11- Offshore disposal	Project Site	-	NA as there is no marine operation during Pre-Construction Phase		-	-	

**Stages = P:PreConstruction, C: Construction,*

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
15	P	Desk study Design & construction of Port	Workplace environment condition	12- Terrestrial fauna (incl. birds)	Offset Area	12-1 (9)	Implement the BAP & establish offset equivalent to 3.5 ha mangrove and 15 ha seagrass	EMP §10.10	Planning Stage	-	TPSA and PMU
16	P	Desk study Design & construction of Port	Workplace environment condition	12- Terrestrial fauna (incl. birds)	Project Site	12-2 (9)	Reclamation of land through alternative use of dredge spoil material if possible, thereby reducing the need to clear terrestrial vegetation for infrastructure and limiting the potential habitat destruction for terrestrial fauna	Terrestrial §10.2 EIS §9.13.4	Planning Stage	-	TPSA
17	P	Desk study Design & construction of Port	Workplace environment condition	12- Terrestrial fauna (incl. birds)	Project Site	12-3 (9)	Selection of the site to limit impact on habitat with the site selected having the lowest possible impact footprint of all the configuration options	Terrestrial §10.2 EIS §9.13.4	Planning Stage	-	TPSA
18	P	Desk study Design & construction of Port	Workplace environment condition	13- Terrestrial vegetation	Project Site	13-1 (5)	Reclamation of land through alternative use of dredge spoil material if possible, thereby reducing the need to clear terrestrial vegetation for infrastructure	Terrestrial §10.1	Planning Stage	-	TPSA
19	P	Desk study Design & construction of Port	Workplace environment condition	13- Terrestrial vegetation	Project Site	13-2 (5)	Selection of the site to limit impact on habitat with the site selected having the lowest possible clearing footprint of all the configuration options	Terrestrial §10.1	Planning Stage	-	TPSA
20	P	Desk study Design & construction of Port	Workplace environment condition	14- Traffic	Project Site	14-1 (11)	Traffic Management Plan	EMP §12.13	Planning Stage	-	TPSA (D&C)
21	P	Desk study Design & construction of Port	Workplace environment condition	15- Employment	Project Site	15-1 (15)	The Concessionaire and the Grantor will coordinate with Secretary of State for Professional Training and Employment Policy SEPFOPE to gear its training program at the local vocational training centre to jobs available at the port	SIA §9	Planning Stage	-	TPSA and PMU
22	P	Desk study Design & construction of Port	Settlement and Livelihood	16- Fishing	Project Site	16-1 (6)	Resettlement Action Plan. Livelihood Restoration Plan.	EMP §10.17 EIS §9.27.4	Planning Stage	-	PMU
23	P	Desk study Design & construction of Port	Settlement and Livelihood	17- Population and community	Project Site	17-1 (5)	The impact on community during the project will be addressed by resettlement and compensation to be undertaken by the GoTL.	EMP §10.19	Planning Stage	-	PMU
24	P	Desk study Design & construction of Port	Settlement and Livelihood	17- Population and community	Project Site	17-2 (5)	Continuous and ongoing consultation with stakeholders throughout the project life	EMP §10.22 EIS §9.26.4	Planning Stage	-	PMU and TPSA

Environmental Assessment & Mitigation Plan of Tibar Port

**Stages = P:PreConstruction, C: Construction,*

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
25	P	Desk study Design & construction of Port	Cultural Heritage Site	18- Cultural Heritage	Project Site	18-1 (7)	Wherever possible, construction and dredging should avoid the identified Sacred and Cultural Heritage Sites	Cultural §8 EIS §1.8	Planning Stage	-	TPSA
26	P	Desk study Design & construction of Port	Mangroves	19- BAP (Mangroves)	Project Site	19-1 (13)	H1.1. Reduce or eliminate impact on mangroves as part of the final project configuration and design	BAP §11.1.1	Planning Stage		TPSA
27	P	Desk study Design & construction of Port	Mangroves	19- BAP (Mangroves)	Project Site	19-2 (13)	H1.2. When mangrove trees are cleared, ensure that the material is able to be re-used by the community or elsewhere on the project	BAP §11.1.1	Planning Stage		TPSA (D&C)
28	P	Desk study Design & construction of Port	Mangroves	19- BAP (Mangroves)	Project Site	19-3 (13)	- H1.3. The existing mangrove habitat within the Study Area require supporting conservation actions and a Conservation Plan. This includes the 16.4ha of mangroves located on the western boundary of Tibar Bay. Despite their current generally poor condition, they are Critical Habitat. - Active rehabilitation of the mangrove area by planting and/or transplanting mangrove plants - Grantor to strongly assist to obtain all required authorizations	- BAP §11.1.1 - BAP §14.1	Planning Stage		TPSA and PMU (EXT)
29	P	Desk study Design & construction of Port	Mangroves	19- BAP (Mangroves)	Offset Area	19-4 (13)	H1.4. Establish an offset area which comprises mangroves with the same; or similar composition and ecological function as the mangroves which have been cleared. This is to ensure conservation into perpetuity. In the Biodiversity Action Plan document, this has been proposed to take the form of a Community-managed conservation area. - Grantor to strongly assist to obtain all required authorizations	BAP §11.1.1	Planning Stage		TPSA and PMU (EXT)
30	P	Desk study Design & construction of Port	Mangroves	19- BAP (Mangroves)	Project Site	19-5 (13)	Community engagement to reinforce Tara Bandu in the conservation of remnant mangrove stands and the development of alternative sources for building material and wood	BAP §14.1	Planning Stage		TPSA and PMU

Stages = P:PreConstruction, C: Construction,

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
31	P	Desk study Design & construction of Port	Mangroves	19- BAP (Mangroves)	Project Site	19-6 (13)	- Community engagement to spearhead the development of alternative fodder sources for livestock with the aim to eliminate the need for livestock to access in the Mangrove stands within Tibar Bay.	BAP §14.1	Planning Stage		TPSA and PMU
32	P	Desk study Design & construction of Port	Mangroves	19- BAP (Mangroves)	Project Site	19-7 (13)	Establish and encourage the implementation of an alternative to wood-burning to manufacture salt within the community e.g Solar Salt farming	BAP §14.1	Planning Stage		PMU and TPSA
33	P	Desk study Design & construction of Port	Mangroves	19- BAP (Mangroves)	Project Site	19-8 (13)	Monitor and manage any grievances from the community regarding access to fishing resources	BAP §11.4	As per Grievance mechanism		PMU and TPSA
34	P	Desk study Design & construction of Port	Mangroves	20- BAP (Mangroves)	Project Site	20-1 (6)	H2.1 Following clearing and during construction, impact should be limited to remaining existing seagrass habitat immediately to the east of the project area and to the north of Tibar Bay	BAP §11.1.2	Planning Stage	-	TPSA
35	P	Desk study Design & construction of Port	Mudflat/Seagrass	20- BAP (Mudflat/Seagrass)	Project Site	20-2 (6)	- H2.2. The existing seagrass habitat within the Study Area require supporting conservation actions and a Conservation Plan. This includes the 7.7ha of remaining seagrass located in Tibar Bay. - Grantor to strongly assist to obtain all required authorizations	BAP §11.1.2	Planning Stage	-	TPSA and PMU (EXT)
36	P	Desk study Design & construction of Port	Mudflat/Seagrass	20- BAP (Mudflat/Seagrass)	Offset Area	20-3 (6)	- H2.3. Establish an offset area which comprises mudflat and seagrass with the same; or similar composition and ecological function as the mudflat and seagrass which have been cleared. This is to ensure conservation into perpetuity. - Grantor to strongly assist to obtain all required authorizations	BAP §11.1.2	Planning Stage	-	TPSA and PMU (EXT)
37	P	Desk study Design & construction of Port	Mudflat/Seagrass	20- BAP (Mudflat/Seagrass)	Project Site	20-4 (6)	Monitor and manage any grievances from the community regarding access to fishing resources	BAP §11.4	As per Grievance mechanism	-	PMU and TPSA
38	P	Desk study Design & construction of Port	Birds and Turtle	21- BAP (Birds and Turtles)	Project Site	21-1 (7)	S1.1. Reduce or eliminate impact on bird habitat (incl. mudflats and mangroves) as part of the final project configuration and design	BAP §11.2.1	Planning Stage	-	TPSA

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No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
39	P	Desk study Design & construction of Port	Birds and Turtle	21- BAP (Birds and Turtles)	Offset Area	21-2 (7)	S1.2. Establish artificial rock outcrops in similar tide-range environment on the northern-most edge of Tibar Bay for bird perches	Terrestrial §10.3 BAP §11.2.1	Planning Stage	-	TPSA (D&C)
40	P	Desk study Design & construction of Port	Birds and Turtle	21- BAP (Birds and Turtles)	Offset Area	21-3 (7)	- S1.3 Establish a Conservation Area within Tibar Bay to protect the habitat visited by birds during migration; providing a permanent link with Lake Tasitolu. - Grantor to strongly assist to obtain all required authorizations	Terrestrial §10.3 BAP §11.2.1	Planning Stage	-	TPSA and PMU (EXT)
41	P	Desk study Design & construction of Port	Birds and Turtle	21- BAP (Birds and Turtles)	Project Site	21-4 (7)	S2.1. Reduce or eliminate impact on turtle habitat as part of the final project configuration and design	BAP §11.3	Planning Stage	-	TPSA
42	P	Desk study Design & construction of Port	Birds and Turtle	21- BAP (Birds and Turtles)	Project Site	21-5 (7)	S2.2. Establish turtle rookery and/or protection area at the beach at Fahi Obuk	BAP §11.3	Planning Stage	-	TPSA and PMU (EXT)
43	P	Desk study Design & construction of Port	Ecosystem at Affected Areas	22- BAP (Ecosystem Services)	Offset Area	22-1 (5)	Implement the BAP & establish offset equivalent to 3.5 ha mangrove and 15 ha seagrass	EMP §10.10	Planning stage	-	TPSA and PMU
44	P	Desk study Design & construction of Port	Ecosystem at Affected Areas	22- BAP (Ecosystem Services)	Offset Area	22-2 (5)	E1.1. Undertake consultation to quantify the uses of any proposed offset area to ensure that their access is maintained or compensated	BAP §11.4.1	Planning stage	-	TPSA and PMU
45	P	Desk study Design & construction of Port	Ecosystem at Affected Areas	22- BAP (Ecosystem Services)	Project Site	22-3 (5)	Monitor and manage any grievances from the community regarding access to fishing resources	BAP §11.4 EIS §9.20.4	As per Grievance mechanism	-	PMU and TPSA
46	P	Desk study Design & construction of Port	Mudflat/Seagrass	23- BAP (Regulating ES)	Offset Area	23-1 (3)	- E2.1. Establish a Community-managed Conservation Area to incorporate seagrass and mudflat habitat. - Grantor to strongly assist to obtain all required authorizations	BAP §11.3.2	Planning Stage	-	TPSA and PMU (EXT)
47	P	Desk study Design & construction of Port	Carbon emission from running vehicle engine	23- BAP (Regulating ES)	Project Site	23-2 (3)	E2.2. Purchase carbon sequestration credits from the certified community-based Withoneseed program being run on the western edge of Timor-Leste, thereby offsetting the impact on CO2 sequestration and investing directly into the country, which has a socio-economic benefit	BAP §11.3.2	Planning Stage	-	TPSA

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No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
48	P	Desk study Design & construction of Port	Carbon emission from running vehicle engine	23- BAP (Regulating ES)	Project Site	23-3 (3)	Verify the alternative sequestration has been implemented.	BAP §11.4	Planning Stage	-	TPSA
49	P	Desk study Design & construction of Port	Settlement and Livelihood	24- Impact on structures in Directly Impacted Areas and Crops/productive trees	Project Site	24-1 (3)	A RAP/Compensation Plan including a livelihood restoration component that adheres to the national law and IFC PS 5 should be prepared and implemented.	SIA §8.2.1 SIA §8.2.2	Planning Stage	-	PMU
50	P	Desk study Design & construction of Port	Settlement and Livelihood	24- Impact on structures in Directly Impacted Areas and Crops/productive trees	Project Site	24-2 (3)	1.2. Establish and implement Grievance mechanism in line with IFC PS 1	SIA §8.2.1 SIA §8.2.2	Planning Stage	-	PMU and TPSA
51	P	Desk study Design & construction of Port	Settlement and Livelihood	24- Impact on structures in Directly Impacted Areas and Crops/productive trees	Project Site	24-3 (3)	1.3. Set-up an Organization Structure and establish the Institutional Plan to ensure effective and efficient implementation of all plans (e.g. RAP/LRP, etc.) from pre-construction to operation phase of the project	SIA §8.2.1 SIA §8.2.2	Planning Stage	-	PMU
52	P	Desk study Design & construction of Port	Settlement and Livelihood	25- Livelihoods	Project Site	25-1 (2)	Livelihood Restoration Component will be incorporated together with the RAP and will include the provision of allowance for temporary loss of income from fishing, allowance for temporary loss of income from employment, accessibility to training provided for potential employment in the construction and operational phases of the project. This training and the associated employment opportunity as a result of increased skills will be discussed, re-updated and implemented with the concessionaire's support within the framework of the proposed Local Development Plan.	SIA §8.2.3 EIS §9.27.4	Planning Stage	Paid by GoTL	PMU
53	P	Desk study Design & construction of Port	Settlement and Livelihood	25- Livelihoods	Project Site	25-2 (2)	Establish and implement Grievance mechanism in line with IFC PS 1	SIA §8.2.3 EIS §9.27.4	Planning Stage	-	PMU and TPSA
54	P	Desk study Design & construction of Port	Settlement and Livelihood	26- Income for businesses	Project Site	26-1 (4)	The government will give due consideration to affected businesses on the approval of new relocation site proposed by them as well as granting them the license to operate with proper application documents filed to concerned	SIA §8.2.4	Planning Stage	Paid by GoTL	PMU

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No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
							entities.				
55	P	Desk study Design & construction of Port	Settlement and Livelihood	26- Income for businesses	Project Site	26-2 (4)	Establish and implement Grievance mechanism in line with IFC PS 1	SIA §8.2.4 EIS §9.28.4	Planning Stage	-	PMU and TPSA
56	P	Desk study Design & construction of Port	Settlement and Livelihood	26- Income for businesses	Project Site	26-3 (4)	Businesses will be provided with sufficient time to transfer to other locations.	SIA §8.2.4	Planning Stage	Paid by GoTL	PMU
57	P	Desk study Design & construction of Port	Settlement and Livelihood	26- Income for businesses	Project Site	26-4 (4)	The Livelihood Restoration Component will be incorporated together with the RAP and will include the provision of allowance for temporary loss of income from fishing, allowance for temporary loss of income from employment, accessibility to training provided for potential employment in the construction and operational phases of the project.	SIA §8.2.4 EIS §9.27.4 EIS §9.28.4	Planning Stage	Paid by GoTL	PMU
58	P	Desk study Design & construction of Port	NA as there is no marine activities during Pre Construction Phase	27- Impacts on access to the deeper ocean, fishing ground within the Bay, increased in turbidity and reduction in sources of livelihood	Project Site	-	NA as there is no marine activities during Pre Construction Phase		Planning Stage	-	
59	P	Desk study Design & construction of Port	NA as there is no activities on site	28- Population Influx	Project Site	-	NA as there is no activities on site		-	-	
60	P	Desk study Design & construction of Port	Health of Population	29- Community Heathly and Safety	Project Site	29-1 (9)	Consulting with NGOs in the area that may support operations at the nearby health centres, with special focus on refurbishment of key areas, equipment and building maintenance, as well as, improved health care management information systems as part of its CSR program	EMP §10.21 EIS §9.25.4	Planning Stage	-	TPSA
61	P	Desk study Design & construction of Port	Employment	30- APORTIL staff numbers will be reduced with the building of the new port	Project Site	-	NA as Employment will be settle before Operation Phase		-	-	

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No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
62	P	Desk study Design & construction of Port	Visual of the Projects	31- Visual impact of the port on local tourist operator and community	Project Site	-	NA as construction will only completed by Operation Phase		-	-	
63	C	Earthworks & Trenching	Dusty environment	1 - Air Quality	Project Site	1-3 (19)	All areas with vehicle traffic shall be watered or have dust palliative applied and all material transported off-site shall be sufficiently watered	Air quality §8 Terrestrial §10.1 & 10.2 EMP §10.4 EMP §10.21 EIS §9.5.4 EIS §9.8.4 EIS §9.13.4 EIS §9.25.4	Regular Basis	Part of Air Quality ≈ $96,322	TPSA (D&C)
64	C	Mobilization of project materials	Dust resulted from the high speed transportation vehicle	1 - Air Quality	Project Site	1-4 (19)	All on-site vehicle traffic shall be limited to a speed of 15 mph on unpaved roads.	Air quality §8 EMP §10.4 EIS §9.5.4 EIS §9.8.4 EIS §9.16.4	Regular Basis	Part of Air Quality ≈ $96,322	TPSA
65	C	Mobilization of project materials	Waste of fuel from running engine	1 - Air Quality	Project Site	1-5 (19)	No vehicles or plant will be left idling unnecessarily.	Air quality §8 EMP §10.4 EIS §9.5.4 EIS §9.8.4	Regular Basis	Part of Air Quality ≈ $96,322	TPSA
66	C	Mobilization of project materials	Carbon emission from running vehicle engine	1 - Air Quality	Project Site	1-6 (19)	Use a good quality fuel (e.g. with low sulphur content)	Air quality §8 EMP §10.4 EIS §9.5.4 EIS §9.8.4	Regular Basis	Part of Air Quality ≈ $96,322	TPSA
67	C	Mobilization of project materials	Gas emission from engine (exhaust)	1 - Air Quality	Project Site	1-7 (19)	Vehicles, plant, engines and exhaust systems shall be well maintained	Air quality §8 EIS §9.5.4 EIS §9.8.4	Semi-Annual	Part of Air Quality ≈ $96,322	TPSA
68	C	Mobilization of project materials	Gas emission from engine (exhaust)	1 - Air Quality	Project Site	1-8 (19)	All heavy duty vehicles should meet emission regulations from local Environmental Protection Agency	EMP §10.4	Semi-Annual	Part of Air Quality ≈ $96,322	TPSA
69	C	Running Heavy equipment to build the port	Pollution to environment	1 - Air Quality	Project Site	1-9 (19)	Install Automated Weather Station (AWS) recording daily measurements of: - Station identification number - State and time of record/observation - Air, wet bulb and wet dew point temperatures - Precipitation and evaporation - Relative humidity - Wind speed and direction - Solar radiation - Barometric pressure - Visibility - Cloud cover - Cloud ceiling height, if practicable	-Carbon monoxide ; 1 hour = 40,000 µg/m3 Annual = Max 1 -Nitrogen dioxide ; 1 hour = 200 µg/m3 Annual = 40 µg/m3 -Photochemical oxidants (as ozone) ; 1 hour = 235 µg/m3 -Sulfur dioxide ; 1 hour = 350 µg/m3 24 hour = 125 µg/m3 -Particles as PM2.5 ; 24 hour = 75 µg/m3 Annual = 70 µg/m3 EMP §12.1 EMP §12.28.2	Daily	Part of Air Quality ≈ $96,322	TPSA (D&C)

Environmental Assessment & Mitigation Plan of Tibar Port

**Stages = P:PreConstruction, C: Construction,*

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
70	C	Running Heavy equipment to build the port	Pollution to people	1 - Air Quality	Tibar Retreat, Tibar Primary School	1-10 (19)	A monitoring and reporting program as required per the Grievance Mechanism, monitor the air quality in the following sensitive receptors: - AQ1 – Tibar Retreat. - AQ2 – Tibar Primary School. The monitoring stations are derived from the Baseline Air Quality monitoring survey (Advisian, 2016a). The monitoring program should assess and report on PM10 and PM2.5.	Air Quality §10 EMP §12.4 EMP §12.28.2 EMP §13.1	As per Grievance Mechanism	Part of Air Quality ≈ $96,322	TPSA (D&C)
71	C	Clearing of Site/Area - excavation, piling, pouring of concrete foundations, Dredging, Land Reclamation, Structure Building, Establishment of Bund, Haulage of building materials by trucks, Piling and Construction of Jetty, Construction of Internal road	Noise and Vibration resulted from the high speed transportation vehicle and Piling	2 - Noise and vibration	Project Site	2-3 (13)	Use selected equipment with the lowest possible noise specifications. If a noise complaint is recorded through the grievance framework and monitoring confirms it is above the guideline level a retrofit mitigation measure will be implemented. e.g. temporary barriers	Noise §7.2 EMP §10.5 EMP §10.21 EIS §1.8 EIS §9.9.4	Regular Basis	Part of Noise & Vibration ≈ $23,351	TPSA (D&C)
72	C	Clearing of Site/Area - excavation, piling, pouring of concrete foundations, Dredging, Land Reclamation, Structure Building, Establishment of Bund, Piling and Construction of Jetty, Construction of Internal road	Storage and transportation of material	2 - Noise and vibration	Project Site	2-4 (13)	Storage areas should be located away from sensitive receptors	Noise §7.2 EIS §9.9.4	Regular Basis	Part of Noise & Vibration ≈ $23,351	TPSA
73	C	Clearing of Site/Area - excavation, piling, pouring of concrete foundations, Dredging, Land Reclamation, Structure Building, Establishment of Bund, Haulage of building materials by trucks, Piling and Construction of Jetty, Construction of Internal road	Noise and Vibration resulted from the high speed transportation vehicle and Piling	2 - Noise and vibration	Project Site	2-5 (13)	Haulage of goods and movement of vehicles/people and equipment can be scheduled and sequenced to reduce the number of noisy operations.	Noise §7.2 EMP §10.21 EIS §9.25.4	Regular Basis	Part of Noise & Vibration ≈ $23,351	TPSA
74	C	Clearing of Site/Area - excavation, piling, pouring of concrete foundations, Structure Building, Establishment of Bund, Haulage of building materials by trucks, Piling and Construction of Jetty, Construction of Internal road	Noise and Vibration resulted from the high speed transportation vehicle and Piling	2 - Noise and vibration	Project Site	2-6 (13)	Alternative construction methods and selection of less noisy equipment to do the tasks	Noise §7.2 EMP §10.21 EIS §9.25.4	Regular Basis	Part of Noise & Vibration ≈ $23,351	TPSA

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No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
75	C	Clearing of Site/Area - excavation, piling, Piling and Construction of Jetty	Noise and Vibration resulted from Piling	2 - Noise and vibration	Project Site	2-7 (13)	Where practicable, limiting of piling activities to day light hours.	EMP §10.5 EIS §1.8 EIS §9.14.4	Regular Basis	Part of Noise & Vibration ≈ $23,351	TPSA
76	C	Clearing of Site/Area - excavation, piling, pouring of concrete foundations, Dredging, Land Reclamation, Structure Building, Establishment of Bund, Haulage of building materials by trucks, Piling and Construction of Jetty, Construction of Internal road	Noise and Vibration resulted from the high speed transportation vehicle and Piling	2 - Noise and vibration	Project Site	2-8 (13)	Measurements as required per the Grievance Mechanism at sensitive receptors i.e. Tibar Retreat. Tibar Primary School. Results interpretation and review of the EMP as required.	EMP §12.5 EMP §12.28.2 EMP §13.1	As per Grievance Mechanism	Part of Noise & Vibration ≈ $23,351	TPSA (D&C)
77	C	Haulage of building materials by trucks, Piling and Construction of Jetty	Noise and Vibration resulted from the high speed transportation vehicle and Piling	2 - Noise and vibration	Project Site	2-9 (13)	Collation of results into semi-annual or annual Environmental Report to NDCPEI.	EMP §12.5 EMP §13.1	Semi-Annual or Annual	Part of Noise & Vibration ≈ $23,351	TPSA
78	C	Clearing of Site/Area - excavation, piling, pouring of concrete foundations, Dredging, Land Reclamation, Structure Building, Establishment of Bund, Haulage of building materials by trucks, Piling and Construction of Jetty, Construction of Internal road	Pollution to environment	3 - Sedimentation	Project Site	3-2 (4)	Culverts on the project site and along the road adjacent to the site to be maintained and kept free of sediment and debris.	Hydro §5 & 6 EMP §12.2 EIS §9.6.4 EIS §9.11.4	Regular Basis	Included in D&C contract	TPSA (D&C)
79	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Unnecessary removal of natural material	4 - Water Quality	Project Site	4-2 (17)	Installation of a satellite-based vessel monitoring system on the dredge, allowing a track plot analysis to ensure maximum efficiency of the dredging effort and to ensure no dredging occurs outside the approved area.	DMP §5.1 EMP §10.12	Regular Basis	Part of Water Quality ≈ $14,594	TPSA (D&C)
80	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Turbidity of the water	4 - Water Quality	Project Site	4-3 (17)	Use of suitable dredging plant and equipment to minimise turbidity, including well maintained pipelines to be utilised to minimise leakage of turbid water during pumping of material to the reclamation zone and/or to the offshore disposal site.	DMP §5.1 EMP §10.12	Regular Basis	Part of Water Quality ≈ $14,594	TPSA (D&C)
81	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Unnecessary removal of natural material	4 - Water Quality	Project Site	4-4 (17)	Maintaining calibration of the hydrographic survey systems on board the dredge to minimise the likelihood of over dredging.	DMP §5.1 EMP §10.12	Regular Basis	Part of Water Quality ≈ $14,594	TPSA (D&C)
82	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Pollution to environment	4 - Water Quality	Project Site	4-5 (17)	Cleaning of all oil, fuel and waste spills immediately. Hydrocarbon spill report	Hydro §5 DMP §7 EIS §9.11.4	Regular Basis	Part of Water Quality ≈ $14,594	TPSA (D&C)

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No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
83	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Pollution to environment	4 - Water Quality	Project Site	4-6 (17)	Waste management procedure to control litter	- E.Coli : 0 mg/L in 100 mL sample - Nitrate : 50 mg/L - Nitrite : 3 mg/L - Chlorine : 5 mg/L - Copper : 2 mg/L - Lead : 0.01 mg/L - Nickel : 0.07 mg/L Hydro §5 EIS §9.11.4	Regular Basis	Part of Water Quality ≈ $14,594	TPSA (D&C)
84	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Flooding	4 - Water Quality	Project Site	4-7 (17)	Mitigation of flooding during extreme runoff events through the use of berms and diversion drains to limit flooding of the construction site	Hydro §5 EIS §9.11.4	Regular Basis	Part of Water Quality ≈ $14,594	TPSA (D&C)
85	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Pollution to environment	4 - Water Quality	Project Site	4-8 (17)	Correct operation and maintenance of waste water treatment unit	Hydro §5 & 6 EIS §9.11.4	Regular Basis	Part of Water Quality ≈ $14,594	TPSA (D&C)
86	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Pollution to environment	4 - Water Quality	Project Site	4-9 (17)	Dredge Contractor to monitor the operation on a continual basis and report any incidents that are likely to cause substantial changes to water quality to the engineer/employer.	DMP §5.1 EMP §12.12	Continual Basis	Part of Water Quality ≈ $14,594	TPSA (D&C)
87	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Turbidity of the water	4 - Water Quality	Project Site	4-10 (17)	Results of the monitoring of turbidity at impact and reference locations. Commentary on any trigger exceedances and resulting management measures	DMP §6.2 DMP §7 EMP §12.8 EMP §12.28.2 EMP §13.1	Continual Basis	Part of Water Quality ≈ $14,594	TPSA (D&C)
88	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Turbidity of the water, Pollution to environment	4 - Water Quality	Project Site	4-11 (17)	Monthly monitoring of sediment deposition. Commentary on any trigger exceedances and resulting management measures	DMP §6.2 DMP §7 EMP §12.8 EMP §12.28.2 EMP §13.1	Monthly	Part of Water Quality ≈ $14,594	TPSA (D&C)
89	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty		4 - Water Quality	Project Site	4-12 (17)	Dredge tracking reports.	DMP §7	Daily	Part of Water Quality ≈ $14,594	TPSA
90	C	Dredging	Damage to coral reef	5 - Benthic Habitat	Project Site	5-3 (26)	To minimise damage to coral reef habitat in the immediate construction area, all construction vessels must limit anchoring over areas of sensitive habitat including mapped seagrass beds and areas of subtidal coral reef	Marine §9.1 EMP §10.12	Regular Basis	Part of Benthic Habitat ≈ $189,726	TPSA

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No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
91	C	Dredging	Damage to marine habitats	5 - Benthic Habitat	Project Site	5-4 (26)	To minimise unnecessary damage to marine habitats Contractor(s) must limit any unnecessary / temporary construction (i.e. through selection of the most appropriate construction methods) and limit any anchoring which is required by vessels.	Marine §9.1 EMP §10.12	Regular Basis	Part of Benthic Habitat ≈ $189,726	TPSA
92	C	Dredging	Turbidity of the water	5 - Benthic Habitat	Project Site	5-5 (26)	Dredging operations ceased if levels of suspended sediment become higher than trigger values developed for the Project.	Marine §9.1 EMP §10.12	Regular Basis	Part of Benthic Habitat ≈ $189,726	TPSA (D&C)
93	C	Dredging	Biodiversity of the Affected Areas	5 - Benthic Habitat	Project Site	5-6 (26)	Implement the BAP & establish offset equivalent to 3.5 ha mangrove and 15 ha seagrass		Regular Basis	Part of Benthic Habitat ≈ $189,726	TPSA and PMU
94	C	Dredging	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-7 (26)	The Vessel Master will be responsible for the management of any spill response during construction activities	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $189,726	TPSA (D&C)
95	C	Dredging	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-8 (26)	As required under MARPOL 73/78 Annex I/ Marine Order 91 all construction greater than 400 gross tonnes must carry, a SOPEP	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $189,726	TPSA (D&C)
96	C	Dredging	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-9 (26)	The Vessel Master will form and incident management team to response to any spills	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $189,726	TPSA (D&C)
97	C	Dredging	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-10 (26)	In the event of a hydrocarbon spill, the Vessel Master will implement available controls and resources of the SOPEP	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $189,726	TPSA (D&C)
98	C	Dredging	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-11 (26)	An oil spill response drill will be undertaken in accordance with SOPEP requirements on all vessels prior to conducting the activity (within 3 months prior)	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $189,726	TPSA (D&C)
99	C	Dredging	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-12 (26)	The Vessel Master will have sufficient boom onsite to fully encircle the largest vessel	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $189,726	TPSA (D&C)
100	C	Dredging	Pollutions to the waters and mangroves	5 - Benthic Habitat	Project Site	5-13 (26)	If the spill from the vessel cannot be contained and the mangroves to the west of Tibar Bay are at risk the protection/containment boom will be installed to protect the mangroves. The boom will be deployed to protect the area of mangroves with the highest canopy cover and where it will be most effective	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $189,726	TPSA (D&C)

Stages = P:PreConstruction, C: Construction,

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
101	C	Dredging	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-14 (26)	Implementation of water quality monitoring as described in the Tiered Monitoring and Management Framework	Marine §9.1 DMP §5.1 DMP §6.7.1 EMP §12.12 EMP §12.28.2 EMP §13.1	Continual Basis	Part of Benthic Habitat ≈ $189,726	TPSA (D&C)
102	C	Dredging	Pollution to Coral + Mangroves + Mudflat/Seagrass	5 - Benthic Habitat	Project Site	5-15 (26)	Reactive benthic habitat (Coral + Mangrove + Mudflat/Seagrass) monitoring in accordance with the tiered management framework Comparison to baseline and reference data.	DMP §5.1 DMP §6.5 DMP §6.6 DMP §6.7.2 DMP §7 EMP §10.12 EMP §12.8 EMP §12.12 EMP §12.28.2 EMP §13.1	In accordance with the tiered manageme nt framework	Part of Benthic Habitat ≈ $189,726	TPSA (EXT)
103	C	Dredging		5 - Benthic Habitat	Project Site	5-16 (26)	In the event of a spill the Vessel Master will make notifications outlined in Section 4	PMSCP §8	Event Trigger	Part of Benthic Habitat ≈ $189,726	TPSA
104	C	Land Reclamation	Turbidity of the water	6 - Reclamation	Project Site	6-1 (8)	Maximise the residence time in the reclamation area to reduce the turbidity plume of the tailwater discharge. Suitable controls (e.g. weir boxes) will be used at the discharge point to control the water level and the rate of discharge;	DMP §5.1 EMP §10.12	Regular Basis	Part of Reclamation ≈ $58,377	TPSA (D&C)
105	C	Land Reclamation	Turbidity of the water	6 - Reclamation	Project Site	6-2 (8)	Cease dewatering or move tailwater within reclamation cells when turbidity is excessive;	DMP §5.1 EMP §10.12	Regular Basis	Part of Reclamation ≈ $58,377	TPSA (D&C)
106	C	Land Reclamation	Turbidity of the water	6 - Reclamation	Project Site	6-3 (8)	Regular inspection and maintenance of erosion and sediment control structures particularly following heavy or prolonged rainfall;	DMP §5.1 EMP §10.12	Regular Basis	Part of Reclamation ≈ $58,377	TPSA (D&C)
107	C	Land Reclamation	Soil erosion leading to pollution to the environment	6 - Reclamation	Project Site	6-4 (8)	Stabilise uncovered areas of soil promptly	DMP §5.1 EMP §10.12	Regular Basis	Part of Reclamation ≈ $58,377	TPSA (D&C)
108	C	Land Reclamation	Soil erosion leading to pollution to the environment	6 - Reclamation	Project Site	6-5 (8)	Install scour protection measures such as gabions where scouring is likely to occur.	DMP §5.1 EMP §10.12	Regular Basis	Part of Reclamation ≈ $58,377	TPSA (D&C)
109	C	Land Reclamation	Soil Pollution	6 - Reclamation	Project Site	6-6 (8)	Lime dosing due to PASS at a rate of 14 kg CaCO3/t	EMP §10.3	Regular Basis	Part of Reclamation ≈ $58,377	TPSA (D&C)

Stages = P:PreConstruction, C: Construction,

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
110	C	Land Reclamation	Pollution to the waters	6 - Reclamation	Project Site	6-7 (8)	Monitoring per the Water Quality requirements regarding turbidity, dissolved oxygen, conductivity, pH and temperature.	DMP §6.3	Daily	Part of Reclamation ≈ $58,377	TPSA (D&C)
111	C	Land Reclamation	Soil Pollution	6 - Reclamation	Project Site	6-8 (8)	PASS Verification testing of treated dredge material shall be conducted at a frequency of 1 sample per 250 m3 of dried material All samples will be subjected to on-site field testing for (pHF and pHFOX). The dredge material ASS performance criteria are : Medium Acceptable Threshold Untreated Dredge Material pHF > 4 pHFOX > 4 Treated Dredge Material pHF > 6.5 pHFOX > 6.5 If samples of treated dredge material are not within acceptable thresholds, the relevant materials shall be re-treated and re-tested, until successful treatment has been achieved	- Aluminium : 55 µg/L - Chromium (VI) : 1 µg/L - Nickel : 11 µg/L - Benzene : 950 µg/L - Phenol : 320 µg/L - Lead : 3.4 µg/L - Manganese : 1,900 µg/L - Mercury (total) : 0.06 µg/L - Zinc : 8 µg/L - Ammonia (NH3-N) : 900 µg/L - Ethanol : 1,400 µg/L DMP §6.4 EIS §9.7.4	If PASS confirmed, 1 sample per 250 m3	Part of Reclamation ≈ $58,377	TPSA (D&C)
112	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Potential Impact to Invasive Marine health	7 - Invasive Marine Species	Project Site	7-1 (5)	All contractors to adopt the Ballast Water Convention (2004)	DMP §5.2 EMP §10.12	Regular Basis	Included in D&C contract	TPSA (D&C)
113	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Potential Impact to Invasive Marine health	7 - Invasive Marine Species	Project Site	7-2 (5)	All contractors to comply with the Guidelines in the Ballast Water Convention (2004) Contractors to comply with INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004 (BWM CONVENTION)	DMP §5.2 EMP §10.12	Regular Basis	Included in D&C contract	TPSA (D&C)
114	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Potential Impact to Invasive Marine health	7 - Invasive Marine Species	Project Site	7-3 (5)	All ships at sea must adhere with the amendments to the International Maritime Organisation’s (IMO’s) International Convention for the Prevention of Pollution from Ships (Marine Pollution: MARPOL) Annex V	EMP §10.8	Regular Basis	Included in D&C contract	TPSA
115	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna	Project Site	8-2 (15)	Procedures for marine fauna interaction shall be developed for vessels to reduce the potential impacts to marine fauna.	DMP §5.3 EMP §10.11	Regular Basis	Part of Marine Megafauna ≈ $14,594	TPSA (D&C)
116	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna	Project Site	8-3 (15)	All work-site personnel shall be inducted regarding the proper response to fauna interaction (including unexpected encounters).	DMP §5.3 EMP §10.11	Regular Basis	Part of Marine Megafauna ≈ $14,594	TPSA (D&C)

Environmental Assessment & Mitigation Plan of Tibar Port

**Stages = P:PreConstruction, C: Construction,*

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
117	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna	Project Site	8-4 (15)	The Dredge Contractor shall appoint an individual on each vessel who is trained in faunal observation and distance estimation to be responsible for undertaking marine fauna observations.	Megafauna §3.1.5 DMP §5.3 EMP §10.11 EIS §1.8 EIS §9.14.4	Regular Basis	Part of Marine Megafauna ≈ $14,594	TPSA (D&C)
118	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna	Project Site	8-5 (15)	The construction workforce and all vessels will be limited to designated areas. Recreational boating, fishing, diving, spear-fishing, fossicking, (i.e. collecting shells and any other biological or natural material e.g. animal bones) will be prohibited during the Project.	DMP §5.3 EMP §10.11	Regular Basis	Part of Marine Megafauna ≈ $14,594	TPSA
119	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna	Project Site	8-6 (15)	All vessels will not travel at speeds no higher than 6 knots, 300 m of a whale (caution zone), and not approach closer than 100 m from a whale. A vessel will not approach closer than 50 m or a dolphin and/or 100 m for a whale (with the exception of animals bow riding)	Megafauna §3.2.4 EIS §1.8 EIS §9.14.4	Regular Basis	Part of Marine Megafauna ≈ $14,594	TPSA
120	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna	Project Site	8-7 (15)	Within the operating constraints of the TSHD, dredge pumps will be turned on when the draghead is as close to the seabed as possible. On completion of dredging, the pumps will be turned off as soon as practicable possible (i.e. after the pipes are clear of dredged material).	Megafauna §3.3.3 EMP §10.11	Regular Basis	Part of Marine Megafauna ≈ $14,594	TPSA
121	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna	Project Site	8-8 (15)	Turtle exclusion or turtle deflecting devices (tickler chains) will be used if turtles are continuously observed.	Megafauna §3.3.3 EMP §10.11	Regular Basis	Part of Marine Megafauna ≈ $14,594	TPSA (D&C)
122	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna	Project Site	8-9 (15)	To reduce the potential impacts of marine debris on marine fauna, waste associated with construction and operation must be managed appropriately. In addition, all ships at sea must adhere with the amendments to the International Maritime Organisation's (IMO's) International Convention for the Prevention of Pollution from Ships (Marine Pollution: MARPOL) Annex V which came into force on 1 January 2013. The amendments prohibit the discharge of all garbage from ships into the sea (except under very specific circumstances). This reverses the presumption that garbage may be discharged into the sea based on defined distances from shore and the nature of the garbage. The amendments also list requirements for garbage management plans on ships and port reception facilities for receiving waste.	Marine §9.2 EMP §10.11	Regular Basis	Part of Marine Megafauna ≈ $14,594	TPSA (D&C)

**Stages = P:PreConstruction, C: Construction,*

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
123	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna	Project Site	8-10 (15)	Observers on the vessels will maintain a watch for the marine turtles/significant marine mammals (during daylight hours) during the dredging and construction. If a significant marine mammal or reptile is sighted within the 'monitoring zone' of 400 m radius around the dredge or piling barge, it will be watched until the marine turtle/significant mammal moves outside of the monitoring zone or is not sighted for 10, 15 or 20 minutes - If the mammal or reptile does not leave the 400m monitoring area or starts to enter the 100m exclusion zone, it will be encouraged to leave the area.	Megafauna §3.3.3	Continual Basis	Part of Marine Megafauna ≈ $14,594	TPSA (D&C)
124	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna	Project Site	8-11 (15)	Marine fauna incident report: the Dredge Contractor must report any turtle, dugong or cetacean injury or mortality immediately to Engineer/Employer	DMP §7	Event Trigger	Part of Marine Megafauna ≈ $14,594	TPSA (D&C)
125	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna	Project Site	8-12 (15)	Marine fauna sighting report: species identified, behaviour, occurrence, numbers of individuals and location.	DMP §7 EMP §10.11	Event Trigger	Part of Marine Megafauna ≈ $14,594	TPSA (D&C)
126	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction and Piling Activities during Land Reclamation	Underwater Noise pollution affecting marine animals	9 - Underwater noise	Project Site	9-1 (8)	Prior to commencement of construction, designated crew (one per vessel) will be trained to observe for marine turtles and marine mammals, record sightings and any injury or mortality.	Megafauna §3.1.5 EMP §10.11	Regular Basis	Part of Underwater Noise ≈ $14,594	TPSA (D&C)
127	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction and Piling Activities during Land Reclamation	Underwater Noise pollution affecting marine animals	9 - Underwater noise	Project Site	9-2 (8)	A "soft start" procedure will be implemented for pile driving. This involves beginning a pile driving session with the lowest power possible and hammering at a low rate, then increasing hammer energy and rate to that desired. This should allow marine fauna close to the source to move away and not be suddenly exposed to sound intensities sufficient to cause them serious injury.	Megafauna §3.1.5 EMP §10.11	Regular Basis	Part of Underwater Noise ≈ $14,594	TPSA (D&C)
128	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction and Piling Activities during Land Reclamation	Underwater Noise pollution affecting marine animals	9 - Underwater noise	Project Site	9-3 (8)	Equipment and vessels shall operate in accordance with appropriate industry and equipment standards including specifications for noise levels. Regular maintenance will be conducted to the manufacturer's specifications. Equipment covers, mufflers and other noise suppression equipment shall also be maintained and in good working order at all times.	Megafauna §3.1.5 EMP §10.11	Regular Basis	Part of Underwater Noise ≈ $14,594	TPSA

**Stages = P:PreConstruction, C: Construction,*

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
129	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction and Piling Activities during Land Reclamation	Underwater Noise pollution affecting marine animals	9 - Underwater noise	Project Site	9-4 (8)	Observations of marine turtles and cetaceans are to be recorded on the Observation Record Form.	Megafauna §3.1.5 EMP §10.11	Regular Basis	Part of Underwater Noise ≈ $14,594	TPSA (D&C)
130	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction and Piling Activities during Land Reclamation	Underwater Noise pollution affecting marine animals	9 - Underwater noise	Project Site	9-5 (8)	Observers on the vessels will maintain a watch for the marine turtles/significant marine mammals (during daylight hours) during the dredging and construction. If a significant marine mammal or reptile is sighted within the 'monitoring zone' of 400 m radius around the dredge or piling barge, it will be watched until the marine turtle/significant mammal moves outside of the monitoring zone or is not sighted for 10, 15 or 20 minutes - If the mammal or reptile does not leave the 400m monitoring area or starts to enter the 100m exclusion zone, it will be encouraged to leave the area.	Megafauna §3.1.5 DMP §5.3 EMP §10.11	Regular Basis	Part of Underwater Noise ≈ $14,594	TPSA (D&C)
131	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction and Piling Activities during Land Reclamation	Underwater Noise pollution affecting marine animals	9 - Underwater noise	Project Site	9-6 (8)	The use of thrusters and excessively noisy equipment will be avoided wherever practicable and engines, thrusters and auxiliary plant will not be left in 'stand by' or 'running' mode unnecessarily	Megafauna §3.1.5 EMP §10.11	Regular Basis	Part of Underwater Noise ≈ $14,594	TPSA
132	C	All Vessel Sea Movement (Dredging, Transportation, Tugboats etc) during Construction and Piling Activities during Land Reclamation	Underwater Noise pollution affecting marine animals	9 - Underwater noise	Project Site	9-7 (8)	Marine Mammal Observations daily	Megafauna §3.1.5	Daily	Part of Underwater Noise ≈ $14,594	TPSA (D&C)
133	C	All Vessel Activities	Excessive Light pollution to the Project Area	10- Lighting	Project Site	10-1 (8)	Where practicable, vessel loading and unloading in nearshore areas shall be conducted during daylight hours. Where this is not practicable, artificial lighting shall be reduced to the minimum required for safe operations.	DMP §5.3 EMP §10.11	Regular Basis	Part of Lighting ≈ $8,757	TPSA
134	C	All Vessel Activities	Excessive Light pollution to the Project Area	10- Lighting	Project Site	10-2 (8)	Outside artificial lighting on vessels will be kept to a minimum (i.e. navigational lights and where safety dictates necessary deck lighting). Lighting should be switched off when not in use and automatic timers/sensors installed where possible.	Megafauna §3.4.5 DMP §5.3 EMP §10.11	Regular Basis	Part of Lighting ≈ $8,757	TPSA

**Stages = P:PreConstruction, C: Construction,*

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
135	C	All Construction Activities	Excessive Light pollution to the Project Area	10- Lighting	Project Site	10-3 (8)	Only necessary artificial lights shall be used. 'Unnecessary lighting' includes lighting in unused areas, decorative lighting or lighting that is brighter than needed.	Megafauna §3.4.5 DMP §5.3 EMP §10.11	Regular Basis	Part of Lighting ≈ $8,757	TPSA
136	C	All Construction Activities	Excessive Light pollution to the Project Area	10- Lighting	Project Site	10-4 (8)	Monitoring of light use after hours to ensure it is essential lighting only		Daily	Part of Lighting ≈ $8,757	TPSA (EXT)
137	C	Dredging	Turbidity of the water	11- Offshore disposal	Project Site	11-1 (3)	Use of suitable dredging plant and equipment to minimise turbidity during transfer of material to the offshore disposal site.	DMP §5.1 EMP §10.12	Regular Basis	Included in D&C contract	TPSA (D&C)
138	C	Dredging	Turbidity of the water	11- Offshore disposal	Project Site	11-2 (3)	Weekly Report by the D&C contractor on the volumes disposed at the offshore disposal ground	DMP §7	Weekly		TPSA (D&C)
139	C	Dredging	Turbidity of the water	11- Offshore disposal	Project Site	11-3 (3)	A report on the bathymetric survey will be provided to Engineer/Employer within two months of the final bathymetric survey being undertaken. This report will include a chart showing the change in sea floor bathymetry as a result of disposal and include written commentary on the volume of dumped material that appears to have been retained within the spoil ground.	DMP §7	2 months after final bathymetric survey		TPSA (D&C)
140	C	All Construction Activities	Biodiversity of the Affected Areas	12- Terrestrial fauna (incl. birds)	Project Site	12-4 (9)	Monthly recording of fauna impacts and mortality as a result of project construction.	EMP §10.10	Monthly	Part of Biodiversity ≈ $23,351	TPSA (D&C)
141	C	All Construction Activities	Biodiversity of the Affected Areas	12- Terrestrial fauna (incl. birds)	Offset Area	12-5 (9)	Implement the BAP & establish offset equivalent to 3.5 ha mangrove and 15 ha seagrass	EMP §10.10	Regular Basis	Part of Biodiversity ≈ $23,351	TPSA and PMU
142	C	All Construction Activities	Biodiversity of the Affected Areas	12- Terrestrial fauna (incl. birds)	Project Site	12-6 (9)	Reporting and interpretation of fauna injury and death records every 6 months.	EMP §10.10 EMP §12.10 EMP §12.28.2 EMP §13.1	Semi-Annual	Part of Biodiversity ≈ $23,351	TPSA (D&C)
143	C	All Construction Activities	Biodiversity of the Affected Areas	12- Terrestrial fauna (incl. birds)	Project Site	12-7 (9)	Collation of results into Annual Environmental Report to NDCPEI.	EMP §12.10 EMP §13.1	Annual	Part of Biodiversity ≈ $23,351	TPSA
144	C	All Construction Activities	Soil Contamination	13- Terrestrial vegetation	Project Site	13-3 (5)	Soil contamination should be monitored through maintaining records of spill events	EMP §10.2	Event Trigger	-	TPSA (D&C)
145	C	Haulage of building materials by trucks	Safety	14- Traffic	Project Site	14-2 (11)	Transport infrastructure upgrades to support container trucks travelling the local road transport network	EMP §10.13 EIS §9.16.4	Regular Basis	-	PMU

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No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
146	C	Haulage of building materials by trucks	Safety	14- Traffic	Project Site	14-3 (11)	Planning to minimize vehicle movements (e.g. use of buses to transport workers).	EMP §10.13 EIS §9.16.4	Regular Basis	-	TPSA (D&C)
147	C	Haulage of building materials by trucks	Safety	14- Traffic	Project Site	14-4 (11)	Implementation of one-way systems, ensuring reversing sensor/alarms are installed on all vehicles and mobile equipment and signage in reversing areas can reduce the risk of reversing accidents	EIS §9.16.4	Regular Basis	-	TPSA (D&C)
148	C	Haulage of building materials by trucks	Safety	14- Traffic	Project Site	14-5 (11)	Traffic signage – all traffic signage will be clearly and prominently displayed in well-lit areas. Signage will be posted to indicate speed limits, restricted access, visitor parking, headroom, and other route hazards	EIS §9.16.4	Regular Basis	-	TPSA (D&C)
149	C	Haulage of building materials by trucks	Safety	14- Traffic	Project Site	14-6 (11)	Traffic Management Plan	EMP §12.13 EMP §12.28.2	Annual	-	TPSA (D&C)
150	C	All Construction Activities	Employment Rate, Skill Training	15- Employment	Project Site	15-2 (15)	The Concessionaire and the Grantor will communicate with SEPFOPE to ensure existing programs of SEPFOPE be especially accessible to the residents of host Suco/District/Country prior to and during the construction period.	SIA §8.3.2 SIA §9 EMP §10.14 EIS §9.17.4 EIS §9.23.4	Regular Basis	Part of Employment ≈ $116,754	PMU and TPSA
151	C	All Construction Activities	Employment Rate, Skill Training	15- Employment	Project Site	15-3 (15)	The concession plan should state that it targets to employ 75% of Timor-Leste citizens and permanent residents during the construction period for positions where skills are available in Timor-Leste.	SIA §8.3.2 EMP §10.14 EIS §9.17.4	Regular Basis	Part of Employment ≈ $116,754	TPSA
152	C	All Construction Activities	Employment Rate, Skill Training	15- Employment	Project Site	15-4 (15)	The Concessionaire should provide continuous training to newly hired port staff.	SIA §8.3.2 EMP §10.14 EIS §9.17.4	Regular Basis	Part of Employment ≈ $116,754	TPSA
153	C	All Construction Activities	Employment Rate, Skill Training	15- Employment	Project Site	15-5 (15)	The Concessionaire should adhere to their targets of approximately 50% of Management and Finance-Administration, 80% of O&M and HSE officers and 95% of equipment driver be filled by Timor-Leste as noted in their Local Development Plan.	EMP §10.14 EIS §9.17.4	Regular Basis	Part of Employment ≈ $116,754	TPSA
154	C	All Construction Activities	Employment Rate, Skill Training	15- Employment	Project Site	15-6 (15)	The Concessionaire will give priority were possible to residents of host Suco/District/Country during the hiring of port personnel.	EMP §10.14 EIS §9.17.4 EIS §9.20.4	Regular Basis	Part of Employment ≈ $116,754	TPSA
155	C	All Construction Activities	Employment Rate, Skill Training	15- Employment	Project Site	15-7 (15)	Maintenance of the Grievance Mechanism.	EMP §10.14 EIS §9.17.4 EIS §9.23.4	Regular Basis	Part of Employment ≈ $116,754	PMU and TPSA
156	C	All Construction Activities	Employment Rate, Skill Training	15- Employment	Project Site	15-8 (15)	Monitoring of the GoTL's implementation of the Resettlement Action Plan and Livelihood Restoration Plan through the Grievance Mechanism.		see PMU	Part of Employment ≈ $116,754	PMU

**Stages = P:PreConstruction, C: Construction,*

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
157	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Settlement and Livelihood	16- Fishing	Project Site	16-2 (6)	Providing alternative access locations if necessary.	EMP §10.17	Regular Basis	Part of Fishing ≈ $53,123	PMU
158	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Settlement and Livelihood	16- Fishing	Project Site	16-3 (6)	Providing safe passage zones.	EMP §10.17	Regular Basis	Part of Fishing ≈ $53,123	TPSA
159	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Settlement and Livelihood	16- Fishing	Offset Area	16-4 (6)	Implement the BAP & establish offset equivalent to 3.5 ha mangrove and 15 ha seagrass	EMP §10.17	Regular Basis	Part of Fishing ≈ $53,123	TPSA and PMU
160	C	Dredging, Land Reclamation, Structure Building, Piling and Construction of Jetty	Settlement and Livelihood	16- Fishing	Project Site	16-5 (6)	Monitoring according to BAP	EMP §10.17	see BAP	Part of Fishing ≈ $53,123	TPSA
161	C	All Construction Activities	Settlement and Livelihood	17- Population and community	Project Site	17-3 (5)	The impact on community during the project will be addressed by resettlement and compensation to be undertaken by the GoTL.	EMP §10.19	Regular Basis	Part of Population ≈ $72,971	PMU
162	C	All Construction Activities	Settlement and Livelihood	17- Population and community	Project Site	17-4 (5)	Continuous and ongoing consultation with stakeholders throughout the project life	EMP §10.22 EIS §9.26.4	Regular Basis	Part of Population ≈ $72,971	PMU and TPSA
163	C	All Construction Activities	Cultural Heritage Site	18- Cultural Heritage	Project Site	18-2 (7)	Where a site is to be permanently destroyed, appropriate community consultation is to be undertaken and documentation of this site.	EMP §10.25 EMP §12.28.2 EIS §9.29.4	Regular Basis	Part of Cultural Heritage ≈ $11,675	TPSA
164	C	All Construction Activities	Cultural Heritage Site	18- Cultural Heritage	Project Site	18-3 (7)	Protection of sites which are adjacent to the project site through fencing, access controls and signpost in accordance with the requirements of the local community.	Cultural §8 EMP §10.25 EIS §9.29.4	Regular Basis	Part of Cultural Heritage ≈ $11,675	TPSA (EXT)
165	C	All Construction Activities	Cultural Heritage Site	18- Cultural Heritage	Project Site	18-4 (7)	Training and education of all employees on cultural heritage (included in Works induction session).	Cultural §8 EMP §10.25 EIS §1.8	Regular Basis	Part of Cultural Heritage ≈ $11,675	TPSA (D&C)
166	C	All Construction Activities	Cultural Heritage Site	18- Cultural Heritage	Project Site	18-5 (7)	Prior to excavation and construction works, consultation to be undertaken with the community and the caretaker of the identified Sacred Site, 05-Usu Madesan and the identified Cultural heritage site, 04-Bilimau ain. This consultation is likely to include conducting a traditional ceremony to approve the project construction and permit the site to be impacted by the project.	Cultural §8	Regular Basis	Part of Cultural Heritage ≈ $11,675	TPSA

Stages = P:PreConstruction, C: Construction,

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
167	C	All Construction Activities	Mangroves	19- BAP (Mangroves)	Project Site	19-9 (13)	Mangrove health assessments during construction according to tiered monitoring and management framework	BAP §11.4 EMP §13.1	As per tiered monitoring & management framework	BAP Mangroves ≈ $396,090	TPSA (EXT)
168	C	All Construction Activities	Mangroves	19- BAP (Mangroves)	Project Site	19-10 (13)	Sedimentation monitoring during construction	BAP §11.4 EMP §13.1	Monthly	BAP Mangroves ≈ $396,090	TPSA (D&C)
169	C	All Construction Activities	Mangroves	19- BAP (Mangroves)	Offset Area	19-11 (13)	Regular review and monitoring of progress of implementation of Community-managed offset area (CMA)	BAP §11.4	Monthly	BAP Mangroves ≈ $396,090	TPSA and PMU (EXT)
170	C	All Construction Activities	Mudflat/Seagrass	20- BAP (Mudflat/Seagrass)	Project Site	20-5 (6)	Seagrass health assessments during construction according to tiered monitoring and management framework	BAP §11.4	As per tiered monitoring & management framework	BAP Mangroves ≈ $396,090	TPSA (EXT)
171	C	All Construction Activities	Mudflat/Seagrass	20- BAP (Mudflat/Seagrass)	Project Site	20-6 (6)	Sedimentation monitoring during construction	BAP §11.4 EMP §13.1	Monthly	BAP Mangroves ≈ $396,090	TPSA (D&C)
172	C	All Construction Activities	Birds and Turtle	21- BAP (Birds and Turtles)	Project Site	21-6 (7)	Reporting of fauna deaths as per the Project Environmental Management Plan (EMP)	BAP §11.4	Event Trigger	≈ $23,351	TPSA (D&C)
173	C	All Construction Activities	Ecosystem at Affected Areas	22- BAP (Ecosystem Services)	Project Site	22-4 (5)	Monitor and manage any grievances from the community regarding access to fishing resources	BAP §11.4 EIS §9.20.4	As per Grievance mechanism	-	PMU and TPSA
174	C	All Construction Activities	NA as it should be settled before the Construction Phase	23- BAP (Regulating ES)	Project Site	-	NA as it should be settled before the Construction Phase		-	-	
175	C	All Construction Activities	NA as it should be settled before the Construction Phase	24- Impact on structures in Directly Impacted Areas and Crops/productive trees	Project Site	-	NA as it should be settled before the Construction Phase		-	-	
176	C	All Construction Activities	NA as it should be settled before the Construction Phase	25- Livelihoods	Project Site	-	NA as it should be settled before the Construction Phase		-	-	
177	C	All Construction Activities	NA as it should be settled before the Construction Phase	26- Income for businesses	Project Site	-	NA as it should be settled before the Construction Phase		-	-	
178	C	All Construction Activities	Fishing, Livelihood	27- Impacts on access to the deeper ocean, fishing ground within the Bay, increased in turbidity and reduction in sources of livelihood	Project Site	27-1 (10)	The Concessionaire will clearly delineate work areas, ensuring access to fishermen going to the deeper offshore and implement measures to minimize impacts on adjacent fishing ground as well as impacts from increased in turbidity. This will be monitored on a regular basis as part of the scope of work under the Environmental Management Plan for the port	SIA §8.3.1 EIS §1.8 EIS §9.20.4	Regular Basis	-	TPSA (D&C)

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179	C	All Construction Activities	Fishing, Livelihood	27- Impacts on access to the deeper ocean, fishing ground within the Bay, increased in turbidity and reduction in sources of livelihood	Project Site	27-2 (10)	A RAP will be prepared which include the provision of allowance for temporary loss of income from fishing and allowance for temporary loss of income from employment at the site	SIA §8.3.1 EIS §1.8 EIS §9.20.4	Regular Basis	Paid by GoTL	PMU
180	C	All Construction Activities	Fishing, Livelihood	27- Impacts on access to the deeper ocean, fishing ground within the Bay, increased in turbidity and reduction in sources of livelihood	Project Site	27-3 (10)	The Livelihood Restoration Plans will be incorporated into the RAP to be prepared and implemented by the Government. Training for jobs available during the construction period should be made accessible to the Suco/District residents. This will be discussed, re-updated and implemented with the concessionaire's support as the impact is likely to occur and extend during port construction and operation.	SIA §8.3.1 EIS §1.8 EIS §9.20.4	Regular Basis	Paid by GoTL	PMU
181	C	All Construction Activities	Fishing, Livelihood	27- Impacts on access to the deeper ocean, fishing ground within the Bay, increased in turbidity and reduction in sources of livelihood	Project Site	27-4 (10)	Mitigation measures applicable to increased turbidity will be determined in detail during the preparation of the Dredging Management Plan that will be part of the Environmental Impact Statement (EIS) development	SIA §8.3.1 EIS §1.8	Regular Basis	-	TPSA
182	C	All Construction Activities	Fishing, Livelihood	27- Impacts on access to the deeper ocean, fishing ground within the Bay, increased in turbidity and reduction in sources of livelihood	Project Site	27-5 (10)	Maintenance of the Grievance Redress Mechanism established pre-construction and expansion to include construction impacted stakeholders	SIA §8.3.1 EIS §1.8 EIS §9.20.4	Regular Basis	-	PMU and TPSA
183	C	All Construction Activities	Employment Rate	28- Population Influx	Project Site	28-1 (3)	The Concessionaire and the Grantor will communicate with SEPFOPE to ensure existing programs of SEPFOPE be especially accessible to the residents of host Suco/District/Country prior to and during the construction period.	SIA §8.3.3	Regular Basis	-	TPSA and PMU
184	C	All Construction Activities	Employment Rate	28- Population Influx	Project Site	28-2 (3)	Maintenance of the Grievance Redress Mechanism established pre-construction and expansion to include construction impacted stakeholders	SIA §8.3.3	Regular Basis	-	PMU and TPSA
185	C	All Construction Activities	Employment Rate	28- Population Influx	Project Site	28-3 (3)	Avoid hiring on the spot in front of the port	SIA §8.3.3	Regular Basis	-	TPSA (D&C)
186	C	All Construction Activities	Health of Population	29- Community Heathly and Safety	Project Site	29-2 (9)	Maintenance of the Grievance Redress Mechanism established pre-construction and expansion to include construction impacted stakeholders	SIA §8.3.4 EMP §10.20 EIS §9.24.4	Regular Basis	-	PMU and TPSA

Environmental Assessment & Mitigation Plan of Tibar Port

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No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
187	C	All Construction Activities	Health of Population	29- Community Heathly and Safety	Project Site	29-3 (9)	Facilitate education and awareness programs throughout the lifespan of the port	SIA §8.3.4 EMP §10.20 EIS §9.24.4	Regular Basis	-	TPSA and PMU
188	C	All Construction Activities	Health of Population	29- Community Heathly and Safety	Project Site	29-4 (9)	Establish access controls to the site activities posing health and safety risks to the community	SIA §8.3.4 EMP §10.20 EIS §9.24.4	Regular Basis	-	TPSA
189	C	All Construction Activities	Health of Population	29- Community Heathly and Safety	Project Site	29-5 (9)	Develop strict protocols for increased traffic safety	SIA §8.3.4 EMP §10.20 EIS §9.24.4	Regular Basis	-	TPSA (D&C)
190	C	All Construction Activities	Employment	30- APORTIL staff numbers will be reduced with the building of the new port	Project Site	-	NA as Employment will be settle before Operation Phase		-	-	
191	C	All Construction Activities	Visual of the Projects	31- Visual impact of the port on local tourist operator and community	Project Site	-	NA as construction will only completed by Operation Phase		-	-	
192	O	Using crane & other heavy equipment for port activities	Exhaust carbon from engine	1 - Air Quality	Project Site	1-11 (19)	No vehicles or plant will be left idling unnecessarily.	-Carbon monoxide ; 1 hour = 40,000 µg/m3 Annual = Max 1 -Nitrogen dioxide ; 1 hour = 200 µg/m3 Annual = 40 µg/m3 -Photochemical oxidants (as ozone) ; 1 hour = 235 µg/m3 -Sulfur dioxide ; 1 hour = 350 µg/m3 24 hour = 125 µg/m3 -Particles as PM2.5 ; 24 hour = 75 µg/m3 Annual = 70 µg/m3 Air Quality §8 EMP §10.4 EIS §9.5.4 EIS §9.8.4	Regular Basis	Part of Air Quality ≈ $64,215	TPSA
193	O	Using crane & other heavy equipment for port activities	Exhaust carbon from engine	1 - Air Quality	Project Site	1-12 (19)	Reduce the number of vehicle movements through better planning (including optimising tug boats working time)	Air Quality §8 EMP §10.4 EIS §9.5.4 EIS §9.8.4	Regular Basis	Part of Air Quality ≈ $64,215	TPSA
194	O	Using crane & other heavy equipment for port activities	Exhaust carbon from engine	1 - Air Quality	Project Site	1-13 (19)	Use a good quality fuel (e.g. with low sulphur content)	Air Quality §8 EMP §10.4 EIS §9.5.4 EIS §9.8.4	Regular Basis	Part of Air Quality ≈ $64,215	TPSA
195	O	Using crane & other heavy equipment for port activities	Exhaust carbon from engine	1 - Air Quality	Project Site	1-14 (19)	All heavy duty vehicles should meet emission regulations from local Environmental Protection Agency or nominated standard.	EMP §10.4	Regular Basis	Part of Air Quality ≈ $64,215	TPSA
196	O	Using crane & other heavy equipment for port activities	Exhaust carbon from engine	1 - Air Quality	Project Site	1-15 (19)	Provide the need-based safety measures by providing PPE to the workers based on the nature of the work	Air Quality §8 EIS §9.5.4 EIS §9.8.4	Regular Basis	Part of Air Quality ≈ $64,215	TPSA

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No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
197	O	Using crane & other heavy equipment for port activities	Exhaust carbon from engine	1 - Air Quality	Project Site	1-16 (19)	Controlled access to the site with warnings around the perimeter	Air Quality §8 EIS §9.5.4 EIS §9.8.4	Regular Basis	Part of Air Quality ≈ $64,215	TPSA
198	O	Using crane & other heavy equipment for port activities	Pollution to environment	1 - Air Quality	Project Site	1-17 (19)	Install Automated Weather Station (AWS) recording daily measurements of: - Station identification number - State and time of record/observation - Air, wet bulb and wet dew point temperatures - Precipitation and evaporation - Relative humidity - Wind speed and direction - Solar radiation - Barometric pressure - Visibility - Cloud cover - Cloud ceiling height, if practicable	EMP §12.1 EMP §12.28.3	Daily	Part of Air Quality ≈ $64,215	TPSA (EXT)
199	O	Using crane & other heavy equipment for port activities	Pollution to people	1 - Air Quality	Tibar Retreat, Tibar Primary School	1-18 (19)	A monitoring and reporting program as required per the Grievance Mechanism, monitor the air quality in the following sensitive receptors: - AQ1 – Tibar Retreat. - AQ2 – Tibar Primary School. The monitoring stations are derived from the Baseline Air Quality monitoring survey (Advisian, 2016a). The monitoring program should assess and report on PM10 and PM2.5.	Air Quality §10 EMP §12.4 EMP §12.28.3 EMP §13.1.1	As per Grievance Mechanism	Part of Air Quality ≈ $64,215	TPSA (EXT)
200	O	Using crane & other heavy equipment for port activities	Pollution to environment	1 - Air Quality	Project Site	1-19 (19)	Safety with staff training and the organisation of annual awareness campaigns	Air Quality §8 EIS §9.8.4	Annual	Part of Air Quality ≈ $64,215	TPSA
201	O	Using crane & other heavy equipment for port activities	Noise and Vibration resulted from the high speed transportation	2 - Noise and vibration	Project Site	2-10 (13)	Haulage of goods and movement of vehicles/people and equipment can be scheduled.	EMP §10.5 EIS §1.8 EIS §9.25.4	Regular Basis	Part of Noise & Vibration ≈ $35,026	TPSA
202	O	Using crane & other heavy equipment for port activities	Noise and Vibration resulted from the high speed transportation	2 - Noise and vibration	Project Site	2-11 (13)	Use selected equipment with the lowest possible noise specifications. If a noise complaint is recorded through the grievance framework and monitoring confirms it is above the guideline level a retrofit mitigation measure will be implemented. e.g. temporary barriers	Noise §7.2 EIS §1.8 EIS §9.9.4	Regular Basis	Part of Noise & Vibration ≈ $35,026	TPSA (EXT)
203	O	Using crane & other heavy equipment for port activities	Noise and Vibration resulted from the high speed transportation	2 - Noise and vibration	Tibar Retreat, Tibar Primary School	2-12 (13)	As required per the Grievance Mechanism measurements at sensitive receptors i.e. Tibar Retreat. Tibar Primary School. Results interpretation and review of the EMP as required.	EMP §12.5 EMP §12.28.3 EMP §13.1.1	As per Grievance Mechanism	Part of Noise & Vibration ≈ $35,026	TPSA

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No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
204	O	Using crane & other heavy equipment for port activities	Noise and Vibration resulted from the high speed transportation	2 - Noise and vibration	Project Site	2-13 (13)	Collation of results into semi-annual or annual Environmental Report to NDCPEI.	EMP §12.5 EMP §12.28.3 EMP §13.1.1	Semi-Annual or Annual	Part of Noise & Vibration ≈ $35,026	TPSA
205	O	Using crane & other heavy equipment for port activities	Pollution to environment	3 - Sedimentation	Project Site	3-3 (4)	Culverts on the project site and along the road adjacent to the site to be maintained and kept free of sediment and debris.	Hydro §5 & 6 EMP §12.2 EIS §9.6.4 EIS §9.11.4	Regular Basis	Part of Sedimentation ≈ $52,539	TPSA
206	O	Using crane & other heavy equipment for port activities	Pollution to environment	3 - Sedimentation	Project Site	3-4 (4)	Regular bathymetry to monitor sedimentation during Operations	Hydro §5 & 6 EMP §12.2 EMP §12.28.3 EMP §13.1.1 EIS §9.6.4 EIS §9.11.4	1 year and 3 years after completion; then, when required	Part of Sedimentation ≈ $52,539	TPSA
207	O	Using crane & other heavy equipment for port activities	Pollution to environment	4 - Water Quality	Project Site	4-13 (17)	Cleaning of all oil, fuel and waste spills immediately	Hydro §5 EIS §9.11.4	Regular Basis	Part of Water Quality ≈ $17,513	TPSA
208	O	Using crane & other heavy equipment for port activities	Pollution to environment	4 - Water Quality	Project Site	4-14 (17)	Waste management procedure to control litter	Hydro §5 EIS §9.11.4	Regular Basis	Part of Water Quality ≈ $17,513	TPSA
209	O	Using crane & other heavy equipment for port activities	Pollution to environment	4 - Water Quality	Project Site	4-15 (17)	Mitigation of flooding during extreme runoff events through the use of berms and diversion drains to limit flooding of the construction site	Hydro §5 EIS §9.11.4	Regular Basis	Part of Water Quality ≈ $17,513	TPSA
210	O	Using crane & other heavy equipment for port activities	Pollution to environment	4 - Water Quality	Project Site	4-16 (17)	Correct operation and maintenance of waste water treatment unit	Hydro §5 & 6 EMP §10.8 EIS §9.11.4	Regular Basis	Part of Water Quality ≈ $17,513	TPSA
211	O	Using crane & other heavy equipment for port activities	Pollution to environment	4 - Water Quality	Project Site	4-17 (17)	One post construction survey event of sedimentation and water quality impact and reference is recommended to take a snapshot of the post construction impact. (a few months after construction completed).	EMP §12.8 EMP §12.28.3 EMP §13.1.1	1 time after construction	Part of Water Quality ≈ $17,513	TPSA
212	O	Using crane & other heavy equipment for port activities	Biodiversity of the Affected Areas	5 - Benthic Habitat	Offset Area	5-17 (26)	Implement the BAP & establish offset equivalent to 3.5 ha mangrove and 15 ha seagrass.		Regular Basis	Part of Benthic Habitat ≈ $43,783	TPSA and PMU
213	O	Using crane & other heavy equipment for port activities	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-18 (26)	The Vessel Master will be responsible for the management of any spill response during construction activities	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $43,783	TPSA
214	O	Using crane & other heavy equipment for port activities	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-19 (26)	As required under MARPOL 73/78 Annex I/ Marine Order 91 all construction greater than 400 gross tonnes must carry a SOPEP	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $43,783	TPSA

Environmental Assessment & Mitigation Plan of Tibar Port

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No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
215	O	Using crane & other heavy equipment for port activities	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-20 (26)	The Vessel Master will form and incident management team to response to any spills	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $43,783	TPSA
216	O	Using crane & other heavy equipment for port activities	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-21 (26)	In the event of a hydrocarbon spill, the Vessel Master will implement available controls and resources of the SOPEP	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $43,783	TPSA
217	O	Using crane & other heavy equipment for port activities	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-22 (26)	An oil spill response drill will be undertaken in accordance with SOPEP requirements on all vessels prior to conducting the activity (within 3 months prior)	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $43,783	TPSA
218	O	Using crane & other heavy equipment for port activities	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-23 (26)	The Vessel Master will have sufficient boom onsite to fully encircle the largest vessel	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $43,783	TPSA
219	O	Using crane & other heavy equipment for port activities	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-24 (26)	If the spill from the vessel cannot be contained and the mangroves to the west of Tibar Bay are at risk the protection/ containment boom will be installed to protect the mangroves. The boom will be deployed to protect the area of mangroves with the highest canopy cover and where it will be most effective	PMSCP §8	Regular Basis	Part of Benthic Habitat ≈ $43,783	TPSA
220	O	Using crane & other heavy equipment for port activities	Pollutions to the waters	5 - Benthic Habitat	Project Site	5-25 (26)	In the event of a spill the Vessel Master will make notifications outlined in Section 4	PMSCP §8	Event Trigger	Part of Benthic Habitat ≈ $43,783	TPSA
221	O	Using crane & other heavy equipment for port activities	Pollution to Coral + Mangroves + Mudflat/Seagrass	5 - Benthic Habitat	Project Site	5-26 (26)	One post construction survey event of Coral, Mangrove and Seagrass impact and reference is recommended to take a snapshot of the post construction impact. (a few months after construction completed).	EMP §12.28.3 EMP 13.1.1	1 time after construction	Part of Benthic Habitat ≈ $43,783	TPSA
222	O	Using crane & other heavy equipment for port activities	No impact as Reclamation is completed in Construction Phase	6 - Reclamation	Project Site	-	NA as Reclamation is completed in Construction Phase		-	-	
223	O	Marine Tugboat and Container Vessel Sea Movement	Potential Impact to Invasive Marine Species' health	7 - Invasive Marine Species	Project Site	7-4 (5)	The operations manual for the port should include reference to: All vessels entering the port to comply with the Guidelines in the Ballast Water Convention (2004) All vessels entering comply with International Convention For The Control and Management of Ship's Ballast Water and Sediments, 2004 (BWM CONVENTION)	EIS §9.13.4 EMP §10.12	Regular Basis	-	TPSA
224	O	Marine Tugboat and Container Vessel Sea Movement	Potential Impact to Invasive Marine Species' health	7 - Invasive Marine Species	Project Site	7-5 (5)	All ships at sea must adhere with the amendments to the International Maritime Organisation's (IMO's) International Convention for the Prevention of Pollution from Ships (Marine Pollution: MARPOL) Annex V	EMP §10.8	Regular Basis	-	TPSA

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No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
225	O	Marine Tugboat and Container Vessel Sea Movement	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna	Project Site	8-13 (15)	To reduce the potential impacts of marine debris on marine fauna, waste associated with construction and operation must be managed appropriately. In addition, all ships at sea must adhere with the amendments to the International Maritime Organisation's (IMO's) International Convention for the Prevention of Pollution from Ships (Marine Pollution: MARPOL) Annex V which came into force on 1 January 2013. The amendments prohibit the discharge of all garbage from ships into the sea (except under very specific circumstances). This reverses the presumption that garbage may be discharged into the sea based on defined distances from shore and the nature of the garbage. The amendments also list requirements for garbage management plans on ships and port reception facilities for receiving waste.	Marine §9.2 EMP §10.11	Regular Basis	-	TPSA
226	O	Marine Tugboat and Container Vessel Sea Movement	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna	Project Site	8-14 (15)	A vessel will not travel greater than 6 knots within 300 m of a whale (caution zone) and not approach closer than 100 m from a whale; and a vessel will not approach closer than 50 m or a dolphin and/or 100 m for a whale (with the exception of animals bow riding).	Megafauna §3.2.4 EIS §1.8 EIS §9.14.4	Regular Basis	-	TPSA
227	O	Marine Tugboat and Container Vessel Sea Movement	Potential Impact to Marine Megafauna's health	8 - Marine Megafauna		8-15 (15)	Procedures for marine fauna interaction shall be developed for vessels to reduce the potential impacts to marine fauna.	EMP §10.11	Regular Basis	-	TPSA
228	O	Using crane & other heavy equipment for port activities	Underwater Noise pollution affecting marine animals	9 - Underwater noise	Project Site	9-8 (8)	A vessel will not travel greater than 6 knots within 300 m of a whale (caution zone) and not approach closer than 100 m from a whale; and a vessel will not approach closer than 50 m or a dolphin and/or 100 m for a whale (with the exception of animals bow riding).	Megafauna §3.1.6	Regular Basis	-	TPSA
229	O	Using crane & other heavy equipment for port activities	Excessive Light pollution to the Project Area	10- Lighting	Project Site	10-5 (8)	Where practicable, vessel loading and unloading in nearshore areas shall be conducted during daylight hours. Where this is not practicable, artificial lighting shall be reduced to the minimum required for safe operations.	DMP §5.3	Regular Basis	Part of Lighting ≈ $8,757	TPSA
230	O	Using crane & other heavy equipment for port activities	Excessive Light pollution to the Project Area	10- Lighting	Project Site	10-6 (8)	Outside artificial lighting on vessels will be kept to a minimum (i.e. navigational lights and where safety dictates necessary deck lighting). Lighting should be switched off when not in use and automatic timers/sensors installed where possible.	Megafauna §3.4.5 DMP §5.3	Regular Basis	Part of Lighting ≈ $8,757	TPSA

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231	O	Using crane & other heavy equipment for port activities	Excessive Light pollution to the Project Area	10- Lighting	Project Site	10-7 (8)	Only necessary artificial lights shall be used. 'Unnecessary lighting' includes lighting in unused areas, decorative lighting or lighting that is brighter than needed.	Megafauna §3.4.5 EMP §10.11	Regular Basis	Part of Lighting ≈ $8,757	TPSA
232	O	Using crane & other heavy equipment for port activities	Excessive Light pollution to the Project Area	10- Lighting	Project Site	10-8 (8)	Monitoring of light use after hours to ensure it is essential lighting only		Regular Basis	Part of Lighting ≈ $8,757	TPSA (EXT)
233	O	Using crane & other heavy equipment for port activities	No impact as Reclamation is completed in Construction Phase	11- Offshore disposal	Project Site	-	No impact as Reclamation is completed in Construction Phase		-	-	
234	O	Using crane & other heavy equipment for port activities	Biodiversity of the Affected Areas	12- Terrestrial fauna (incl. birds)	Offset Area	12-8 (9)	Implement the BAP & establish offset equivalent to 3.5 ha mangrove and 15 ha seagrass	EMP §10.10	Regular Basis	-	TPSA and PMU
235	O	Using crane & other heavy equipment for port activities	Biodiversity of the Affected Areas	12- Terrestrial fauna (incl. birds)	Offset Area	12-9 (9)	Collation of results into Annual Environmental Report to NDCPEI.	EMP §12.10 EMP §13.1.1	Annual	-	TPSA
236	O	Using crane & other heavy equipment for port activities	Soil Contamination	13- Terrestrial vegetation	Project Site	13-4 (5)	Maintenance of Spill response kits	EMP §10.3	Regular Basis	-	TPSA
237	O	Using crane & other heavy equipment for port activities	Soil Contamination	13- Terrestrial vegetation	Project Site	13-5 (5)	Soil contamination should be monitored through maintaining records of spill events	EMP §10.2	Event Trigger	-	TPSA
238	O	Using crane & other heavy equipment for port activities	Safety	14- Traffic	Project Site	14-7 (11)	Transport infrastructure upgrades to support container trucks travelling the local road transport network	EMP §10.13 EIS §9.16.4	Regular Basis	-	PMU
239	O	Using crane & other heavy equipment for port activities	Safety	14- Traffic	Project Site	14-8 (11)	Planning to minimize vehicle movements (e.g. use of buses to transport workers).	EMP §10.13 EIS §9.16.4	Regular Basis	-	TPSA
240	O	Using crane & other heavy equipment for port activities	Safety	14- Traffic	Project Site	14-9 (11)	Implementation of one-way systems, ensuring reversing sensor/alarms are installed on all vehicles and mobile equipment and signage in reversing areas can reduce the risk of reversing accidents	EIS §9.16.4	Regular Basis	-	TPSA
241	O	Using crane & other heavy equipment for port activities	Safety	14- Traffic	Project Site	14-10 (11)	Traffic signage – all traffic signage will be clearly and prominently displayed in well-lit areas. Signage will be posted to indicate speed limits, restricted access, visitor parking, headroom, and other route hazards	EIS §9.16.4	Regular Basis	-	TPSA
242	O	Using crane & other heavy equipment for port activities	Safety	14- Traffic	Project Site	14-11 (11)	Traffic Management Plan	EMP §12.13 EMP §12.28.3 EMP §13.1	Annual	-	TPSA (D&C)
243	O	Using crane & other heavy equipment for port activities	Employment Rate, Skill Training	15- Employment	Project Site	15-9 (15)	The Concessionaire should provide continuous training to newly hire port staff.	SIA §8.4.5 EMP §10.14 EIS §9.17.4	Regular Basis	Part of Employment ≈ $58,377	TPSA
244	O	Using crane & other heavy equipment for port activities	Employment Rate, Skill Training	15- Employment	Project Site	15-10 (15)	The Concessionaire should adhere to their targets of approximately 50% of Management and Finance-Administration, 80% of O&M and HSE officers and 95% of equipment driver be filled by Timor-Leste as noted in their Local Development Plan.	SIA §8.4.5 EMP §10.14 EIS §9.17.4	Regular Basis	Part of Employment ≈ $58,377	TPSA

**Stages = P:PreConstruction, C: Construction,*

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
245	O	Using crane & other heavy equipment for port activities	Employment Rate, Skill Training	15- Employment	Project Site	15-11 (15)	The Concessionaire will give priority were possible to residents of host Suco/District/Country during the hiring of port personnel.	SIA §8.4.5 EMP §10.14 EIS §9.17.4	Regular Basis	Part of Employment ≈ $58,377	TPSA
246	O	Using crane & other heavy equipment for port activities	Employment Rate, Skill Training	15- Employment	Project Site	15-12 (15)	Maintenance of the Grievance Mechanism.	SIA §8.4.5 EMP §10.14 EIS §9.17.4	Regular Basis	Part of Employment ≈ $58,377	PMU and TPSA
247	O	Using crane & other heavy equipment for port activities	Employment Rate, Skill Training	15- Employment	Project Site	15-13 (15)	Training for jobs available during Operations and Maintenance phase should be made accessible to Suco/District residents.	SIA §9	Regular Basis	Part of Employment ≈ $58,377	TPSA and PMU
248	O	Using crane & other heavy equipment for port activities	Employment Rate, Skill Training	15- Employment	Project Site	15-14 (15)	The Concessionaire and the Grantor will coordinate with Secretary of State for Professional Training and Employment Policy SEPFOPE to gear its training program at the local vocational training centre to jobs available at the port	SIA §9	Regular Basis	Part of Employment ≈ $58,377	TPSA and PMU
249	O	Using crane & other heavy equipment for port activities	Employment Rate, Skill Training	15- Employment	Project Site	15-15 (15)	Monitoring of the GoTL's implementation of the Resettlement Action Plan and Livelihood Restoration Plan through the Grievance Mechanism.		see PMU	Part of Employment ≈ $58,377	PMU
250	O	Using crane & other heavy equipment for port activities	Settlement and Livelihood	16- Fishing	Offset Area	16-6 (6)	Implement the BAP & establish offset equivalent to 3.5 ha mangrove and 15 ha seagrass	EMP §10.17	Regular Basis	-	TPSA and PMU
251	O	Using crane & other heavy equipment for port activities	Settlement and Livelihood	17- Population and community	Project Site	17-5 (5)	Continuous and ongoing consultation with stakeholders throughout the project life	EMP §10.22 EIS §9.26.4	Regular Basis	'≈ $ 29,189	PMU and TPSA
252	O	Using crane & other heavy equipment for port activities	Cultural Heritage Site	18- Cultural Heritage	Project Site	18-6 (7)	Training and education of all employees on cultural heritage.	EIS §1.8	Regular Basis	-	TPSA
253	O	Using crane & other heavy equipment for port activities	Cultural Heritage Site	18- Cultural Heritage	Project Site	18-7 (7)	Any and all occurrences of damage sites are to be recorded;	EMP §12.28.3 EMP §13.1.1	Event Trigger	-	TPSA
254	O	Using crane & other heavy equipment for port activities	Mangroves	19- BAP (Mangroves)	Project Site	19-12 (13)	Monitoring implementation of the BAP	BAP §11.4	see BAP	BAP Mangrove ≈ $72,971	TPSA and PMU (EXT)
255	O	Using crane & other heavy equipment for port activities	Mangroves	19- BAP (Mangroves)	Project Site	19-13 (13)	Regular review and monitoring of progress of implementation of Community-managed conservation area (CMA)	BAP §11.4	Semi-Annual	BAP Mangrove ≈ $72,971	TPSA and PMU (EXT)
256	O	Using crane & other heavy equipment for port activities	Mudflat/Seagrass	20- BAP (Mudflat/Seagrass)	Project Site	-	NA as all construction will be completed		-	-	
257	O	Using crane & other heavy equipment for port activities	Birds and Turtle	21- BAP (Birds and Turtles)	Project Site	21-7 (7)	Reporting of fauna deaths as per the Project Environmental Management Plan (EMP)	BAP §11.4	Event Trigger	-	TPSA (EXT)

Stages = P:PreConstruction, C: Construction,

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
258	O	Using crane & other heavy equipment for port activities	Ecosystem at Affected Areas	22- BAP (Ecosystem Services)	Project Site	22-5 (5)	Monitor and manage any grievances from the community regarding access to fishing resources	BAP §11.4 EIS §9.20.4	As per Grievance mechanism	-	PMU and TPSA
259	O	Using crane & other heavy equipment for port activities	NA as it should be settled before the Construction Phase	23- BAP (Regulating ES)	Project Site	-	NA as it should be settled before the Construction Phase		-	-	
260	O	Using crane & other heavy equipment for port activities	NA as it should be settled before the Construction Phase	24- Impact on structures in Directly Impacted Areas and Crops/productive trees	Project Site	-	NA as it should be settled before the Construction Phase		-	-	
261	O	Using crane & other heavy equipment for port activities	NA as it should be settled before the Construction Phase	25- Livelihoods	Project Site	-	NA as it should be settled before the Construction Phase		-	-	
262	O	Using crane & other heavy equipment for port activities	NA as it should be settled before the Construction Phase	26- Income for businesses	Project Site	-	NA as it should be settled before the Construction Phase		-	-	
263	O	Marine Tugboat and Container Vessel Sea Movement	Fishing, Livelihood	27- Impacts on access to the deeper ocean, fishing ground within the Bay, increased in turbidity and reduction in sources of livelihood	Project Site	27-6 (10)	Consultation with local community members should be on-going to include regular communications regarding fishing access and availability.	SIA §8.4.4	Regular Basis	-	TPSA and PMU
264	O	Marine Tugboat and Container Vessel Sea Movement	Fishing, Livelihood	27- Impacts on access to the deeper ocean, fishing ground within the Bay, increased in turbidity and reduction in sources of livelihood	Project Site	27-7 (10)	The Concessionaire should regularly maintain access to offshore fishing ground including maintaining proper navigational aid to avoid collision between fishermen and vessels	SIA §8.4.1 SIA §8.4.4 EIS §1.8	Regular Basis	-	TPSA
265	O	Marine Tugboat and Container Vessel Sea Movement	Fishing, Livelihood	27- Impacts on access to the deeper ocean, fishing ground within the Bay, increased in turbidity and reduction in sources of livelihood	Project Site	27-8 (10)	Mitigation measures to minimize impacts on fishing ground within the Bay and impacts from higher turbidity of water that will impact sources of livelihood will be determined during the preparation of the Environmental Impact Statement (EIS). The EMP should be strictly implemented by the Concessionaire.	SIA §8.4.1	Regular Basis	-	TPSA
266	O	Marine Tugboat and Container Vessel Sea Movement	Fishing, Livelihood	27- Impacts on access to the deeper ocean, fishing ground within the Bay, increased in turbidity and reduction in sources of livelihood	Project Site	27-9 (10)	Training for positions available at the Port during Operation should be made available to local community	SIA §8.4.1 EIS §1.8 EIS §9.17.4 EMP §10.14	Regular Basis	-	TPSA
267	O	Marine Tugboat and Container Vessel Sea Movement	Fishing, Livelihood	27- Impacts on access to the deeper ocean, fishing ground within the Bay, increased in turbidity and reduction in sources of livelihood	Project Site	27-10 (10)	Maintenance of Grievance Redress Mechanisms to address changes to local access	SIA §8.4.4 EIS §1.8 EIS §9.20.4	Regular Basis	-	PMU and TPSA

Stages = P:PreConstruction, C: Construction,

No	Stages	Activities	Potential Impact	Parameter / Aspect	Sampling Location	ID #	Mitigation Plan	Doc reference / Limit Value	Frequency	Cost	Respon-sibility
268	O	Using crane & other heavy equipment for port activities	NA as Employment will be settle before Operation Phase	28- Population Influx	Project Site	-	NA as Employment will be settle before Operation Phase		-		
269	O	Using crane & other heavy equipment for port activities	Health of Population	29- Community Heathly and Safety	Project Site	29-6 (9)	Maintenance of the Grievance Redress Mechanism established pre-construction and expansion to include construction impacted stakeholders	SIA §8.3.4 EMP §10.20 EIS §9.24.4	Regular Basis	-	PMU and TPSA
270	O	Using crane & other heavy equipment for port activities	Health of Population	29- Community Heathly and Safety	Project Site	29-7 (9)	Facilitate education and awareness programs throughout the lifespan of the port	SIA §8.3.4 EMP §10.20 EIS §9.24.4	Regular Basis	-	TPSA and PMU
271	O	Using crane & other heavy equipment for port activities	Health of Population	29- Community Heathly and Safety	Project Site	29-8 (9)	Establish access controls to the site activities posing health and safety risks to the community	SIA §8.3.4 EMP §10.20 EIS §9.24.4	Regular Basis	-	TPSA
272	O	Using crane & other heavy equipment for port activities	Health of Population	29- Community Heathly and Safety	Project Site	29-9 (9)	Develop strict protocols for increased traffic safety	SIA §8.3.4 EMP §10.20 EIS §9.24.4	Regular Basis	-	TPSA (D&C)
273	O	Using crane & other heavy equipment for port activities	Employment	30- APORTIL staff numbers will be reduced with the building of the new port	Project Site	30-1 (3)	A Strategic Port Area Development Plan (APORTIL Development Plan) is being developed to encompass port operations in other districts.	SIA §8.4.2	Regular Basis	-	PMU
274	O	Using crane & other heavy equipment for port activities	Employment	30- APORTIL staff numbers will be reduced with the building of the new port	Project Site	30-2 (3)	A National Port Organisational structure should be developed to include position descriptions and demobilisation and or re skilling of staff.	SIA §8.4.2	Continual basis	-	PMU and TPSA
275	O	Using crane & other heavy equipment for port activities	Employment	30- APORTIL staff numbers will be reduced with the building of the new port	Project Site	30-3 (3)	Some staff will be transferred to the Tibar Bay Port.	SIA §8.4.2	Continual basis	-	TPSA and PMU
276	O	Using crane & other heavy equipment for port activities	Visual of the Projects	31- Visual impact of the port on local tourist operator and community	Project Site	31-1 (3)	Existing vegetation around the perimeter of the port should be retained, if possible to act as a visual screen	SIA §8.4.3	Continual basis	-	TPSA
277	O	Using crane & other heavy equipment for port activities	Visual of the Projects	31- Visual impact of the port on local tourist operator and community	Project Site	31-2 (3)	Where feasible the elements within the construction site should be located to minimise visual impact	SIA §8.4.3	Continual basis	-	TPSA
278	O	Using crane & other heavy equipment for port activities	Visual of the Projects	31- Visual impact of the port on local tourist operator and community	Project Site	31-3 (3)	Preparation of Light Management Plan should be considered to mitigation night time lighting	SIA §8.4.3	Continual basis	-	TPSA

1.9 Public consultation process

Considerable resources were invested into stakeholder engagement from the inception of this project by the GoTL. Stakeholder engagement has been institutionally anchored in the inter-ministerial PPP Working Group, which in October 2013 appointed a Special Panel for Stakeholder Engagement (Special Panel) chaired by the Vice Minister for Transport and Communication.

The GoTL socio-economic census that was conducted from December 14 to 16, 2015 collected further in-depth socio-economic information that has been used in the preparation of the Social Impact Assessment (SIA) and RAP. This detailed census identified a total of 217 people which consists of 68 project affected people (PAP) in Group A and 149 Project PAP in Group B.

On 10-14th October 2016, Advisian (WorleyParsons) conducted socio- economic surveys in the greater project area with indirectly affect community members. This refers to community member who will not be physical or economically displaced by the project however will still be impacted. The households mainly consisted of Tibar community members living on the opposite side of the road from the proposed port location (i.e. eastern side) as well households in neighbouring Ulmera. The survey was undertaken for 25 households currently living near the proposed development.

Consultation undertaken to date includes:

- Public Private Partnership Launch Unit (PPPLU): Community meeting (June 11,2014) Presentation, discussion & leaflet to the locally affected community
- PPPLU: Community meeting (August 1, 2014) Locally affected population Informing the community about the area of the Tibar Port
- PPPLU: Business Owners (Nov 18, 2015) Project timeline, status and clearance of the area.
- Advisian (WorleyParsons); Principal Of Tibar Primary school (12 October, 2016) Introduction to Advisian, EIS scope and timeframe.
- Advisian (WorleyParsons): Doctor at Tibar Clinic (12 October, 2016) Introduction to Advisian, EIS scope and timeframe
- Advisian (WorleyParsons): Manager at Tibar Training Centre (12 October 2016) Introduction to Advisian, EIS scope and timeframe
- Advisian (WorleyParsons): Manager at Tibar Bay resort (12 October 2016) Introduction to Advisian, EIS scope and timeframe
- Advisian (WorleyParsons): Jesuit Religions Group (16 January 2017) Introduction to Advisian, EIS scope and timeframe
- Advisian (WorleyParsons): Presentation to the Community in Tibar and Ulmera (23 February 2017) presented the results of this EIS.

1.10 Summary of EIS recommendations

The key high environmental impacts of the project relate to the removal and disturbance of benthic habitat within the reclamation area. This is an unavoidable impact and the development and implementation of the recommended Biodiversity Action Plan will guide and create alternative, sustainable mangrove and benthic habitat which also contributes to community resilience.

The environmental impacts relating to dredging, reclamation and disposal offshore may result in impact to corals, water quality, mangrove and seagrass health and distribution. The EIS and EMP incorporates mitigation and management measures including real-time monitoring during dredging and reactive monitoring and management measures during construction.

2 Details of Project Proponent

Timor Port SA is a new company that has been created to design, construct and operate Tibar Port on behalf of the GoTL. Timor Port SA is a consortium of parties comprising of:

1. Bolloré Africa Logistics
2. SDV Logistics East Timor Unipessoal Limitada
3. Societe de Participations Africaines

The lead shareholder is Bolloré Africa Logistics. Under the concession agreement Timor Port SA will construct and operate the report and are responsible for the delivery of the EIS, and therefore are the Project Proponent.

The contact details of the Project Proponent are given below:

Name:	**Timor Port SA**
Dili	
Address:	Av. 30 De Agosto, No. 68 Bairo Dos Grilios Gricenfor, Nain Feto. Dili, East Timor
Phone:	+670-3322-818
Website:	www.bollore-logistics.com
Contact Person:	Rafael Ribiero Managing Director
Singapore	
Address:	Timor Port – c/o Bolloré Ports Asia Pacific Regional Office 1 Magazine Road Central Mall #06-03 Singapore 059567
Contact Person	Eric Mancini Project Manager
Email:	eric.mancini@bollore.com
Phone:	+65 6416 1441
Website:	www.bollore-transport-logistics.com

3 Details of EIA Consultant

Advisian (WorleyParsons) is responsible for leading the environmental assessment process, conducting the environmental and social baseline studies, and preparing the EIS and EMP.

Globally, Advisian is a leading provider of professional services to the infrastructure and resource industries. Advisian has been involved in environmental engineering for decades and has a proven track record of delivering for our customers. Advisian offers a full suite of environmental and engineering services, which cover all aspects from planning to detailed design and implementation. Services include engineering and environmental services to assist in site selection, site analysis, site layout, and design.

One of the key differentiators to Advisian's environmental assessment approach is our ability assemble multi-disciplinary, in-house teams, including but not limited to engineers, urban planners, GIS and mapping specialists, geotechnical engineers, environmental scientists, social impact specialists, and hydrological engineers. These teams are led by experienced environmental assessment professionals who are capable of integrating the technical aspects of all disciplines into a tailored solution. Our ability to draw upon all of these resources internally streamlines the project delivery process and ensures reliable quality for the customer.

3.1 Local presence

Advisian (WorleyParsons) established an office in Timor-Leste in 2010 to provide our customers with the advantages of local content and an 'on-the-ground' understanding of local conditions. 'WorleyParsons Timor-Leste' (WPTL) has delivered several major projects nationwide for the GoTL, TIMOR GAP, and international development agencies, including engineering feasibility, engineering design, and environmental assessment projects.

As a local company employing local staff, Advisian (WorleyParsons) is intimately familiar with the Timorese environment and culture. Our local staff are fluent in Portuguese, Tetum, and other local languages and are experienced in community engagement. Our multi-disciplinary team has extensive experience in the delivery of environmental studies in Timor-Leste.

The development of the EIS and EMP has been led by Mr Daniel Hunter, supported by a core team of specialists with world-class expertise and extensive experience in Timor-Leste. The lead EIS and EMP author has been Annette Jacobs, with key marine input and review from Harry Houridis. Social impacts and community engagement has been led by Alison Mratovich. Their profiles, experience and qualifications for these roles are presented in the table below. The team has been supported in-country by the local office, including Antonio Bernardo and Joanna Belo.

Key Personnel	Qualifications and Experience
Daniel Hunter **EIA Specialist**	***B App Sci (Natural Resources Management), University of Melbourne*** Dan is a Project Manager and Environmental Scientist with over 20 years' experience predominantly in the area of environmental assessment and management. He has extensive experience in managing multidisciplinary projects, including the assessment and management of cumulative environmental issues associated with large infrastructure projects such as mine and port developments, roads, rail corridors, land developments, pipelines and has worked pro-actively with environmental planning teams, project design teams, government regulators, construction personnel, consultants and the community to achieve environmental / sustainability objectives and the development of mitigation strategies and consents in accordance with regulatory requirements. One of Dan's major roles on projects is to integrate environmental considerations into all aspects of decision making, planning, design, construction and operational processes and drive for sustainable outcomes. Dan is currently Advisian's Country Director for Timor-Leste. Recent work in Timor-Leste includes Baucau Cement Plant EIS, TL Cement Bathymetry and marine survey, Local industry capability survey for ConocoPhillips and Tibar Port EIS. Dan has previously managed and led a study of the Timor-Leste local industry capability for ConocoPhillips.
Annette Jacobs **EIS and EMP Lead Author**	***BSc (Hon) Geology, Rhodes University, Dip Project Management*** Annette is trained as a Geologist and Environmental Scientist with 15 years' experience in environment and social impact assessment (ESHIA), management plans development, geology and hydrogeology. She has experience in delivering Environmental and Social assessments in Australia, Africa and Asia. Her technical expertise includes EIA, regulatory approvals and advanced spatial analysis using geographic information systems (GIS). Recent work in Timor-Leste includes the Baucau Cement Plant and Limestone Mine EIS (Category A), and Tibar Port EIS.
Harry Houridis **Marine Sciences** **Principal Consultant**	***BSc, Zoology; MSc, Marine Science, Deakin University, University of Melbourne*** Harry is a marine scientist has over 20 years consulting experience. Harry's fields of expertise include environmental investigation and management of marine and estuarine ecosystems both in temperate and tropical ecosystems. Studies of intertidal and subtidal habitats including mangroves, seagrasses, soft and hard bottom reef habitat (including corals) and soft bottom communities. Harry has extensive experience in the monitoring and management of turbidity and sedimentation associated with dredging and spoil disposal activities (both land and marine based) and their impacts on BPPH, in particular corals, seagrass and other epibenthic species. Recent work in Timor-Leste includes the Baucau Cement Plant and Limestone Mine EIS, TL Cement Bathymetry and marine survey and Tibar Port EIS.

Key Personnel	Qualifications and Experience
Alison Mratovich **Community Consultation**	***BA Geography and Environment Management, University of Johannesburg*** Alison has over 10 years' experience in stakeholder management providing consultancy and advisory services to government agencies and private companies on environmental and social impact assessments, community engagement and socio-economic baseline assessments. Her focus is on social and environmental impact assessments, stakeholder engagement programs and social investment strategies. Delivering assessments in accordance with WA, International Finance Corporation (IFC) and World Bank Standards. Recent work in Timor-Leste includes the Baucau Cement Plant and Limestone Mine EIS, and Tibar Port EIS.

WorleyParsons is supported by the following specialist consultants, who have extensive experience in Timor-Leste, including:

- Bita Bina Semesta (BBS): BBS is based in Bandung, Indonesia and maintains a locally-registered project office in Dili, Timor-Leste. BBS specializes in 'front end' type works, including planning and environmental studies for transport, resources, urban development, infrastructure and industrial development. BBS has become a regional leader in the preparation of environmental impact assessments that meets international standards. BBS recently worked with WorleyParsons to deliver environmental studies in support of the Dili Drainage EIA for the Ministry of Public Works.
- InSight Consulting: Insight is a Timorese-owned organization based in Dili conducting research into public attitudes in the country. Their work is intended to advance the mutual interest of stakeholders, civil society and the people of Timor-Leste. They have a proven record as a credible research agency, based on sound principles of investigation and an intimate knowledge of the country. Their greatest emphasis is on compiling accurate information in a fully accountable way. Insight recently worked with WorleyParsons and BBS on the Dili Drainage EIA environmental studies.
- Nuno Oliviera: Dr. Nuno Oliveira is currently the Cultural Heritage Adviser for the Timor-Leste Secretary of State for Arts and Culture where he has led development of cultural heritage management programs and policies including the National Cultural Policy, Cultural Strategic Plan, Resolution on Protection of Cultural Heritage and ratification of UNESCO's main conventions on cultural heritage. Prior to this role, Dr. Oliveira conducted extensive research in Timor-Leste for the Australia National University (ANU), completing his dissertation on early subsistence practices and agriculture in Timor-Leste. His research included extensive fieldwork and excavations near the proposed project location.
- Dr Colin Trainor: During 1997-2002, Colin worked internationally as an ecologist with BirdLife International, leading biodiversity assessments, particularly of forest birds, in Indonesia and Timor-Leste. In Timor-Leste (2002-2014), work included a PhD thesis involving systematic survey of birds, mammals, reptiles, ants and trees across a 2,000 km^2 district, and consulting projects on transmission and proposed hydropower works at Baucau and Iralalaro; shorebird and waterbird assessments; bird species rediscoveries. He has worked on establishment of a protected area for birds, wrote and published a field guide to the birds of Timor-Leste and produced a site priority guide.

These specialists are supported by a team of local Timorese staff including environmental specialists, social specialists, and field surveyors. Field assistants have also been hired from the local area to ensure access to local knowledge and to promote public consultation.

In addition, wherever possible, the environmental assessment process has involved participation from local communities and mentoring of Timor-Leste university students, especially during field survey activities.

4 Project Description

4.1 Project identification

The Tibar Port Project comprises the design, construction and operation of a new port in Tibar Bay, 10 km west of Dili. The port will have new facilities consisting of a container terminal, wharf, turning basin, shipping channel and associated infrastructure located in Tibar Bay.

4.2 Project category

The Environmental Authority for this Project is the NDPCEI.

Pursuant to Decree Law 5/2011, the NDPCEI categorized the Project as Category A.

4.3 Project background

The GoTL proposes to construct a new port facility in Tibar Bay, 10 km west of Dili, to replace the transportation of shipping containers and cargo traffic through Dili Port which is becoming increasingly congested. The Tibar Port Project comprises the design, construction and operation of the port. The design and construction include a two-berth shipping quay, a container terminal through land reclamation, the demarcation of a shipping channel and, dredging a vessel turning circle within the bay, and construction of associated landside infrastructure. Port facilities at this site are likely to consist of a container terminal, general cargo area and for offices and workshops.

Dredging of the seabed to accommodate vessels at the quay berths, the turning circle for vessels and the incoming/outgoing vessel channel, is estimated to require removal of 3.2 million m^3 of material. This will include removal of marine habitat, most notably a large seagrass bed, live coral and a stand of mangroves. Most of the dredged material will be used to reclaim land for the container terminal, with some (approximately 15%) estimated to be unsuitable fill material, and will be disposed of offshore at a designated dredge spoil disposal site.

The GoTL is being assisted with the development of the port by the IFC. The GoTL, with the IFC's assistance, identified the preferred site for the port within Tibar Bay. They also prepared a conceptual port design, and an environmental and social scoping study that identified the likely primary and secondary impacts of the port, and a range of other supporting studies for the port development. The concept design for the port was developed by Hamburg Port Consulting, building on earlier work undertaken by Soros Associates (2012). A Rapid Environmental Assessment was conducted for the port in September 2012 to provide a preliminary identification of environmental and social issues associated with the development. An environmental and social Scoping Study (2013) was prepared by EcoStrategic Consultants to provide a more detailed identification of issues and assist the GoTL in selecting the preferred site within Tibar Bay. These studies have fed into the Concession Agreement and Appendix II – Terms of Reference (ToR) for the EIS, as required under Decree Law 5/2011.

This EIS has been completed to address the requirements in the ToR. It deviates from the Annex I: Example of EIS structure (as contained in the ToR) as it has been created using the EIS structure and headings required under Decree Law 5/2011. The Decree Law structure does not suit Port

Projects completely, and its structure is better suited to mining and terrestrial assessments, however since the NDCEPI utilises the Checklist contained in Annexure 4 (ADB, 2010), it was essential to compile this document to align with the regulator review requirements.

The EIS has incorporated the ToR scope of work requirements under different headings to the ToR, but still covers the items.

4.4 Project location

The Tibar Port Project is located in Tibar Bay, approximately 10 km west of Dili on the north coast of Timor-Leste Figure 4-1. The bay dimensions are approximately 1.6 km from east to west and 1 km north to south. It was selected by the GoTL as the most appropriate site for the new port, based on a range of considerations.

Seven alternative port site layouts were then considered within the Bay based on operational, engineering, environmental, social and cost factors. A site on the western side of the Bay was selected as the preferred site based on its operational suitability, minimal environmental and social impacts and cost effectiveness (
Figure 4-2 & Figure 4-3).

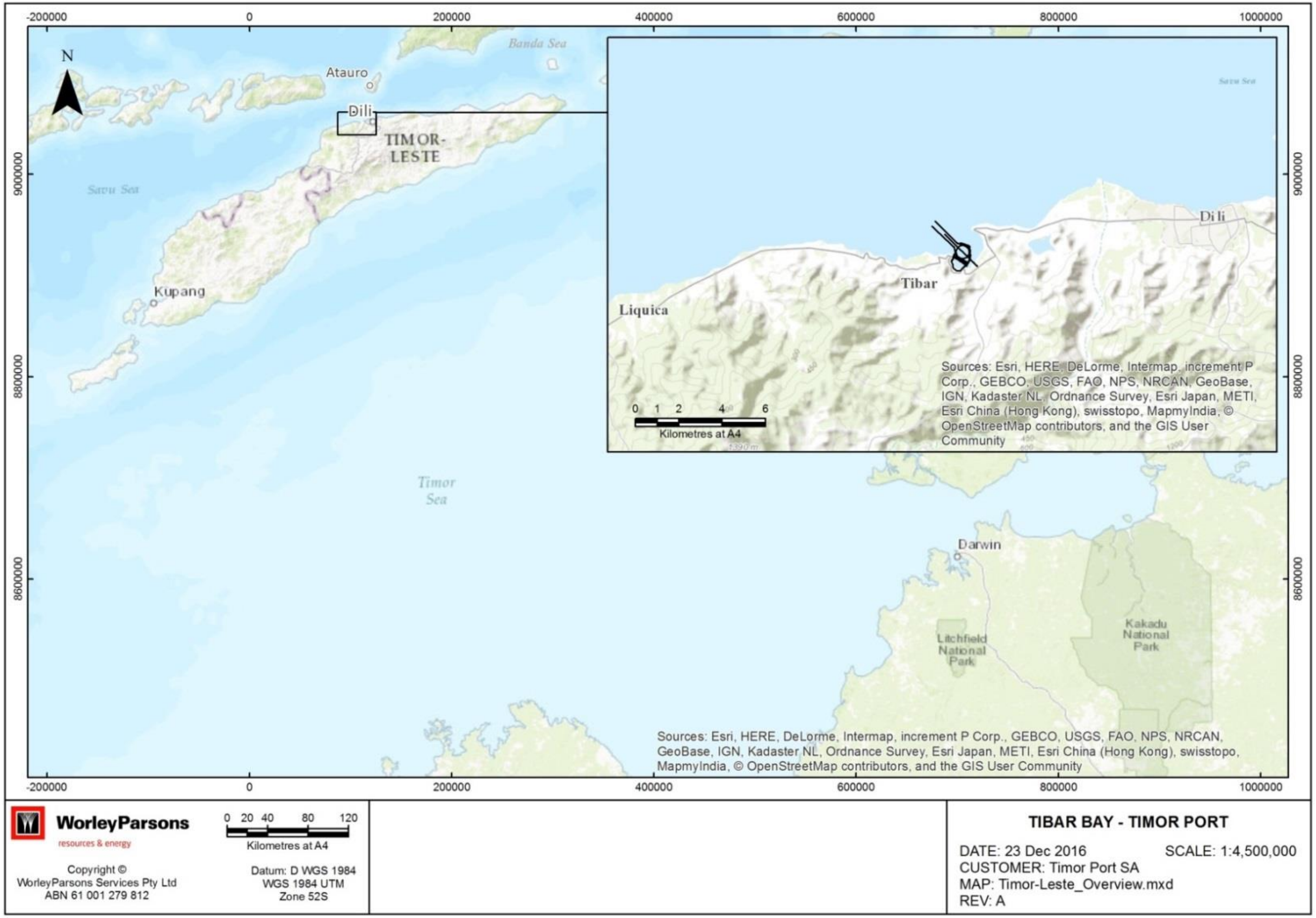


Figure 4-1: Project location in regional context, Timor-Leste

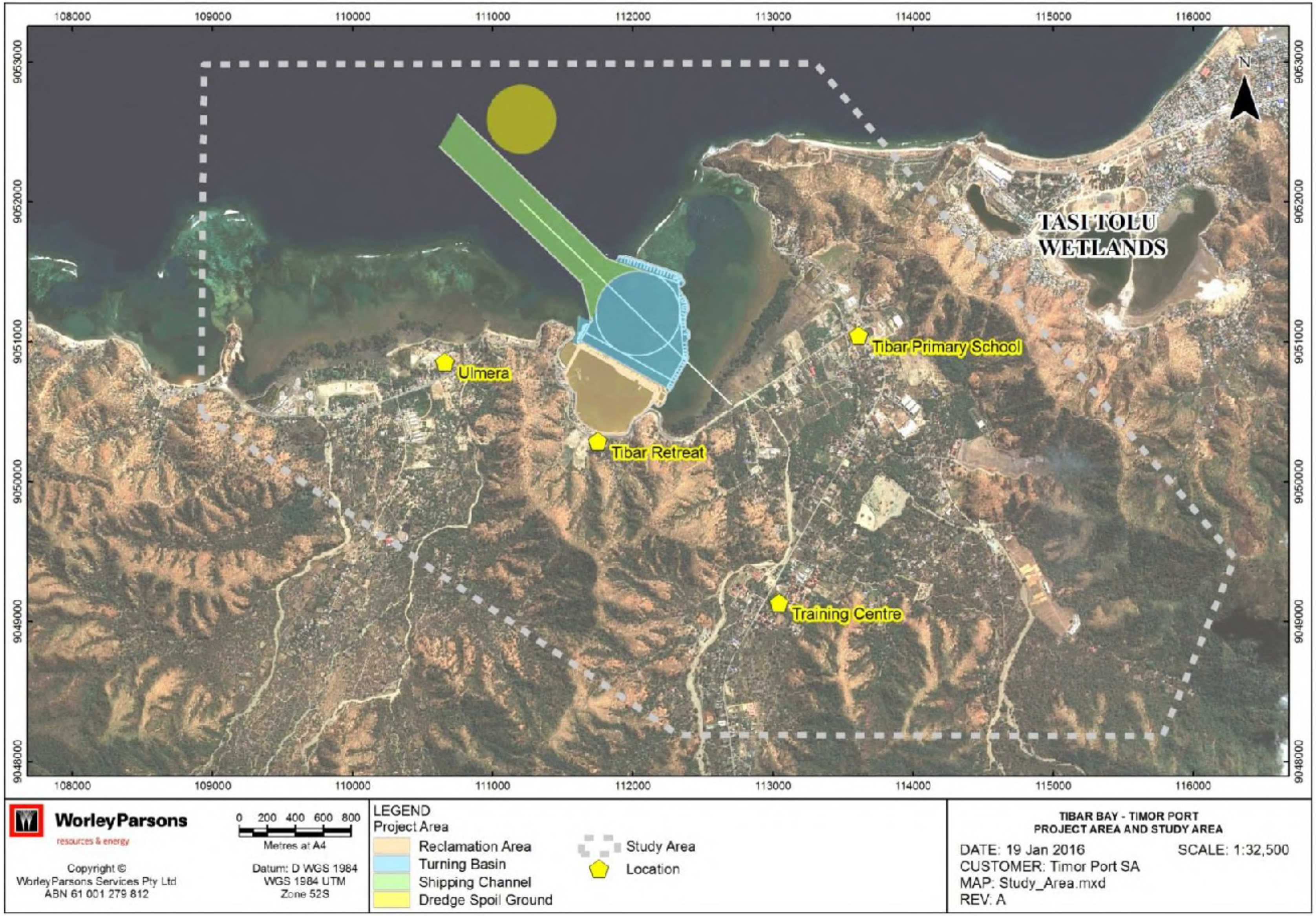


Figure 4-2: Project area, study area and key components of the Tibar Port Project

Figure 4-3: Photo of Tibar Bay taken from south west corner of bay (adjacent to proposed port jetty location)

4.5 Project description

The port project includes the design and construction of the following infrastructure:

- A two-berth quay wall approximately 630 m long;
- Dredging of the quay berth and 600 m diameter turning circle to -16 m CD (Chart Datum);
- Demarcation of a 250 m wide shipping channel;
- Reclamation and soil improvement of the 27.1 ha container terminal; and
- Supporting infrastructure for operation of the port including:
  a. vehicle and machinery fuelling station;
  b. power supply system;
  c. potable water supply system;
  d. fire-fighting system;
  e. rainwater / stormwater drainage system;
  f. waste water treatment plant which includes a sewerage system;
  g. solid waste management system;
  h. marine navigation aids to mark the port entrance and access channel;
  i. offices; and
  j. parking lot.

Phase 1 of the project design is depicted in Figure 4-4.

The port layout and the quay have been designed to service container vessels up to panama size, which are 7,000 TEU (Twenty-Foot Equivalent Unit) capacities. The port capacity is planned for up to 471,000 TEUs per annum, with 614,360 tonnes of general cargo throughput per annum.

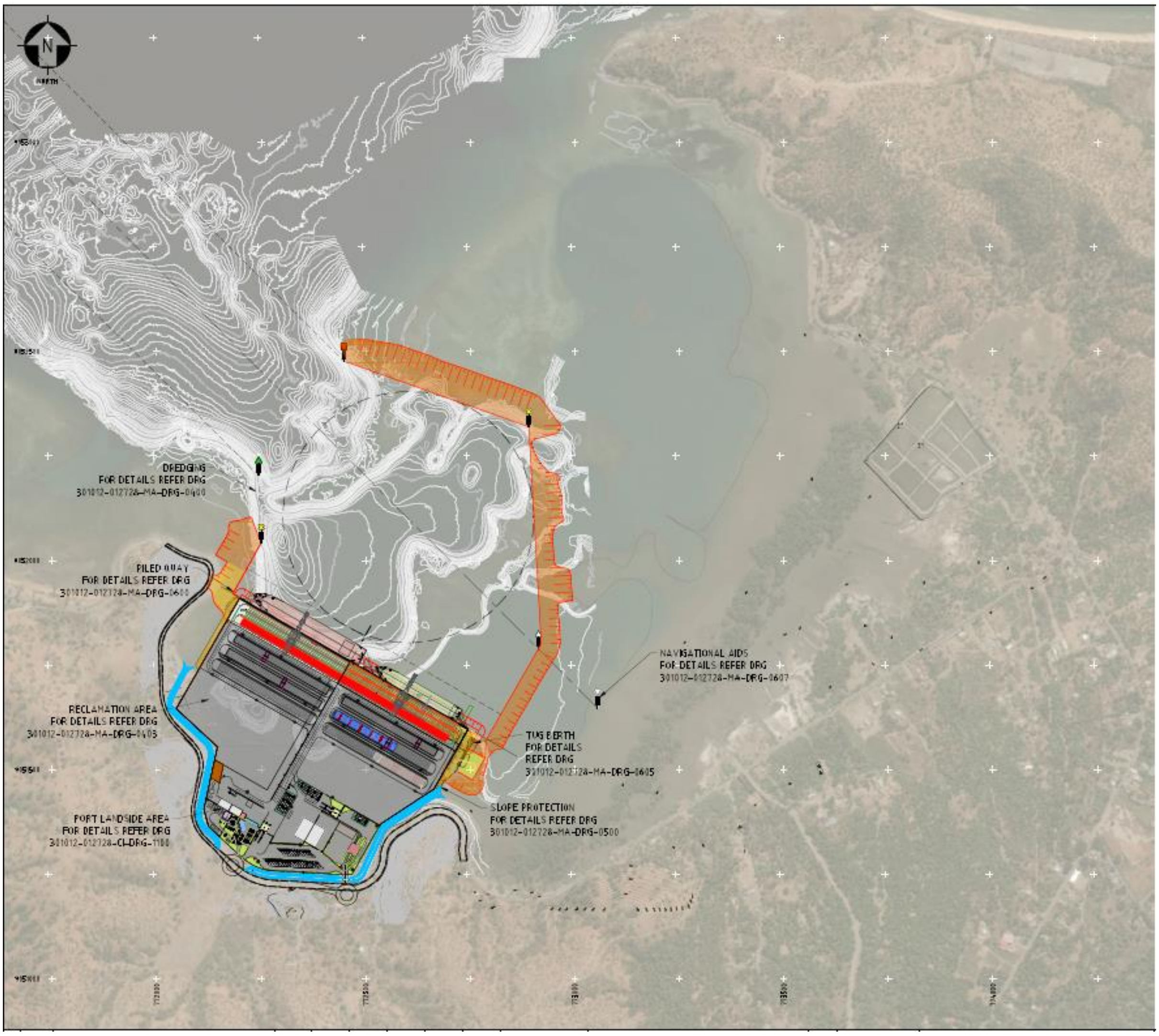


Figure 4-4: Schematic of proposed piled quay wall, container terminal area, general cargo area for Tibar Port (Extract from 301320-13728-MA-DRG-0300_0)

The total cost of the project is estimated at 490 million USD over the life of the concession (30 years), including the completion of the yard in phases and the addition of new equipment to cater to the growth of the port activity and the replacement of equipment that will have reached its life expectancy.

The total cost estimated for the first 3 years of main construction and equipment described above is 290 million USD:

- Infrastructures: 230 MUSD
  - Dredging and reclamation: 111 MUSD
  - Quay: 80 MUSD
  - Yard and networks: 29 MUSD
  - Buildings: 8 MUSD
  - Back-up plant: 2 MUSD

- Equipment: 50 MUSD
  - Ship To Shore cranes and Mobile Harbour crane: 30 MUSD
  - Rubber Tyred Gantry cranes: 10 MUSD
  - Marine equipment: 5 MUSD
  - Other handling equipment (reach stackers, empty handlers, trucks, …): 5 MUSD
- Other costs (start-up costs, financing costs): 10 MUSD

4.6 Supporting facilities

The port will require supporting facilities, as identified in the Project Description. These supporting facilities may have different demands from different stages of the port i.e. during pre-construction, construction and operation of the port. These demands and their relevant stages are summarised below. Decommissioning has not been included as while the concession agreement is currently for 30 years, the port is expected to operate beyond this, and therefore decommissioning is not planned as part of this project.

Power Supply	Timor-Leste Power Company Construction: 8 MVA Operations: 15 MVA
Water Supply	Government-owned groundwater borehole in Tibar Construction: 12L/s (1,000m^3/day) Operations: 4L/s (345m^3/day)
Building Material and rock	Source of material – Local sources, to be confirmed and included in the construction contractor's scope of work. Quarry location - undefined Responsibility for quarry approvals – construction contractor 740,000 m^3 additional rock material required for construction (Advisian, 2017c)
Solid Waste Management	Solid waste will be trucked to Tibar Landfill during construction and operations
Liquid Waste Management	Construction: Sewage will be collected in port-a-loos and transported to Dili Sewage Treatment Plant Operations: A waste water treatment plant will be constructed and operated during operations to treat sewage prior to discharge of treated liquid effluent to the ocean.

4.7 Project stages

The port development is planned in stages, with the initial construction works to be completed in Phase 1 to achieve an operating port with ability to expand. Minor development is planned in Phase 2 including upgrades of the port facility capacity while it is in operation.

The project phases are detailed below:

Pre-construction: Early to mid-2016 including detailed design and procurement.

Construction: Phase 1 is split into two sub-phases, which consist of the following:

- **Phase 1A**: Q4 2017 to Q4 2019 (2 years). This consists of 325 m of quay wall length being constructed, including a portion of the container terminal area (including pavements, services networks, lightings, buildings and supporting infrastructure).
- **Phase 1B**: Q4 2019 to Q4 2020 (1 year). This consists of the construction of a further 305 m of quay wall, including the remainder of the container terminal. This will be constructed while the infrastructure built in Phase 1A is operational.

Phase 2 includes some upgrades and completion of the container terminal yard and buildings:

- **Phase 2**: 2030 for 2 years. Additional laydown area and workshops on the southern extent of the operating cargo and container terminal. This will be constructed while the port is operational.

Operations: Q4 2019 for 28 years.

An artist's impression of the proposed Tibar Port facility is shown on Figure 4-5. The infrastructure associated with each construction phase 1A, 1B and 2 are shown in

Figure 4-6, **Figure 4-7** and Figure 4-8.

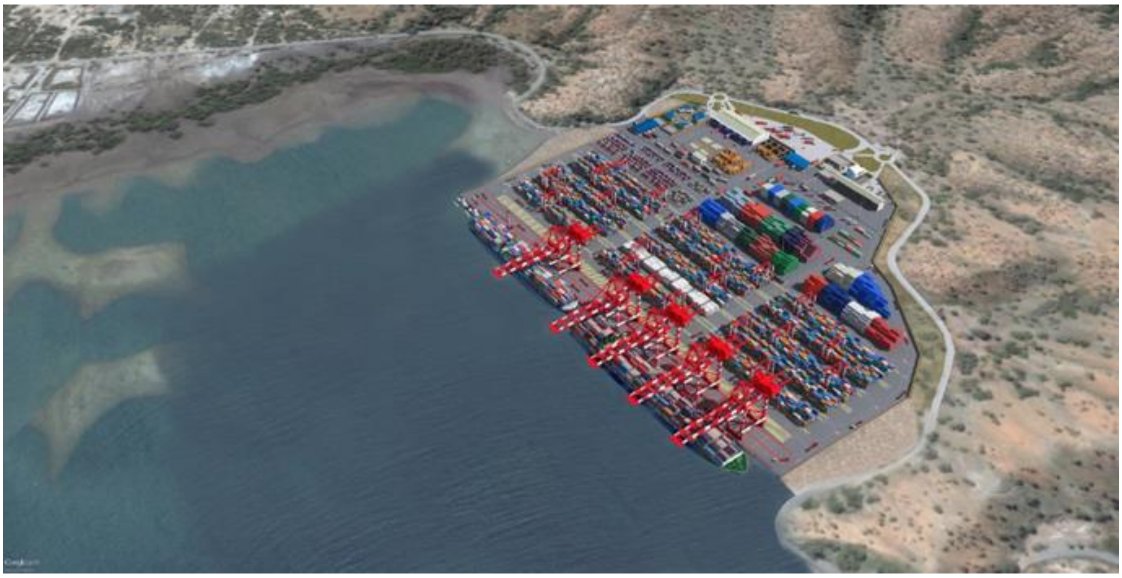
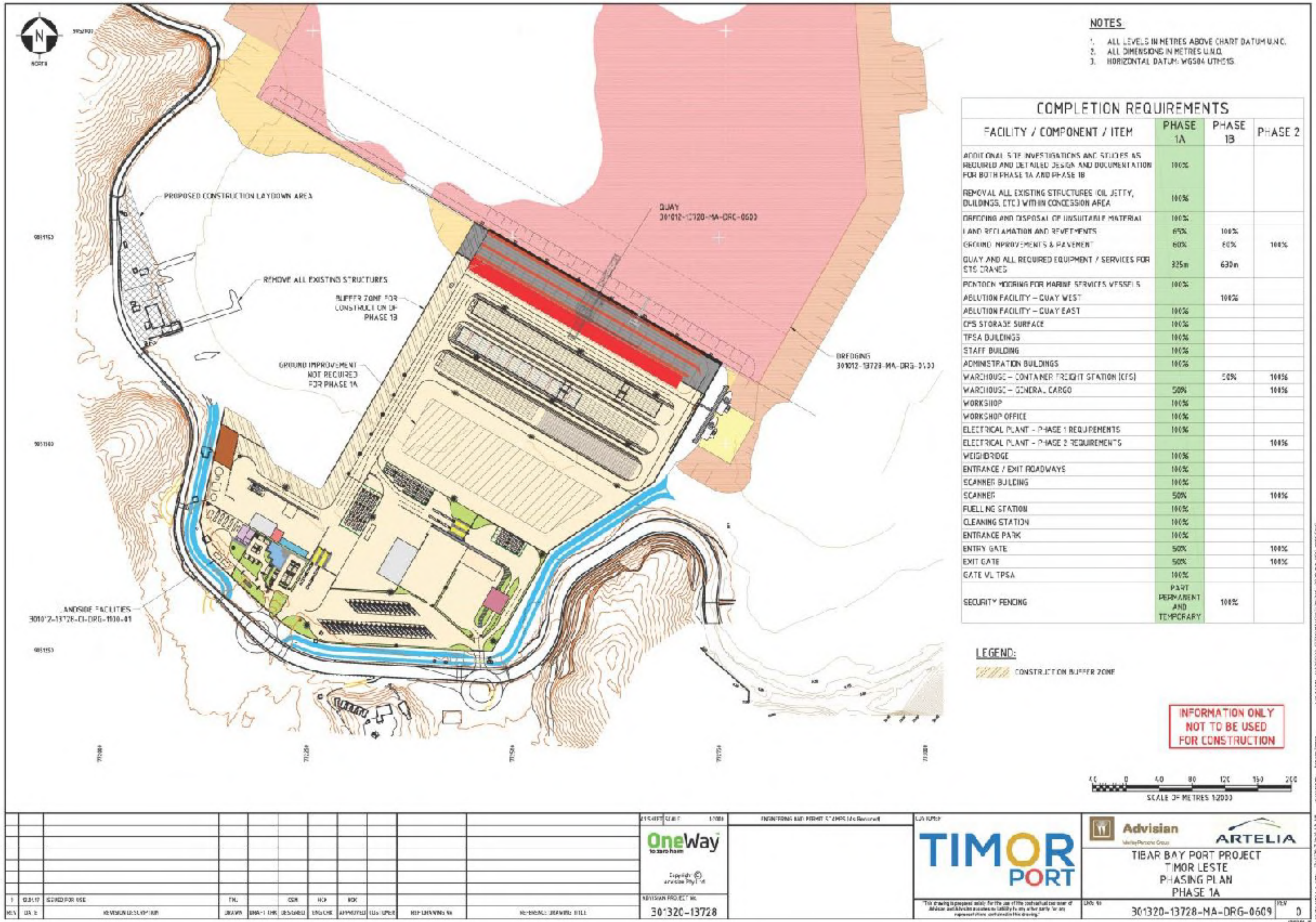


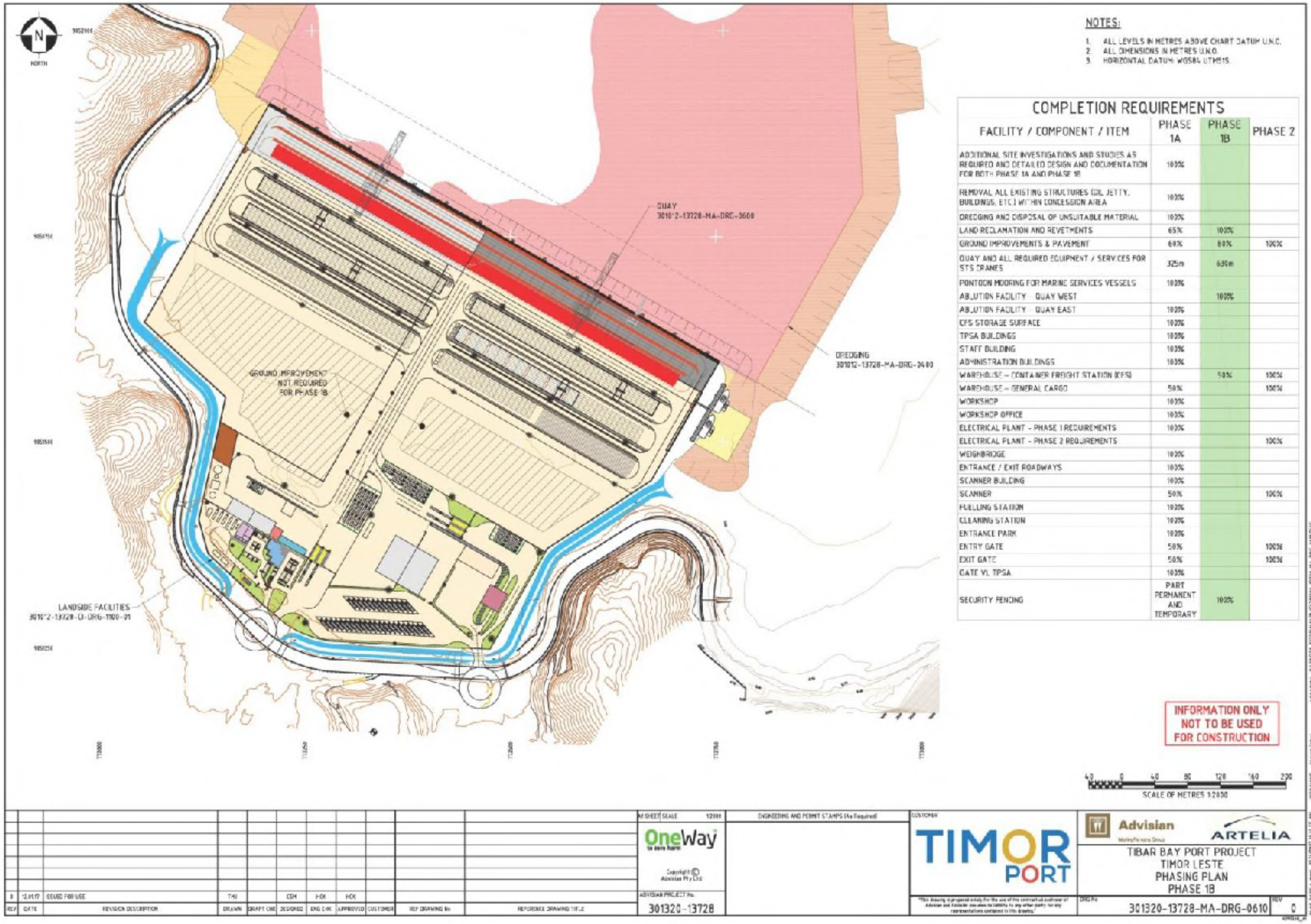
Figure 4-5: Artist's impression of Tibar Port Phase 1 and 2



COMPLETION REQUIREMENTS

FACILITY / COMPONENT / ITEM	PHASE 1A	PHASE 1B	PHASE 2
ADDITIONAL SITE INVESTIGATIONS AND STUDIES AS REQUIRED AND DETAILED DESIGN AND DOCUMENTATION FOR BOTH PHASE 1A AND PHASE 1B	100%		
REMOVAL ALL EXISTING STRUCTURES (OIL JETTY, BUILDINGS, ETC) WITHIN CONCESSION AREA	100%		
DREDGING AND DISPOSAL OF UNSUITABLE MATERIAL	100%		
LAND RECLAMATION AND REVETMENTS	65%	100%	
GROUND IMPROVEMENTS & PAVEMENT	60%	80%	100%
QUAY AND ALL REQUIRED EQUIPMENT / SERVICES FOR STS CRANES	325m	630m	
PONTOON MOORING FOR MARINE SERVICES VESSELS	100%		
ABLUTION FACILITY – QUAY WEST		100%	
ABLUTION FACILITY – QUAY EAST	100%		
CFS STORAGE SURFACE	100%		
TPSA BUILDINGS	100%		
STAFF BUILDING	100%		
ADMINISTRATION BUILDINGS	100%		
WAREHOUSE – CONTAINER FREIGHT STATION (CFS)		50%	100%
WAREHOUSE – GENERAL CARGO	50%		100%
WORKSHOP	100%		
WORKSHOP OFFICE	100%		
ELECTRICAL PLANT - PHASE 1 REQUIREMENTS	100%		
ELECTRICAL PLANT - PHASE 2 REQUIREMENTS			100%
WEIGHBRIDGE	100%		
ENTRANCE / EXIT ROADWAYS	100%		
SCANNER BUILDING	100%		
SCANNER	50%		100%
FUELLING STATION	100%		
CLEANING STATION	100%		
ENTRANCE PARK	100%		
ENTRY GATE	50%		100%
EXIT GATE	50%		100%
GATE VL TPSA	100%		
SECURITY FENCING	PART PERMANENT AND TEMPORARY	100%	

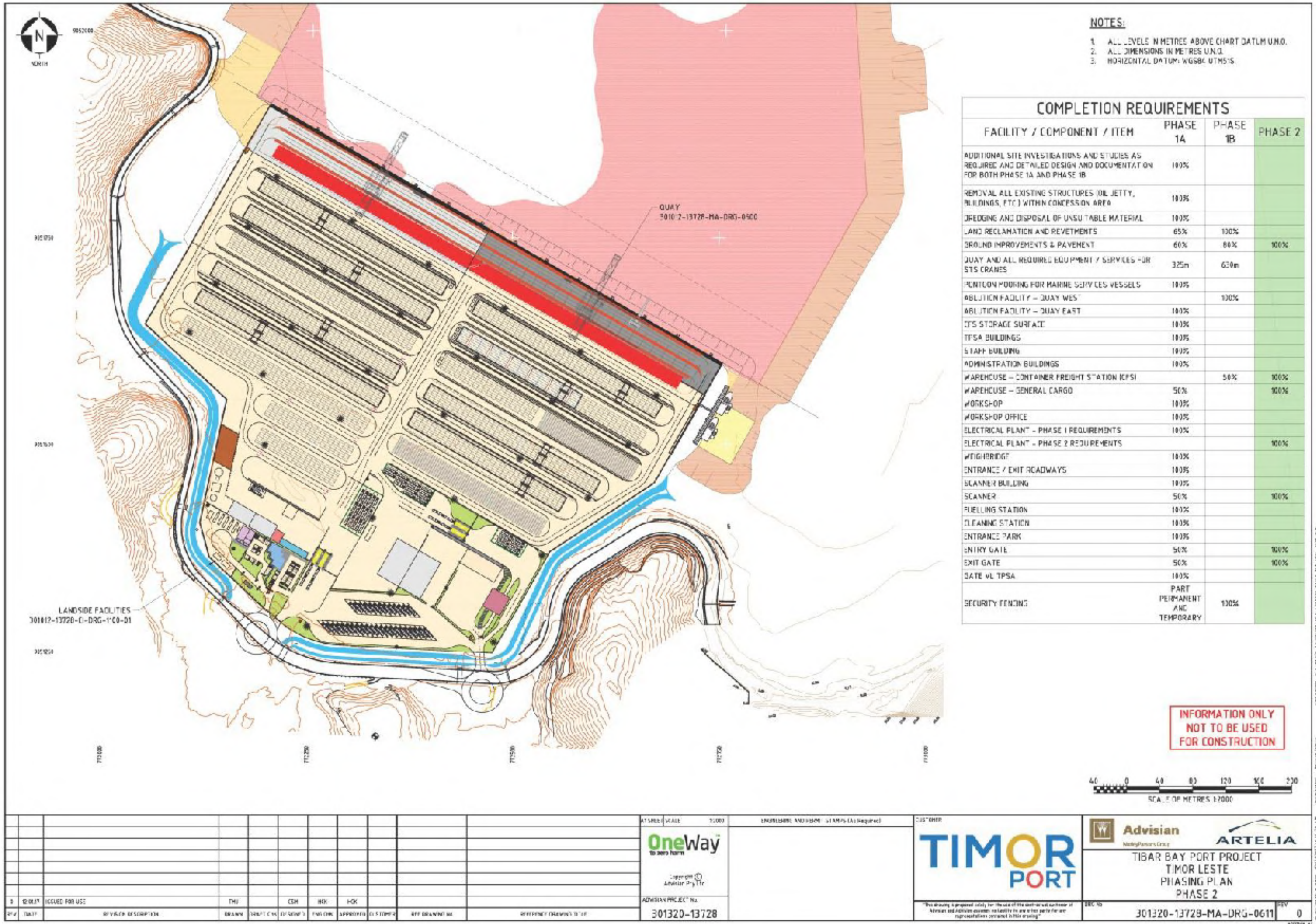
Figure 4-6: Phase 1A infrastructure



COMPLETION REQUIREMENTS

FACILITY / COMPONENT / ITEM	PHASE 1A	PHASE 1B	PHASE 2
ADDITIONAL SITE INVESTIGATIONS AND STUDIES AS REQUIRED AND DETAILED DESIGN AND DOCUMENTATION FOR BOTH PHASE 1A AND PHASE 1B	100%		
REMOVAL ALL EXISTING STRUCTURES (OIL JETTY, BUILDINGS, ETC.) WITHIN CONCESSION AREA	100%		
DREDGING AND DISPOSAL OF UNSUITABLE MATERIAL	100%		
LAND RECLAMATION AND REVETMENTS	65%	100%	
GROUND IMPROVEMENTS & PAVEMENT	60%	80%	100%
QUAY AND ALL REQUIRED EQUIPMENT / SERVICES FOR STS CRANES	325m	630m	
PONTOON MOORING FOR MARINE SERVICES VESSELS	100%		
ABLUTION FACILITY – QUAY WEST		100%	
ABLUTION FACILITY – QUAY EAST	100%		
CFS STORAGE SURFACE	100%		
TPSA BUILDINGS	100%		
STAFF BUILDING	100%		
ADMINISTRATION BUILDINGS	100%		
WAREHOUSE – CONTAINER FREIGHT STATION (CFS)		50%	100%
WAREHOUSE – GENERAL CARGO	50%		100%
WORKSHOP	100%		
WORKSHOP OFFICE	100%		
ELECTRICAL PLANT – PHASE 1 REQUIREMENTS	100%		
ELECTRICAL PLANT – PHASE 2 REQUIREMENTS			100%
WEIGHBRIDGE	100%		
ENTRANCE / EXIT ROADWAYS	100%		
SCANNER BUILDING	100%		
SCANNER	50%		100%
FUELLING STATION	100%		
CLEANING STATION	100%		
ENTRANCE PARK	100%		
ENTRY GATE	50%		100%
EXIT GATE	50%		100%
GATE VL TPSA	100%		
SECURITY FENCING	PART PERMANENT AND TEMPORARY	100%	

Figure 4-7: Phase 1B infrastructure



COMPLETION REQUIREMENTS

FACILITY / COMPONENT / ITEM	PHASE 1A	PHASE 1B	PHASE 2
ADDITIONAL SITE INVESTIGATIONS AND STUDIES AS REQUIRED AND DETAILED DESIGN AND DOCUMENTATION FOR BOTH PHASE 1A AND PHASE 1B	100%		
REMOVAL ALL EXISTING STRUCTURES (OIL JETTY, BUILDINGS, ETC) WITHIN CONCESSION AREA	100%		
DREDGING AND DISPOSAL OF UNSUITABLE MATERIAL	100%		
LAND RECLAMATION AND REVETMENTS	65%	100%	
GROUND IMPROVEMENTS & PAVEMENT	60%	80%	100%
QUAY AND ALL REQUIRED EQUIPMENT / SERVICES FOR STS CRANES	325m	630m	
PONTOON MOORING FOR MARINE SERVICES VESSELS	100%		
ABLUTION FACILITY – QUAY WEST		100%	
ABLUTION FACILITY – QUAY EAST	100%		
CFS STORAGE SURFACE	100%		
TPSA BUILDINGS	100%		
STAFF BUILDING	100%		
ADMINISTRATION BUILDINGS	100%		
WAREHOUSE – CONTAINER FREIGHT STATION (CFS)		50%	100%
WAREHOUSE – GENERAL CARGO	50%		100%
WORKSHOP	100%		
WORKSHOP OFFICE	100%		
ELECTRICAL PLANT – PHASE 1 REQUIREMENTS	100%		
ELECTRICAL PLANT – PHASE 2 REQUIREMENTS			100%
WEIGHBRIDGE	100%		
ENTRANCE / EXIT ROADWAYS	100%		
SCANNER BUILDING	100%		
SCANNER	50%		100%
FUELLING STATION	100%		
CLEANING STATION	100%		
ENTRANCE PARK	100%		
ENTRY GATE	50%		100%
EXIT GATE	50%		100%
GATE AL TPSA	100%		
SECURITY FENCING	PART PERMANENT AND TEMPORARY	100%	

Figure 4-8 Phase 2 Infrastructure

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4.8 Project timeline

Following the signing of the Concession Agreement in mid-2016, FEED and EIS commenced. The FEED and EIS are now complete, and Timor Port SA have gone out to tender for the design and construction contract. This will initiate the pre-construction phase. Pre-construction will involve detailed design of Phase 1A and 1B. It will be required to incorporate allowance for mitigation and management measures outlined in the EMPs.

Following detailed design, construction will commence in 2 phases. Phase 1A and Phase 1B will be completed consecutively (one after the other) with Phase 1A completing construction of the majority of infrastructure to allow port operations to commence. Phase 1B construction will be completed while the port is in operation. A second Phase of construction (Phase 2) is planned to be completed in 2030, also while the port is in operation. These are summarised in Table 4-1 below.

Table 4-1: Project activities planned

Phase	Activities	Timing
Pre-Construction	• Engineering design and finalising of implementation plans. • Relocation/Compensation of people by the GoTL. • Installation/Equipping of water supply wells. • Establishment of exclusion zones around the Project Area. No physical ground work preparation or clearing	Early to mid-2017 to Q3 2017
Construction	• Clearing of the site/area – excavation, piling, pouring of concrete foundations and permanent establishment of laydown area, offices and workshops. • Dredging and reclamation • Building structures in concrete and steel. • Establishment of bunds, drainage areas. • Haulage of building materials and supplies by truck. • Piling and construction of 325 m jetty quay wall. • Construction of portion of container terminal area. • Construction of internal access roads.	**Phase 1A:** Q4 2017, for 2 years to Q4 2019
	• Construction of further 305 m of quay wall. • Construction of remainder of the container terminal.	**Phase 1B:** Q4 - 2019 to Q4 - 2020 (12 months)
	• Additional laydown area and workshops on the southern extent of the operating cargo and container terminal. • Upgrades and completion of the container terminal yard and buildings.	**Phase 2**: 2030 for 2 years
Operations	• Port operation 24 hours a day, 7 days a week. • Truck hauling. • Operating port.	Late 2019, for 28 years
Decommissioning	Not applicable	N/A

4.9 Employment and residence

Employment is estimated to be up to 500 people during construction, with up to 200 people employed during operations.

Construction workers are assumed to be housed in Dili and bussed to the project site each day during the construction period. During operations, it is assumed all workers will live in Dili commute to and from the operating port.

4.10 Pre-construction activities

Pre-construction will consist of detailed design and procurement of equipment and materials. No physical ground work preparation or ground clearing is planned to occur during this phase.

4.11 Construction

Construction will commence with the demolition of the small existing oil jetty. This will be replaced with the project office and a laydown area. There will be a retention bund installed to a minimum of +3 m CD which traverses the outer edge of the Phase 1A reclamation area. Dredging to -16m CD will begin along the eastern end of the berth pocket and a temporary construction load out ramp will be installed adjacent to the dredging. Some seabed reclamation will also occur within the reclamation area.

Step two will see the continuation of dredging with the dredge spoil either used to start the reclamation and ground improvement within the south-western corner of the reclamation area or dumped offshore at a dredge spoil ground if not suitable for fill material.

Dredging of the raised areas of reef will continue, with the reclamation continuing until the bund wall is reached. Once this occurs, the construction of another bund along the norther edge of the reclamation area will be created, with the reclamation continuing until the entire reclamation area is complete.

The initial and final phases of the dredging and reclamation areas are presented in Figure 4-9.

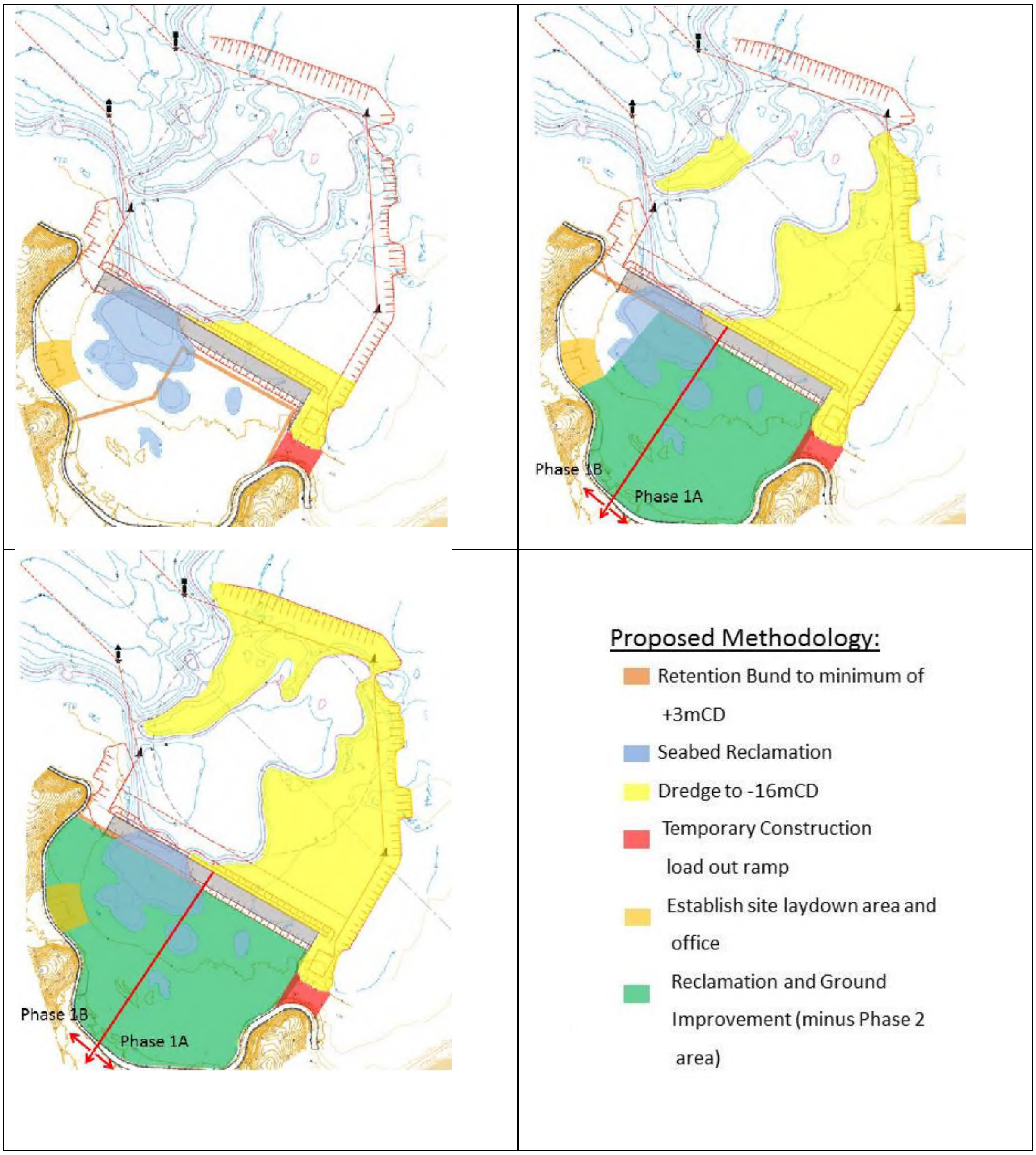


Figure 4-9: Phasing illustration of dredging and reclamation work (TPSA, 2016)

4.11.1 Dredging

The dredging program is estimated to run for nine months and involve the dredging of 3.2 million m^3 of material from within the bay. The dredge spoil material is predicted to be predominantly unsuitable for reclamation use in the top few metres of the seabed, with the underlying bedrock suitable for reclamation. This will result in the initial top layers of dredged material being dumped at a dredge spoil location offshore.

Upon commencement of dredging, it has been recommended that a dredge will initially be used to break the coral crust across the area to be dredged. A dredge is then recommended to suck the fine sediments onto barges to be dumped offshore. For the program, three barges will be used for the placement of material in an offshore spoil ground. The purpose of the dredging works is:

- To provide an approach channel to allow access from deep water to the quays;
- To provide safe vessel berth pockets and turning area within the bay; and
- To provide a source of fill for the reclamation of land on which to construct the port landside facilities.

All dredging works shall comply with applicable Permanent International Association of Navigation Congresses (PIANC) / Recomendaciones para Obras Marítimas (ROMS) Guidelines and have the following minimum dimensions:

- Width of approach channel: 250 m
- Diameter of turning circle: 600 m

Siltation criteria shall apply to all areas. It has been assumed that maintenance dredging will occur every 10 years at a minimum.

Approximately 10,000 m^3 - 100,000 m^3 of material will be dredged per week on a continuous basis during construction.

Table 4-2: Assumed design dredge depth

Location	Design Depth
Berth Pocket	-16 m CD
Turning Basin / Approach Channel	-16 m CD

4.11.2 Dredge disposal

Disposal of dredge material not suitable for use as reclamation full will be disposed of offshore at a dredge spoil disposal site. The estimated volume to be disposed of offshore is estimated to be approximately 15% of the total dredge material, and approximately 480,000 m^3. The recommendation is that the dredge disposal site is 1.2 km from the dredge channel mouth.

It is anticipated that the majority of unsuitable reclamation fill from dredging will be collected and disposed of offshore within the first eight to twelve weeks of dredging. After this, dredge disposal will occur infrequently, if unsuitable material is encountered.

4.11.3 Reclamation

The area to be reclaimed is indicated in orange in

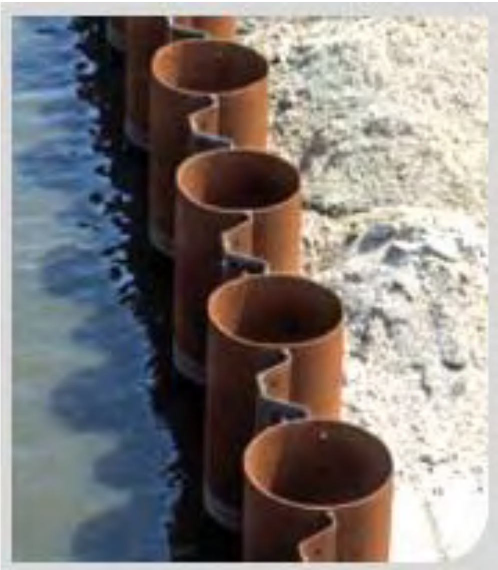
Figure 4-2. The total area is approximately 270,000m^2 (27 ha).

It is planned for the reclamation to be undertaken behind a retention bund constructed to a minimum of +3m CD. Other bunds are anticipated to be designed and constructed by the dredging and construction contractor to allow water that has been pumped in with the dredge material to be slowed down and allow it to slowly seep out of the reclamation area. Example of the proposed dredging and reclamation work is provided in Figure 4-9.

It is not yet known where the dewatering discharge location will be, as it will be selected by the dredging and construction contractor based on their construction design. It is assumed that it will be closest to the bay mouth to allow sufficient dilution via mixing and will be monitored and sampled for contaminants.

4.11.4 Pile jetty

A pile wall will be constructed at the jetty to protect the reclaimed area from waves. The wall will be a *combiwall* and consist of 600 piles, spaced 2 m apart with a sheet between each pile. This will be constructed using three piling barges in rotation, achieving installation of four piles per day. The piling barges will operate six days per week over a period of six months. An example of a pile



4.12 Operations

The operation of the port will consist of vessel loading and offloading of containers and general cargo. Goods to be imported and exported will be stored in the container laydown area and will be transported from the port using haul trucks. Additional periodic activities will include maintenance dredging (every 10 years). The operating port will be supported by a sewage treatment plant on site.

The port is designed to service container vessels between 400 – 7000 TEU capacity. The vessels will have a largest overall design length of 280 m and a maximum draft of 14.5 m. The port will operate continuously 24 hours a day, seven days a week and a forecast of 2 tug trips per day are anticipated. The shipping forecast design is for between 4 and 25 vessels per month visiting the port, dependent on their size and cargo. The port is not expected to be a ship maintenance hub as there are no dry yard facilities.

Shipping routes and frequency currently serving Dili Port is depicted in Figure 4-11. The north coast of Timor-Leste is located at the junction of four major shipping routes between Indonesia, Australia, China and Western Australia.

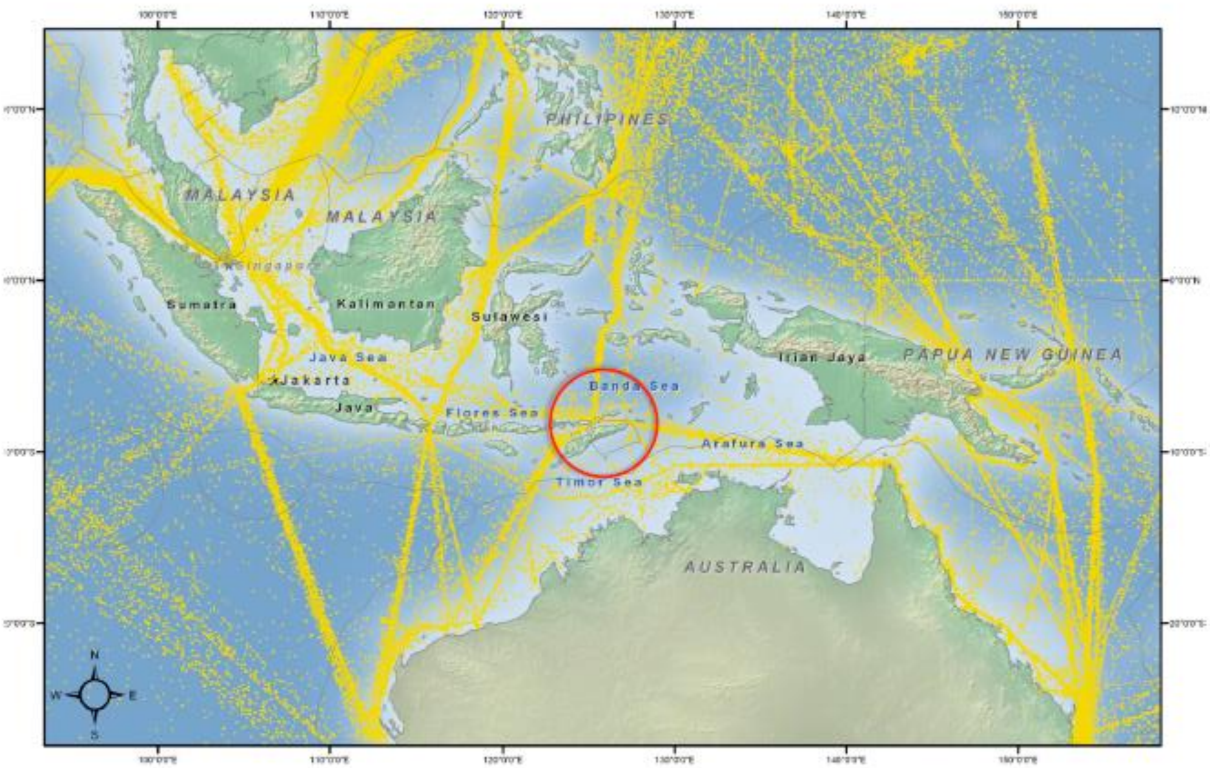


Figure 4-11: Shipping routes in Asia (Ecostrategic, 2014)

4.13 Nature of the project area

Tibar Port is located in Suco Tibar in the sub-district of Bazartete on the north coast of Timor-Leste. The natural environment in Tibar Bay consists of a sheltered bay bordered by mangrove and sandy silt beaches and two rocky headlands at the mouth of the bay. Within the bay, coralline ridges are found, with intertidal seagrass beds and silty mudflat areas. The bay is bounded by low hills to the east and west, with a minor ephemeral drainage, Rihui River draining an upper catchment of approximately 30 km^2.

The area supports important bird species, International Union for the Conservation of Nature (IUCN) listed threatened turtles, dugong and also contains important freshwater springs used for local consumption. There are also fish hatching sites and salt harvesting plots on the eastern end of the bay. Local livestock forage in the mangrove stand that runs along the southern side of the bay. A small jetty is located on the south-western bank which is used for vessel refuelling, oil import and anchoring.

Tibar Bay flows out into the Arafura Sea deep-water strait which is an important migratory channel for large marine mammals including dolphins and whales. Approximately 30 km north-west is the Timor-Leste island of Atauro, an internationally-protected habitat island.

The population of Suco Tibar is approximately 1,800 people and there are two primary schools and one clinic located in the village, adjacent to the project area. The primary occupation of the people in the village is fishing and salt harvesting. There are also old fish hatching sites and salt harvesting plots in the eastern end of the bay. Local livestock currently forage in the mangrove stand that runs along the southern side of the bay, and a small jetty is located in the western bank used for fishing vessel refuelling and anchoring.

Figure 4-12: Tibar Port Site

4.14 Justification and need for the project

Dili Port, the primary port in Timor-Leste, servicing its capitol city is becoming increasingly congested. Tibar Port is needed to replace the transportation of cargo through Dili Port. A report by Payze *et al*. (2011) identified the following constraints with the current port:

- Harbour limitations, especially draught restrictions stop access by competing shipping lines operating larger vessels and hamper productivity as small ships work slower than larger ones;
- Suboptimal management and coordination of cargo operations are currently in place which leads to inefficient use of scarce space at the Port;
- Cargo handling methods employed at the port slow handling and elevate risk to operations;

- Shortage or limitations of the facilities in the Port limits the availability and access to efficient operations which slows cargo delivery;
- Physical constraints around the Port precinct along all boundaries apparently has resulted in the Port being unable to be extended; and
- Dili City infrastructure limits Port access. In particular, road links are congested and the road intersection to the port is inadequate for current operations and is unable to be expanded.

4.15 EIS endorsement

The project proponent, Timor Port SA, endorses this EIS and EMP prepared by its consultants, Advisian (WPTL). Evidence of this endorsement is presented below.

Eric Mancini
Tel +65 64161441
Fax +65 63322548
E-mail eric.mancini@bollore.com

Antonio Lelo Taci
National Director
NDPCEI

ref 20171018EM01

18/10/2017

SUBJECT: Tibar Bay Port Project – Proponent endorsement of EIS

Dear Sir,

Timor Port S.A. has reviewed and endorses the contents of this Draft Environmental Impact Statement (EIS) and this Draft Environmental Management Plan (EMP) for the Tibar Bay Port Project as prepared by our Consultant, WorleyParsons Services Pty Ltd which include the responses to the detailed and very relevant comments received from NDPCEI following the submission of the first draft.

With best regards,

Eric MANCINI
Project Manager

4.16 EIS structure

This EIS has been prepared in accordance with the template provided in Annex 4 of the Draft General Regulations of Decree Law 5/2011 (Draft 5 dated 22 April 2014). The contents of this EIS are listed below:

1. Executive Summary;
2. Details of the Project Proponent;
3. Details of the EIA consultants;
4. Description of the Project;
5. Policy, Legal, and Institutional Framework;
6. Description of the Environment;
7. Climate Change;
8. Alternatives;
9. Impact Assessment and Mitigation Measures;
10. Social Impact Assessment;
11. Economic Assessment;
12. Summary of Environmental Management Plan;
13. Public Consultation and Information Disclosure;
14. Difficulties encountered;
15. Conclusions and recommendations; and
16. Non-Technical Summary.

The Environmental Licensing Law requires that the EMP is a separate stand-alone document from the EIS. In addition to the EMP, three other management plans have been prepared, as required by the ToR for the project. These are also stand-alone documents consisting of:

1. Biodiversity Action Plan;
2. Dredging Management Plan; and
3. Port Marine Spill Contingency Plan.

The EIS and four management plans are written to meet the requirements of the Concession Agreement Appendix II: ToR for the project. The structure and headings of this EIS are consistent with those required under the Decree Law, as stated above, and therefore deviate from the structure and headings presented in Annex I of the ToR for the project EIS.

5 Policy Legal and Institutional Framework

This section identifies the legislation and guidelines governing the conduct of the environmental and social impact studies and preparation of the EIS and EMP documentation. This section also identifies other applicable laws, regulations, guidelines, and standards governing environmental quality, health and safety, protection of protected areas and sensitive areas, protection of vulnerable and endangered species, land use control, and other environmental and social issues.

5.1 Constitution of the republic of Timor-Leste

Timor-Leste's environment and its valuable natural resources, represent a potential source of wealth that may support economic growth and community development (RDTL, 2011b). However, the GoTL recognizes the need to develop these resources in a sustainable way and still provide a better quality of life for its citizens. The GoTL and the constitution recognize the importance of environmental protection as a fundamental task of the government and as a fundamental right of its citizens. The constitution of Timor-Leste provides the guiding principle for environmental protection in the country. Article 61 of the constitution states:

- Everyone has the right to a humane, healthy and ecologically balanced environment and the duty to protect it and improve it for the benefit of the future generations.
- The State shall recognize the need to preserve and rationalize natural resources.
- The State should promote actions aimed at protecting the environment and safeguarding the sustainable development of the economy.

Furthermore, the constitution states 'the exploitation of the natural resources shall preserve the ecological balance and prevent destruction of ecosystems'.

5.2 Environmental legislation

Timor-Leste has developed key environmental legislation used to govern the above constitutional objectives for the country. Below is a list of these environmental laws and regulations, a brief description of each and a demonstration of how the project meets each law.

Name	Description	Project Compliance
Decree Law 26/2012 Environment Basic Law (EBL)	The EBL (also sometimes called the Environmental Framework Law / EFL) sets the overall framework for environmental protection in Timor-Leste. Articles 14, 15 and 16 of the Decree Law No. 26/2012 define the instruments for environmental standards, environmental assessment and licensing and environmental monitoring respectively for Environmental Assessment (EA).	Environmental Assessment study
Decree Law 5/2011 Environmental Licensing Law (ELL)	The objective of the Decree Law is to create a system of environmental licensing for public and private projects likely to produce environmental and social impacts. This	The proposed project has been classified by the NDPCEI as a 'Category A' project "that may

Name	Description	Project Compliance
	system of licensing is based on assessing the size of the potential impacts of projects taking account of their nature, size, technical characteristics and location. Decree-Law No. 5/2011 elaborates the licensing requirement and the Environmental Impact Assessment (EIA) procedure in Timor-Leste. Article 4 of the Decree defines the categories of projects and the Type of EA procedure required. The classification of projects is made in accordance with Annex I and II of the Decree.	potentially cause significant environmental impacts, and [is] subject to the procedure of Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP)
Draft Ministerial Diploma for General Regulations for Environmental Assessment	The Asian Development Bank (ADB) has prepared detailed requirements for Screening, Scoping and the Terms of Reference, Environmental Impact Statements and Environmental Management Plans for Environmental Assessment. Although these guidelines have not been formally adopted, they are in practical use by NDPCEI.	Environmental Assessment conducted in conformance with draft regulations. Format of EIS/EMP compliant with guidelines.
Draft Ministerial Diploma Regulation on the Public Consultation Procedures	The Asian Development Bank (ADB) has prepared detailed requirements for Public Consultation Procedures and Requirements during the Environmental Assessment Process. Although these guidelines have not been formally adopted, they are in practical use by NDPCEI.	Public consultation conducted in conformance with draft regulations. Public Consultation conducted by proponent during preparation of draft ToR (scoping) and draft EIS/EMP

5.3 Biodiversity and protected areas legislation

Biodiversity and protected areas legislation frames the requirements for maintaining a high level of natural resource protection during project planning. A list of key legislation, and how the project complies, is presented below.

Name	Description	Project Compliance
UNTAET Regulation 2000/19 on Protected Places	United Nationals Transitional Administration in East Timor (UNTAET) Regulation 2000/19 is still in force and used by the Forestry Department, although it is intended to be replaced by a draft Decree Law on Protected Areas, a draft Decree Law on Forestry, and the draft Decree Law on Biodiversity. Section 3 provides for the protection of endangered species and their habitats. The killing, injuring, harming, taking or	EIS Section 9.13 includes results of terrestrial ecology study focused on the flora and fauna in Timor-Leste, including mapping of vegetation, location and description of key habitats

Name	Description	Project Compliance
	disturbing of any endangered species is prohibited. The destruction in any way of the habitat of an endangered species is also prohibited. Section 4 provides for the protection of coral and coral reefs. Section 5 provides for the protection of wetlands and mangrove areas."	
UNTAET Regulation 2000/17 on the Prohibition of Logging Operations and the Export of Wood from East Timor	UNTAET Regulation 2000/17 also remains in force at present. Section 2 prohibits the cutting, removal, and logging of wood from land in East Timor. It also prohibits the burning or any other destruction of forests. These prohibitions are subject to Section 3 which allow for exemption to be authorized for certain logging activities.	
Draft Decree Law on Forest Management, draft 7, received August 2013	The cutting of "forest trees" and harvesting of other forest products in any zone is prohibited unless specifically authorized by the National Director of Forestry (Article 61). The Director may give authorization for such cutting and harvesting if it would be in accordance with this law and other legislation, any community guideline agreements or with the forest management plan. The Director must take into consideration the forest management plan, conservation of the soil and water of the area, ecology and biodiversity of the area, and any other technical specifications determined by the National Director. Article 61.2 allows for community cutting of trees and harvesting other forest products without authorization, when used for traditional purposes. Article 67 provides for measures to prevent deforestation. No-one is allowed to cut, damage, destroy, remove, transport, purchase, sell, donate or otherwise acquire or dispose of any tree, unless that tree is private property or the person has a Community Forestry Management Agreement or a permit/authorization from the National Director. It is an offence under Article 86 for any person to pollute or contaminate land in any Protected Area with chemicals, industrial waste or organic or other polluting substances.	

Name	Description	Project Compliance
Draft Decree Law on Biodiversity, dated March 2012	When preparing an SIA, EIS, EMP or any other environmental assessment, the proponent must include an assessment of the potential impacts of the proposal on biodiversity and biological resources. This assessment must include: (a) Impacts on any natural ecosystems and habitats located within or near the proposed site, in particular the habitat of any protected species and critical habitat; (b) Impacts on any legally protected areas, as well as any areas the subject of cultural or traditional protection mechanisms such as Tara Bandu; (c) Impacts associated with invasive alien species on or near the proposed site; (d) The sustainability of any proposed use of biological resources; and (e) Proposed measures to avoid, minimize, or mitigate identified impacts, and measures to offset or compensate for any affected biological resources and impacts on biodiversity. In analyzing any environmental assessment and before deciding to grant an environmental license, the decision-maker must take into account whether granting approval for the proposed activity would be consistent with the purpose and principles of the draft Biodiversity Decree Law. In particular, the Decision-maker must be satisfied that: (a) Any adverse impacts and risks identified in the assessment are deemed satisfactory; (b) Adequate measures to avoid, minimize, or mitigate identified adverse impacts have been identified and will be implemented; (c) As a last resort, adequate compensatory measures, which are designed to achieve no net loss of biodiversity, have been identified and will be implemented by the proponent to offset or compensate for any impacts on biodiversity and affected biological resources; (d) The proponent has prepared, in close consultation with affected local communities, a comprehensive plan that includes details about all necessary remedial and restoration efforts, and is satisfied that the plan will be implemented at the proponent's expense.	

Name	Description	Project Compliance
United Nations Convention for Biodiversity (1992)	To develop national strategies for the conservation and sustainable use of biological diversity.	
Government Decree-Law 21/2003 on Quarantine and Sanitary Control on Goods Imported and Exported	The Government Decree-Law 21/2003 on Quarantine and Sanitary Control on Goods Imported and Exported establishes the processes for sanitation control of the import and export of plants and animal and their derived products. The objective of the law decree states: • Prevent and control the introduction, establishment and propagation of exotic plagues and diseases and other harmful organisms in the national territory. • Protect the environment, agricultural production and livestock as well as aquaculture production originating from the country. • Control the already existing plagues and diseases in the country. • Protect human beings and the public health from diseases transmitted by animals, plants or their derivatives, or by other organisms.	The Environmental Management Plan deals with introduced marine pests management.

5.4 Ports and shipping

As this is a port project, relevant ports and shipping law requirements and how the project will meet these requirements are detailed below.

Name	Description	Project Compliance
Decree Law 3/2003 Port Authority establishment	The Decree Law 3/2003 on the establishment of the Port Authority and on the approval of the bylaws thereof details the structure, nature and responsibilities of the Administração dos Portos de Timor-Leste or Port Authority of Timor-Leste (APORTIL). The annex to this law requires APORTIL to grant licences for works carried out within their jurisdiction. The marine facilities associated with the project will require the issuing of a port licence from APORTIL prior to commencement of construction.	The project will seek to comply with APORTIL requirements using the relevant information from the project design and construction plans.

5.5 Land legislation

To protect people on the land upon which the project is proposed, the following legislation and project compliance details have been presented below.

Name	Description	Project Compliance
Draft Expropriation Law	Property may only be expropriated for the public interest and upon timely payment of fair compensation (Article 1). Only the State can order expropriation (Article 5). There must be public consultation on any project requiring expropriation of private or community property (Article 13), and the documents made available to the public for consultation and public hearings must include any environmental, social or economic impact assessment studies (Article 15.4).	If expropriation of private or community property is required, this EIS may be provided for public review in accordance with Article 15.4.
United Nations Convention to Combat Desertification	To combat desertification and mitigate drought in affected countries through international cooperation and partnerships.	EIS assesses impacts associated with climate change, geology and soils, terrestrial vegetation, surface water and groundwater.

5.6 Aquaculture and fishing legislation

The port project compliance with aquaculture and fishing legislation in Timor-Leste is detailed in the table below.

Name	Description	Project Compliance
Decree Law 6/2004 On General Bases of the Legal Regime for Fisheries and Aquaculture Management and Regulation (amended by Decree Law 4/2005)	The Decree-Law responds to the need of regulating fishing activities so as to contribute to the attainment of objectives on the economic and social development policies of the country while simultaneously ensuring the protection and conservation of species, as well as their continuous and sustainable exploitation. It also establishes the legal regime for aquaculture. Prohibits the introduction into national maritime waters and hydrographical basis of Timor-Leste of any substances or toxic objects likely to cause infection, and which poisons or destroys fishing resources, algae or any aquatic flora species.	Sections 6.17 and 9.12 of this EIS provide the results of a coastal processes assessment including modelling of coastal processes. Section 9.15 of this EIS provides the results of marine ecological surveys including a benthic habitat survey and fisheries assessment in the area of the proposed Port to assess potential direct and indirect impacts associated with the proposed infrastructure

5.7 Labour legislation

As part of the SIA, labour laws were investigated. Those identified, along with how the project will comply with these laws are outlined below.

Name	Description	Project Compliance
Law 4/2012 Labor Code	The duties of the employer include providing workers with good working conditions, prevention of risks from diseases and occupational accidents, providing workers with information and equipment necessary to prevent such risks. The employer is under a general obligation to provide appropriate health and safety conditions, to prevent accidents and dangers, and to reduce risks. Employers must ensure that workers are not exposed to risks that are harmful to their health, and must promote awareness programs. Where necessary, employers must provide safety equipment to workers.	Sections 6.19, 6.20, 9.21 and 9.27 of this EIS provide the results of a comprehensive study of the project's socio-economic impacts including labor force, public health and health facilities.

5.8 Cultural heritage legislation

Cultural heritage is an important part of Timor-Leste culture. The laws governing the protection and management of cultural heritage and demonstration of project compliance is presented below.

Name	Description	Project Compliance
Constitution of the Democratic Republic of East Timor	Section 59 for Education and culture, ensure everyone has the right to cultural enjoyment and creativity and the duty to preserve, protect and value cultural heritage.	Sections 6.21 and 9.29 of this EIS provide the results of a detailed cultural study to avoid or minimize impact on archeological and cultural sites, manage and to protect heritage sites
National Cultural Policy	Section 6.7 Legislation stated "The State Secretariat of Culture has initiated a partnership with the State Secretariat of environment in order to regulate the heritage component in environmental impact assessment studies. Besides this, the creation of a new Heritage Law, aiming at classifying the cultural heritage of East Timor and defining the actions to be taken by the nation, will allow to clarify the rights and duties of citizens towards cultural heritage.	

5.9 Environmental and social sustainability standard

In addition to Timor-Leste environmental legislation, environmental and social standards required to be complied with are detailed below.

Name	Description	Project Compliance
IFC's Performance Standard on Environment and Social Sustainability 2012	The Sustainability Framework comprises IFC's Policy and Performance Standards on Environmental and Social Sustainability. The Policy on Environmental and Social Sustainability describes IFC's commitments, roles, and responsibilities related to environmental and social sustainability. IFC requires its clients to apply the Performance Standards to manage environmental and social risks and impacts so that development opportunities are enhanced. There are eight performance standards including; Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts, Performance Standard 2: Labor and Working conditions, Performance Standard 3: Resource Efficiency and Pollution Prevention, Performance Standard 4: Community Health, Safety, and Security, Performance Standard 5: Land Acquisition and Involuntary Resettlement, Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, Performance Standard 7: Indigenous Peoples, Performance Standard 8: Cultural Heritage	Environmental, social and cultural studies have been undertaken. Socio Economic baseline study included educational level, labor force, Socio-cultural environment, community infrastructure, health and educational facilities, land use and land status conducted. The results of these studies, including impacts and associated mitigation measures are incorporated into this EIS.

5.10 Noise regulation

Noise and associated vibration regulations have been identified.

Name	Description	Project Compliance
The Western Australian Environmental Protection (Noise) Regulation 1997 (WA) (DEC, 1997)	Regulation 7 of the Environmental Protection (Noise) Regulations 1997 states that 'noise emitted from any premises when received at other premises must not cause. Or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind'.	Section 9.9 of this EIS provides the results of noise impact modeling to predict the likelihood of impacts on sensitive receptors. It also provides recommendations to mitigate or reduce noise impacts to acceptable levels and address any residual risk
AS 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites	The standard provides guidance on noise and vibration control in respect to construction, demolition and maintenance sites. The standard provides formulae which have been used to calculate predicted noise emissions.	
UNTAET Guideline on Ambient Noise (2002)	This Guideline was introduced by UNTAET Administration to protect the public from nuisance associated with stationary sources of noise in outdoor environments and does not extend to Occupational and health issues. Its maximum admissible noise levels and abatement levels are identical to those in the World Bank Environmental Health and Safety Guidelines (reference for ADB projects)	

5.11 Air quality guidelines

International guidelines on the assessment and mitigation of air quality impacts by the project, along with project compliance, are detailed below.

Name	Description	Project Compliance
World Health Organization (WHO), 2006: Air Quality Guidelines (AQGs) for PM_{10}	World Health Organization Air Quality Guidelines (WHO AQGs) provide an international reference that countries, particularly those without the resources to conduct their own assessment, can use to develop AAQSs. The 2006 WHO AQGs are composed of a single guideline value and interim targets (ITs). The interim targets provide as stepwise approach to achieving the air quality guideline value. The guideline values can be used by developed countries, with the capacity to implement a strict AAQS, while developing countries, with higher levels of air pollution, could select an interim target level achievable based on their own air quality management infrastructure, and progress towards the AQG value at own pace.	Section 9.8 of this EIS provides the results of air quality monitoring to establish the baseline ambient concentrations of the pollutants of concern and modelling of potential air quality impacts. It also provides recommendations to mitigate or reduce air quality impacts to acceptable levels and address any residual risk

5.12 Climate change and Kyoto Protocol

To assess, mitigate and manage the impacts from climate on the project, the below key framework and guidance has been used.

Name	Description	Project Compliance
United Nations Framework to Combat Climate Change (1992) and the Kyoto Protocol	To stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Requires industrialized countries to reduce emissions by setting a mandatory emission limit. The Democratic Republic of Timor-Leste (RDTL) is currently exempt from the emission reduction target, based on their own air quality management infrastructure, and progress towards the AQG value at own pace.	Section 7 of this EIS assesses the potential Climate Change impacts on the project and environment and identifies necessary adaptation measures.

5.13 Ozone layer and Montreal Protocol

To minimise the project impact on the ozone layer, the below protocol has been identified and the project compliance demonstrated.

Name	Description	Project Compliance
Vienna Convention for the Protection of the Ozone Layer (1993) and the Montreal Protocol	To protect the ozone layer by controlling the production and consumption of specific chemicals and phasing out the production of numerous substances believed to be responsible for ozone depletion.	Not applicable to this project.

5.14 Water resources

The sustainable use and consumption of water is managed through the below legislation and guidance. Project compliance is demonstrated below.

Name	Description	Project Compliance
Decree Law 4/2004 Water Supply for public consumption	The Law creates conditions for water distribution for domestic use for urban and non-urban areas. In accordance with the decree law, the Direcção Nacional Serviço de Agua e Saneamento or National Directorate for Water and Sanitation (DNSAS) facilitates, at the national level, the appropriate, secure and sustainable water supply for public consumption, outside of urban areas, by community-run water supply systems. The water supply system, outside of urban areas, is managed by water	Sections 9.10 and 9.11 of this EIS address water requirements.

Name	Description	Project Compliance
	management groups, which are appointed by the community. The role of the water management group is to establish a number of procedures, including who, how and how much water is distributed to members of the water management group.	
[Draft] National Water Resources	DNCQA (Direcção Nasional Contolo e Qualidade de Agua or National Directorate for Control and Quality of Water) has advised that they have prepared a Draft Water Resources Law which is currently under consideration by the Council of Ministers. When enacted, the law will require licensing for groundwater extraction, including addressing potential impacts on other users and the environment and compliance with specific conditions.	Section 9.11 of this EIS addresses the impacts of groundwater use by the Project.

5.15 Summary of project approvals

Project approvals are listed in Table 5-1 which follows. These detail all the licenses which are required prior to port construction.

Table 5-1: Summary of project approvals

Permit	Aspect	Permit / Guideline Name	Legal Framework	Agency with Primary Responsibility	Responsible Ministry	Duration for Approval	Expiry
Yes	Clearing of vegetation	Environmental License	*Decree Law 5/2011* on environment licensing law	National Directorate for Pollution Control and Environment Impact	Ministry for housing development, Spatial Planning and Environment	Approx. 90[1] days from submission of draft ESIA to NDPCEI	Never
Yes	Sand/Gravel extraction	Environmental License - if sourcing more than 5,000 m^3 / year (Category B project)	*Decree Law 5/2011* on environment licensing law	National Directorate for Pollution Control and Environment Impact	Ministry for housing development, Spatial Planning and Environment	30 days	Never
No	Pollution control	Chapter V Section I Pollution	*Decree Law 26/2012* on environment basic law	National Directorate for Pollution Control and Environment Impact	Ministry for housing development, Spatial Planning and Environment	N/A	N/A
Yes	Abstraction of water	Water Supply for Public use	*Decree Law 4/2004* Draft Water Resources Law	Direcção Nacional Serviço de Agua e Saneamento or National Directorate for Water and Sanitation (DNSAS)	Ministry of Public Works, Transport and Communication (MPWTC)	Uncertain	Never
No	Internal roads		*Decree Law 2/2003* on basic law on the road transport system; Rural Roads Policy (2009, awaiting approval)	Directorate for Roads, Bridges and Flood Control	MPWTC	Uncertain	Uncertain

[1] *Total timeframe to obtain the environmental license may be up to 24 months incl. specialist studies and scoping for a Category A project.*

Permit	Aspect	Permit / Guideline Name	Legal Framework	Agency with Primary Responsibility	Responsible Ministry	Duration for Approval	Expiry
Yes	Hot mix plant (Plant releasing environmental pollutant, producing flammable/hazardous materials)	Environmental License - Installation area >3,000 m^3	*Decree Law 5/2011* on environment licensing law	National Directorate for Pollution Control and Environment Impact	Ministry for housing development, Spatial Planning and Environment	30 days	Uncertain
Yes	Telecommunications	License/Permit to use or establish a radio communications system	*Decree Law 11/2003* on establishing the bases for the telecommunications sector; *Decree Law 12/2003*	Autoridade Nasional Comunicasaun	MPWTC	Uncertain	Never
Yes	Electricity	Section 29 Non-Binding License	*Decree Law 13/2003* on establishing the bases for the national electricity system	Electricidade de Timor-Leste (EDTL)	MPWTC	Uncertain	12 months
Yes	Operating a Port	Port licence from APORTIL	*Decree Law 3/2003* on the establishment of the Port Authority	APORTIL	MPWTC	min 3 months	Never

Permit	Aspect	Permit / Guideline Name	Legal Framework	Agency with Primary Responsibility	Responsible Ministry	Duration for Approval	Expiry
No	Impact on Fishing Resources (Habitat Protection)	Prior opinion from the Minister (APORTIL)	*Decree Law 6/2004* On General Bases of the Legal Regime for Fisheries and Aquaculture Management and Regulation (amended by *Decree Law 4/2005*)	National Directorate for Fisheries and Aquaculture	Ministry for Agriculture and Fisheries	Uncertain	Uncertain
No	Disposal of solid waste (non-sanitation)	N/A	Pollution Control Law; Government Decree on Waste Management (draft)	EDTL and DNSAS	MPWTC	N/A	N/A
No	Disposal of solid waste (non-sanitation) - Site selection	Environmental License	Pollution Control Law; Government Decree on Waste Management (draft)	National Directorate for Pollution Control and Environment Impact	Ministry for housing development, Spatial Planning and Environment	N/A	N/A
No	Disposal of solid waste (non-sanitation) - Site selection	Chapter V Section II Waste	*Decree Law 26/2012* on environment basic law	National Directorate for Pollution Control and Environment Impact	Ministry for housing development, Spatial Planning and Environment	N/A	N/A
No	Disposal of solid waste (sanitation)	N/A	Draft regulations on Sanitation Control (awaiting approval)	DNSAS	MPWTC	Uncertain	Never

Permit	Aspect	Permit / Guideline Name	Legal Framework	Agency with Primary Responsibility	Responsible Ministry	Duration for Approval	Expiry
Yes	Disposal of liquid waste to sea	Prior opinion from the Minister (DNSAS)	*Decree Law 6/2004* On General Bases of the Legal Regime for Fisheries and Aquaculture Management	DNSAS	Ministry for Agriculture and Fisheries	min 3 months	Never
No	Hazardous Waste	N/A		National Directorate for Pollution Control and Environment Impact	Ministry for housing development, Spatial Planning and Environment	N/A	N/A
Yes	Impact on Heritage Sites	Environmental License	Heritage Law (awaiting approval) / Government Resolution No. 25/2011 / National Policy for Culture (4th Constitutional Government)	Direcção Nacional da Cultura	Ministry for Tourism, Art and Culture	24 months	Never
Yes	Taking water samples for analysis	Licencing regulations, Sale and Quality of Drinking Water	*Decree Law 5/2009* of January 15	DNSAS	Ministry for Agriculture and Fisheries	min 1 week	One-off per sample/ consignment
Yes	Import of material and equipment	Import Permit	*Decree Law 1/2006* General Regulations on Quarantine	Quarantine Services Directorate	Ministry for Agriculture and Fisheries	min 1 week	One-off per sample/ consignment
Yes	Building Construction	License for Office/Building Construction		Diresaun Nasional Edifikasaun	MPWTC	Uncertain	Never

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6 Description of the Environment

6.1 Climate

Tibar Bay is located on the north coast of Timor-Leste, with the closest recorded information located at Dili, 10 km east of the project area. The climate information for Dili is therefore presented below.

The local climate is tropical and generally hot, characterized by distinct wet and dry seasons.

Temperature

The monthly average maximum temperatures are in the months of November and December, at around 32 °C. August has the lowest monthly average temperature of around 28 °C. The variation in maximum and minimum monthly temperature recorded at Dili Airport between January 2012 and August 2016 is shown in Figure 6-1.

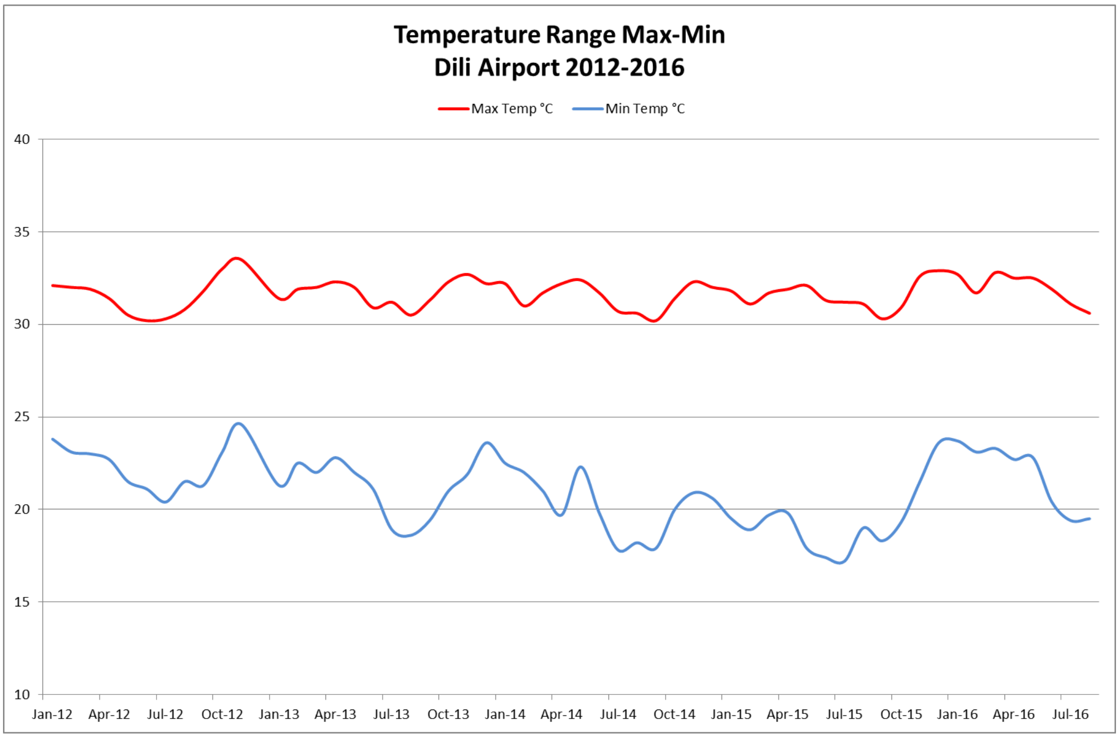


Figure 6-1: Monthly average maximum and minimum temperatures recorded between January 2012 and August 2016 at Dili Airport

Rainfall

The average annual rainfall recorded between January 2012 and August 2016 at the Dili Airport is 660 mm. Ninety percent of the annual rainfall occurred each year between October and May. The average number of rainy days varied from 100 to 140 during this period with an average of 125 days each year.

During the dry season (June to October), average monthly rainfall in Dili is less than 70 mm, while during the wet season (November to May) the monthly average rainfall is above 600 mm. Almost no rain was recorded during the month of August.

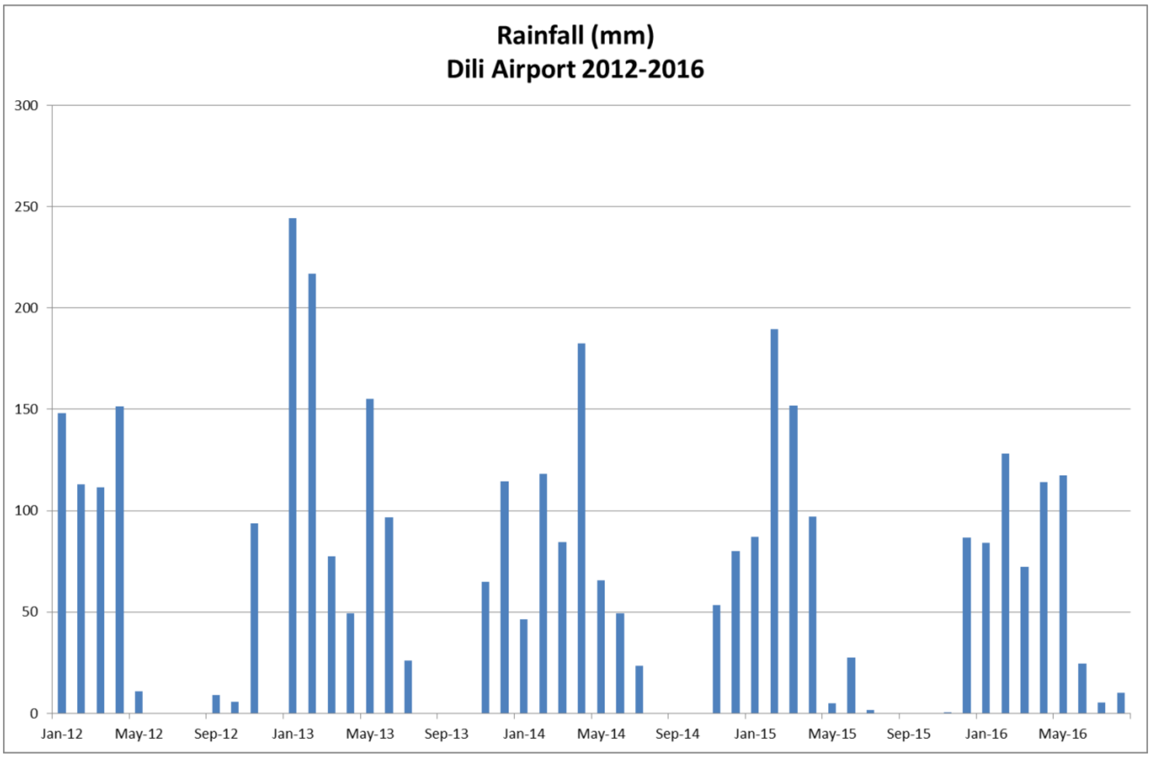


Figure 6-2: Monthly rainfall recorded between January 2012 and August 2016 at Dili Airport

Relative humidity

The average relative humidity is high throughout the year, varying between 60% and 90%. The lowest relative humidity occurs from August to October and highest months are from December to March. The monthly average relative humidity recorded at Dili Airport between January 2012 and August 2015 is shown in Figure 6-3.

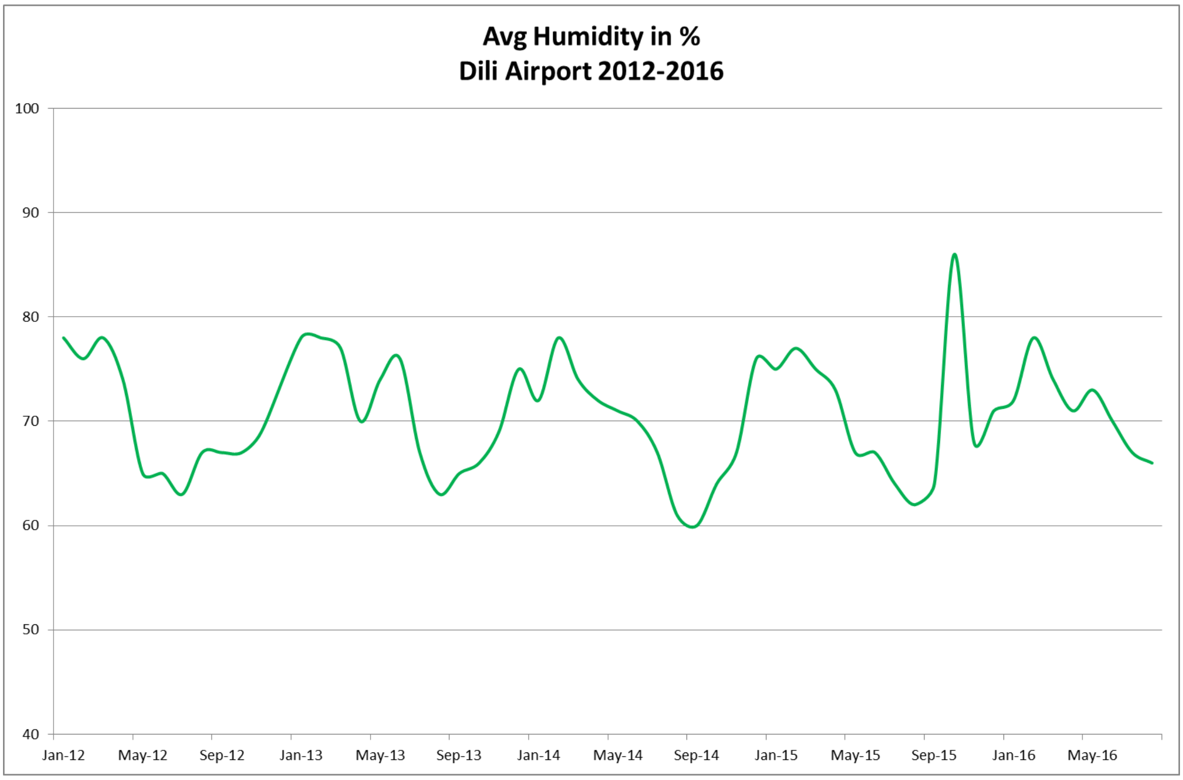


Figure 6-3: Average relative humidity recorded between January 2012 and August 2016 at Dili Airport

Wind speed and direction

Both annual total wind speed and direction and seasonal maximum wind speed for Dili Airport have been sourced. The total annual wind speed and direction data from the Dili Airport indicates that (Figure 6-4):

- The most frequent direction (over the year) is from SE (approximately 40% of wind occurrence is from E-SE to S-SE). Such direction is more or less aligned with the quay and access fairway;
- The strongest winds are from W to NW, which occur during the wet season (Monsoon);
- Altogether, the wind speeds are rather mild, except on rare occasions. As a matter of illustration, a wind speed (V10min at 10 m) of 10 m/s (36 km/h) is exceeded 1.5% of the time yearly and a wind speed of 12 m/s (43 km/h) is only exceeded 0.4% yearly (1.5 day a year).

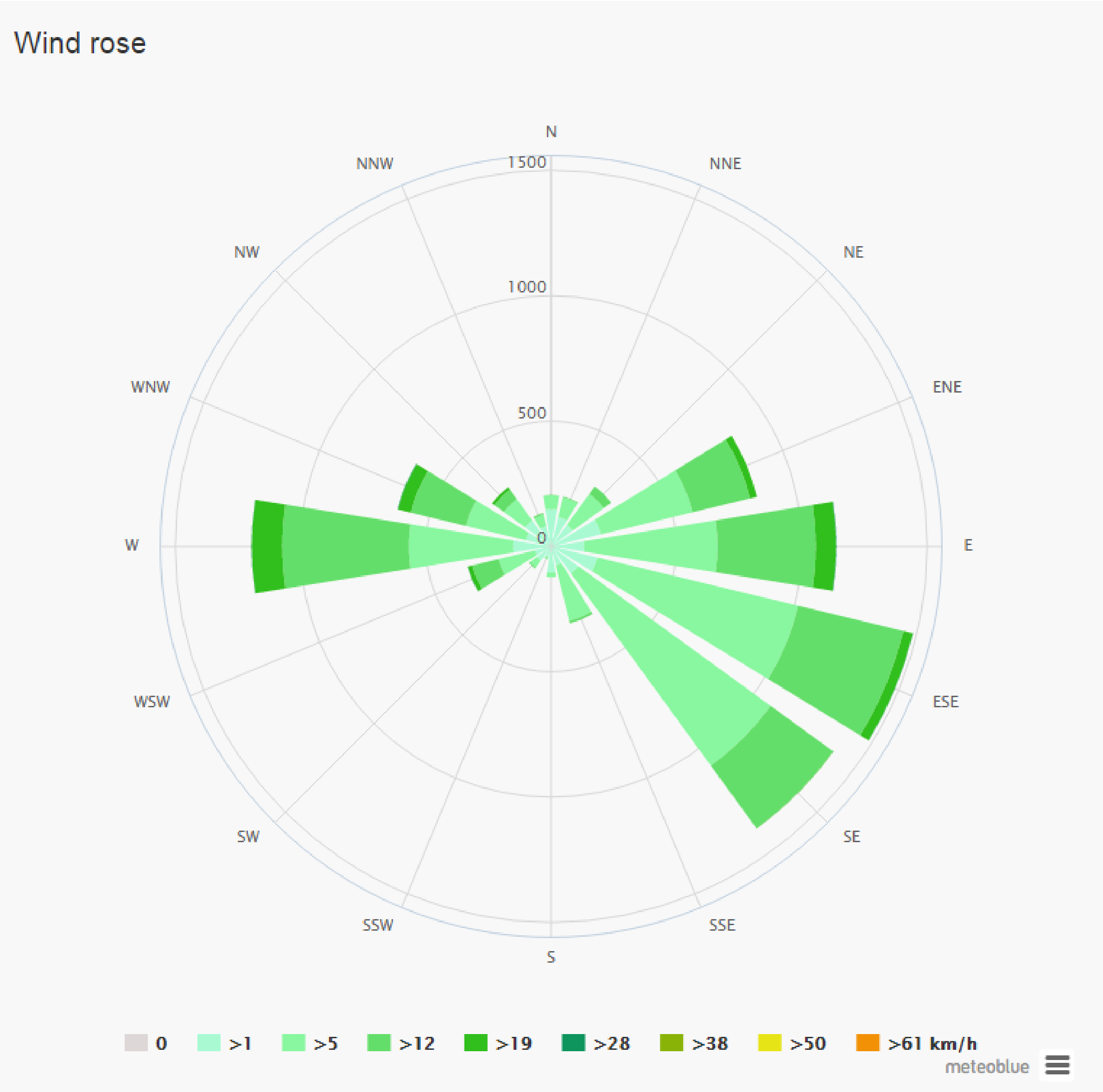


Figure 6-4: Wind rose for Dili Airport (https://www.meteoblue.com/en/weather/forecast/modelclimate/dili_east-timor_1645457)

Maximum wind speeds for the two distinct seasons (wet season from December to March and dry season from April to October) have been derived from the National Oceanic and Atmospheric Administration (NOAA) as shown in Figure 6-5 below.

Between April and October (dry season) the maximum wind speeds reach up to 43 km/hr - 54 km/hr, however these speeds only occur 0.03% of the time. Wind speeds of around 14 km/hr - 21 km/hr prevail over 42% of the time in the south-easterly direction.

Between December and March (wet season) the maximum wind speed is between 54 - 72 km/hr, however these conditions occur relatively rarely with a percentage of only 0.05% of the time. The wind speed that prevails around 30% of the time is between 7 km/hr - 14 km/hr in a west-north-westerly direction.

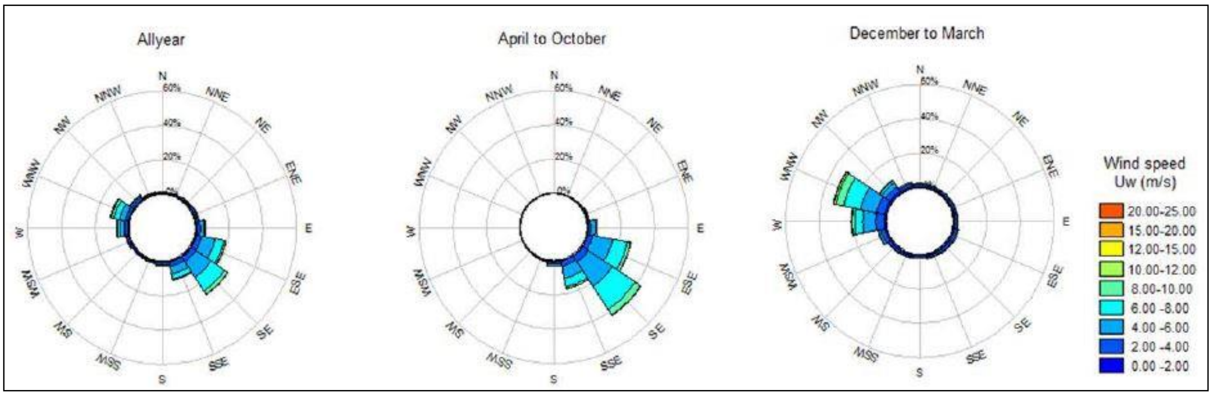


Figure 6-5: NOAA wind rose (1 minute average wind speed)

Cyclones

Timor-Leste falls within the Southern Hemisphere cyclone zone (Figure 6-6). Tropical cyclones can affect Timor-Leste in the wet season between November and April, however their effects tend to be weak (CSIRO, 2011). Between 1969 and 2010, 31 tropical cyclones passed within 400 km of Dili, which is less than 1 cyclone per year (CSIRO, 2011). Cyclones tend to be associated with heavy rain and very high winds.

The recorded minimum wind speeds in the area during a cyclone have been 110 km/hr, while maximum wind speed for a one in 500 year cyclone are 360 km/hr.

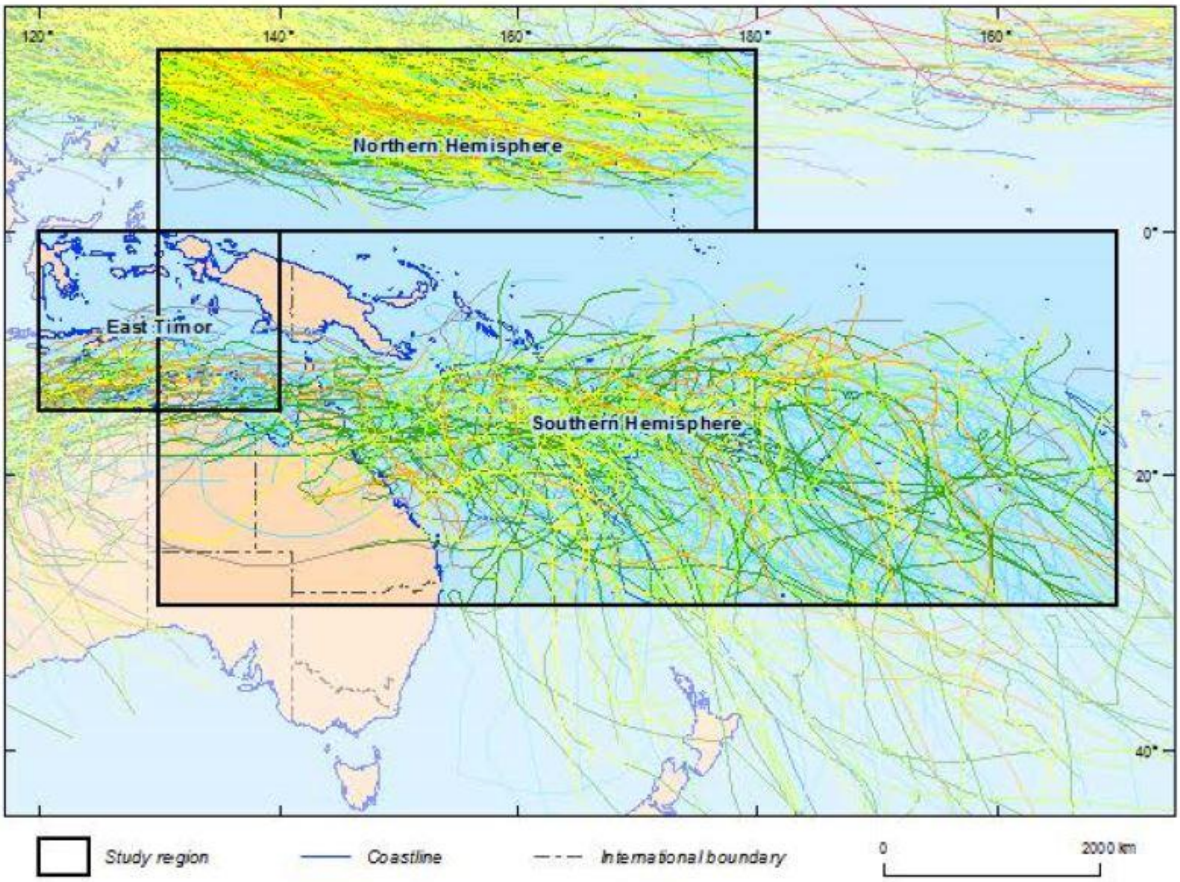


Figure 6-6: Cyclones in the greater area (historic cyclone tracking) (CSIRO, 2011)

Climate change

The Intergovernmental Panel on Climate Change (IPCC) published the Special Report on Emissions Scenarios in 2000. This report contains "scenarios" of future changes in emissions of greenhouse gases which have been used to project future changes in climate and their impacts, such as sea level rise and increases or decreases in temperature.

The Australian Government in conjunction with the Commonwealth Science and Industry Research Organization (CSIRO) and the Timor-Leste National Directorate of Meteorology and Geophysics provides estimates of climate change for the Pacific Climate Change Science Program Region which includes Timor-Leste. A report published by the CSIRO in 2011 based on this collaboration, has the following predictions (CSIRO, 2011):

Figure 6-7 shows observed and projected relative sea-level change near Timor-Leste (CSIRO, 2011). The observed sea-level records are indicated in red (relative tide gauge observations from Wyndham in Western Australia) and light blue (the satellite record since 1993).

Reconstructed estimates of sea level near Timor-Leste (since 1950) are shown in orange. The projections for the A1B (medium) emissions scenario (representing 90% of the range of models) are shown by the shaded green region from 1990 to 2100. The A1B scenario is described by a balanced use of fossil and non-fossil energy sources and therefore represents a "medium" prediction of sea level rise (CSIRO, 2011).

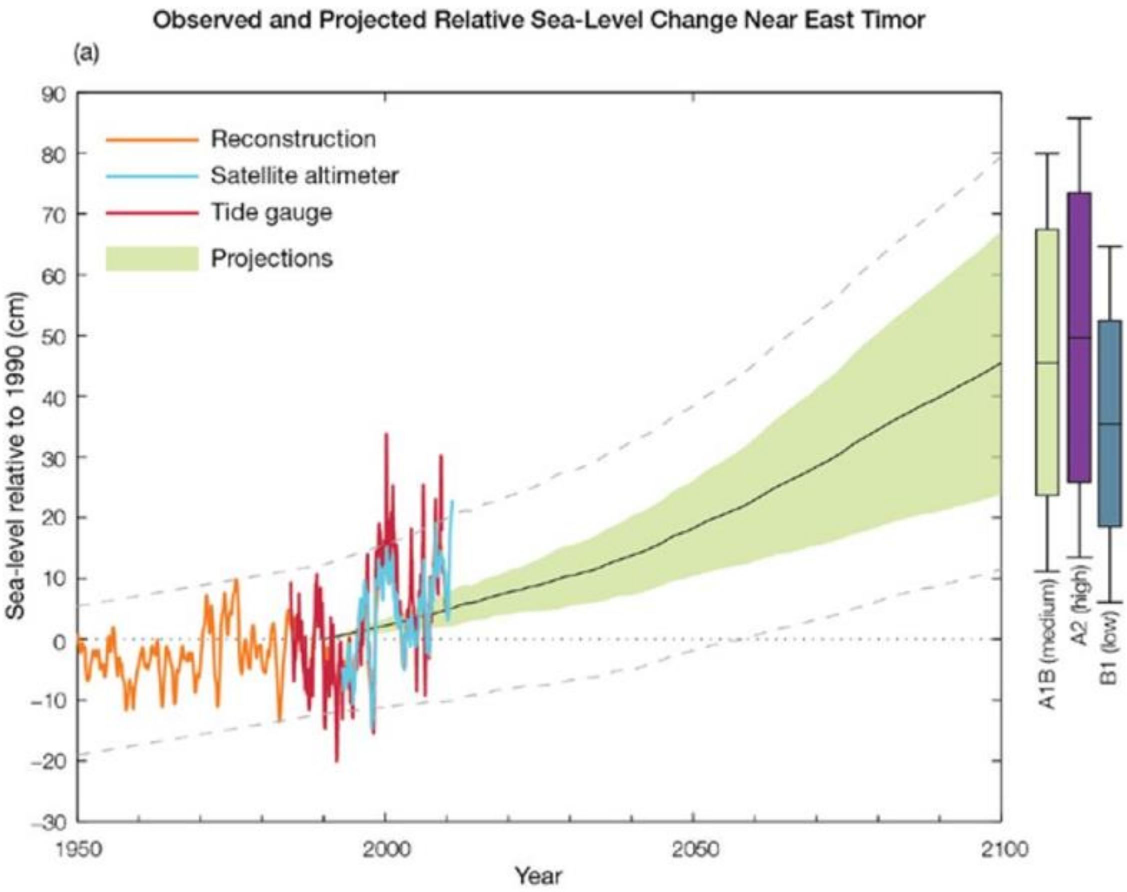


Figure 6-7: Pacific Climate Change Science Program sea level rise estimates for East Timor (CSIRO, 2011)

Air temperature data for Dili are only available from 2003 which makes it very difficult to establish temperature trends. However, sea surface temperature in the Timor-Leste region has increased by 0.15 °C – 0.2 °C per decade over the period 1950–2009 (CSIRO, 2011). It is likely that air temperature has increased by a similar amount over the same period (CSIRO, 2011).

Projections for all greenhouse gas emissions scenarios indicate that the annual average air temperature and sea surface temperature will increase in the future in Timor-Leste. By 2030, under a high emissions scenario, this increase in temperature is projected to be in the range of 0.4 °C - 1.0 °C (CSIRO, 2011). Increases in average temperatures will also result in a rise in the number of hot days and warm nights, and a decline in cooler weather.

There is uncertainty around rainfall projections as model results are not consistent. However, projections generally suggest a decrease in dry season rainfall and an increase in wet season rainfall over the course of the 21st century. Wet season increases are consistent with the expected strengthening of the West Pacific Monsoon and model projections show extreme rainfall days are likely to occur more often. Little change is projected in the frequency of droughts throughout this century (CSIRO, 2011).

Tropical cyclones on a global scale are predicted to decrease in number by the end of the 21st century. But there is likely to be an increase in the average maximum wind speed of cyclones by between 2% and 11% and an increase in rainfall rates of about 20% within 100 km of the cyclone centre (CSIRO, 2011). In the Timor-Leste region, projections tend to show a decrease in the frequency of tropical cyclones by the late 21st century (CSIRO, 2011).

6.2 Topography

About one third of Timor–Leste is mountainous. These highlands are mainly concentrated in the Tatamailau Mountains area with the highest peak (Mount Ramelau 2,963 m) centrally situated within the highlands. The highland region averages more than 2,000 m above sea level and stretched from east to west.

The central and eastern parts of Timor-Leste contain several low plateaus and coastal lowlands fringed by the narrow coastal plain in the north and a wide coastal plain in the south. The topography of Timor-Leste is presented in Figure 6-8.

The topography of Tibar Bay is a sheltered port at the outlet of relatively flat drainage system **Error! Reference source not found.**. Both sides of the bay are characterized by steep hills, one reaching 230 m to the south-east and up to 110 m to the north-west. The bay is oriented with the bay mouth facing north-west.

Figure 6-8: Timor-Leste showing topography (and bathymetry) along with the major towns and districts (Grantham *et al.*, 2011)

6.3 Geology and geomorphology

The main geological units in the study area of interest are the Quaternary alluvium and the Permian Aileu Formation. The Aileu Formation forms a suite of metamorphic rocks consisting of a series of shales, phyllites, slates and occasional metamorphosed eruptive rocks and interbedded quartz-phyllites. Quaternary sediments form a heterogeneous system of reworked marine sediments and the weathered Aileu Formation.

The project area is characterised by a basin shape with a peak elevation of 100 masl located on the hill immediately overlooking the proposed jetty location. There are small creeks eroded into the loose gravelly sand, which drain into an ephemeral creek that flows out into the mangrove stand into the bay. Further east in the bay, there is the larger ephemeral Rihui River which drains from 140 masl, 4 km from the bay edge and becomes a braided stream in its lower reaches (**Error! Reference source not found.**).

The topography within the Rihui catchment is generally flat, between 20-50 masl, with the river basin 1.6 km wide at its widest point. This river does not directly impact the project area, it is in the indirect area of impact.

Figure 6-9: Project area drainage and topography

6.4 Seismic conditions and tsunamis

Timor Island is located in a tectonic region known as the Banda Arc. The Banda Arc is a west-facing horseshoe shaped arc located in eastern Indonesia which marks the collision zone of the Intro-Australian Plate, the Pacific Plate and the Eurasian Plate. Timor Island is an aggregation of continental fragments of the Australian Plate, deep marine sediments, oceanic crust and the Quaternary sediments brought about by the collision between the northwestern edge of the Australian continent and a former oceanic subduction zone (Ministry of Infrastructure, 2011).

The mountainous terrain of Timor-Leste as well as years of poor agricultural technique contribute to the likelihood of landslides. This is additionally complicated by the few earthquake resistant structures in Dili and the majority of private dwellings are non-engineered masonry or grass buildings. These buildings will have a high rate of failure in a strong earthquake.

Compilation of major shallow earthquakes in Indonesia from 1897 to 1984 showed a number of earthquakes with epicenters located offshore north Timor Island. A magnitude of 8 or greater has been recorded in 1963, with the epicenter located offshore south-west Timor Island. Timor-Leste was hit by 707 earthquakes up to 2016. The strongest earthquake for 2016 had a magnitude of 6.3, which hit 274 km from Dili on 5th December 2016 (Ministry of Infrastructure, 2011). Figure 6-10 shows the compilation of historic earthquakes in the region of Timor Island (Fugro, 2016).

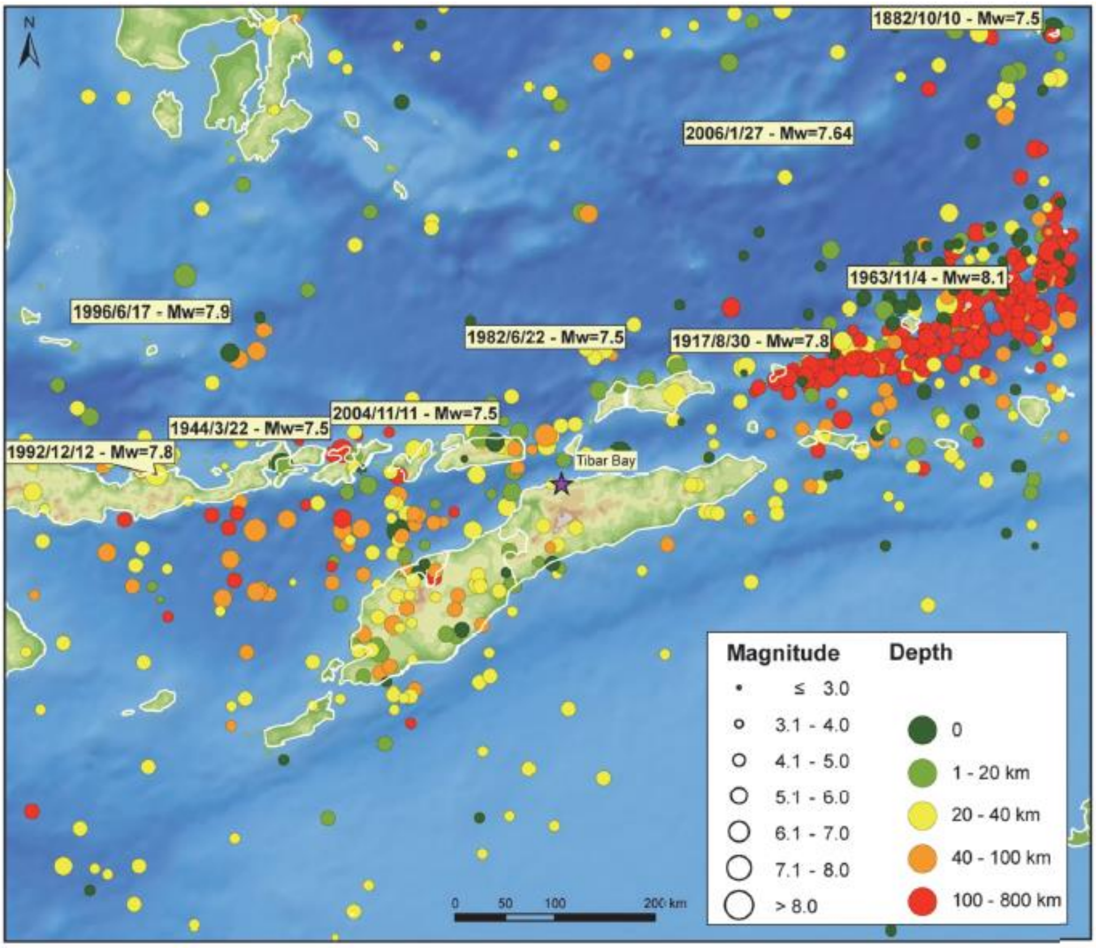


Figure 6-10: Final homogenized earthquake catalogue Tibar Port project from 1629 to 2016 (n = 835) (Fugro, 2016). Magnitudes are expressed in moment magnitude (Mw)

Earthquakes both on land and in the ocean can cause tsunamis. Based on tsunami zone mapping produced by Puslitbang SDA (2004) (Figure 6-11) the risk of a tsunami hitting the coastline and marine facilities is high, being ZONE 3 (Return Period of 100 years). An indicative wave height for a 100 year tsunami is 4 - 6 meters.

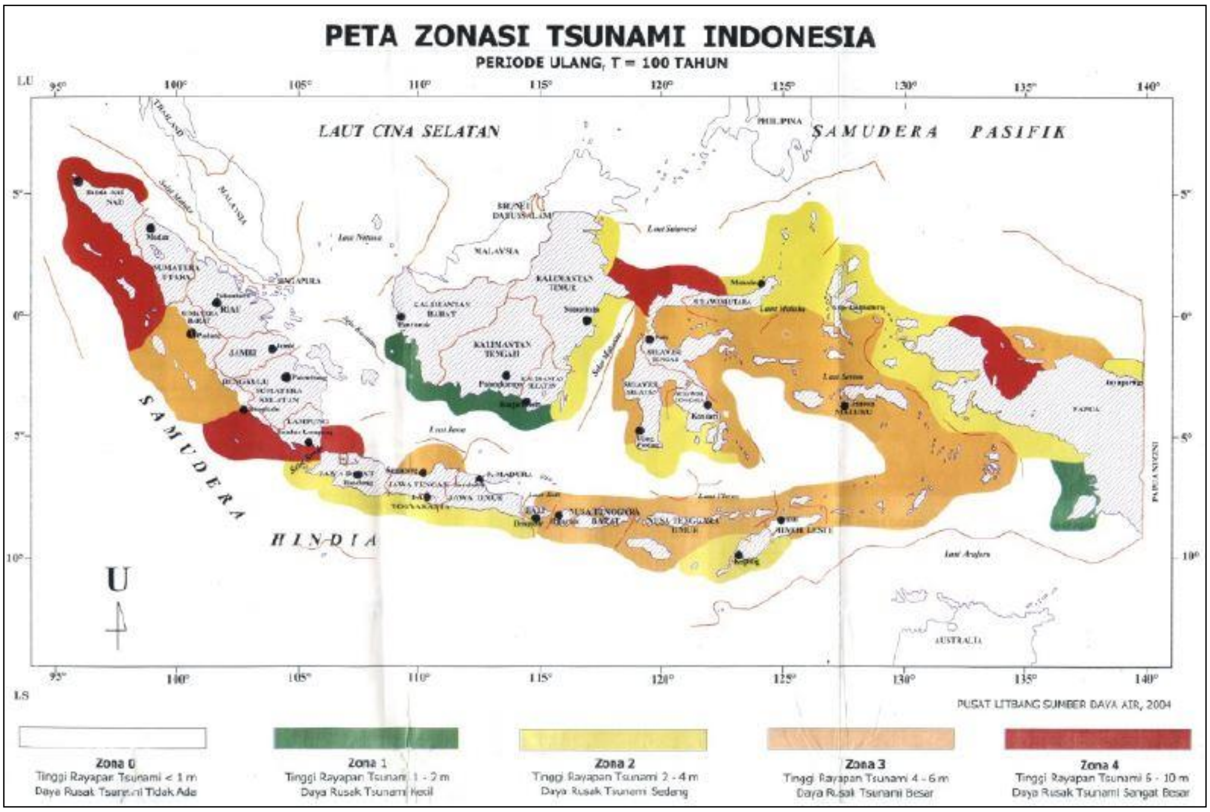


Figure 6-11: Tsunami mapping zone with return period of 100 years. (Pustlibang SDA, 2004)

6.5 Air quality

The air quality in Timor-Leste is generally good, with the main impacts to human health coming from indoor air pollution and burning of wood indoors. An air quality baseline assessment for the project area was conducted. The results are summarised below:

- The baseline particulates recorded at the Tibar Retreat range from 110 µg/m^3 recorded in the morning to a lower limit of 20 µg/m^3;
- The baseline particulates recorded at the Tibar Primary School range from a high of nearly 1000 µg/m^3 recorded at 3pm on one day in the measurement period and a lower mean of 50 µg/m^3;
- The standard 24 hour exposure limit is generally exceeded at the Tibar Primary School. The measurements taken at the Tibar Retreat do not approach the standard's 24-hour exposure limit of 75 µg/m^3.
- The dust levels recorded at the Tibar Primary School are of concern from a community health perspective.

Images of the air quality equipment used and the sensitive receptors for any air quality changes are presented in Figure 6-12, Figure 6-13 and Figure 6-15.

Figure 6-12: Dust monitoring at AQ01 – Tibar Retreat

Figure 6-13: Dust monitoring at AQ02 – Tibar Primary School

Figure 6-14: Air quality monitoring at Summa 01 Tibar Retreat and Summa 02 Fisherman

Figure 6-15: Sensitive receptors identified and used in the model interpretation (BBS, 2016)

6.6 Noise

Noise sources in Timor-Leste are typically rural sources, which consist mainly of vehicles and equipment. There is no local noise regulation or town planning and development processes which reduce the potential noise impact on sensitive receptors.

Sensitive receptors are characterized by the WHO as follows:

- Schools and places of worship;
- Hospitals and Health Care facilities; and
- Community meeting places.

Two sensitive receptor locations for noise were identified for the project: Tibar Retreat and Tibar Primary School. Sensitive receptors identified in the area are shown in Figure 6-15. These noise standards, as defined by WHO, will be subject to higher restrictions on allowable noise levels from project sources during daytime hours. Residential receptors are subject to slightly lower restrictions on allowable noise levels during daytime hours. The permissible noise levels during night time hours will be lower than the daytime for all receptors, to ensure people are not disturbed during their time of rest.

Baseline noise measurements for the two sensitive receptor locations were taken using a Casella CEL 633C which records the noise levels and sound frequency every 2 seconds for the duration of the measurement period. The baseline noise data are presented in below in Figure 6-16 and Figure 6-17.

Noise 01	-8.575556 S 125.473888 E	Tibar Retreat
This noise monitoring station was deployed adjacent to the Tibar Retreat main residence to represent the nearest sensitive private receptor. Measured parameters: **LA (max)** **LA (min)** **LAEq** **LAI** **Octaves** **Duration of measurement interval (seconds)** Deployed: 8/10/16 Retrieved: 15/11/10 Duration: 7 days	 **24** **120**	

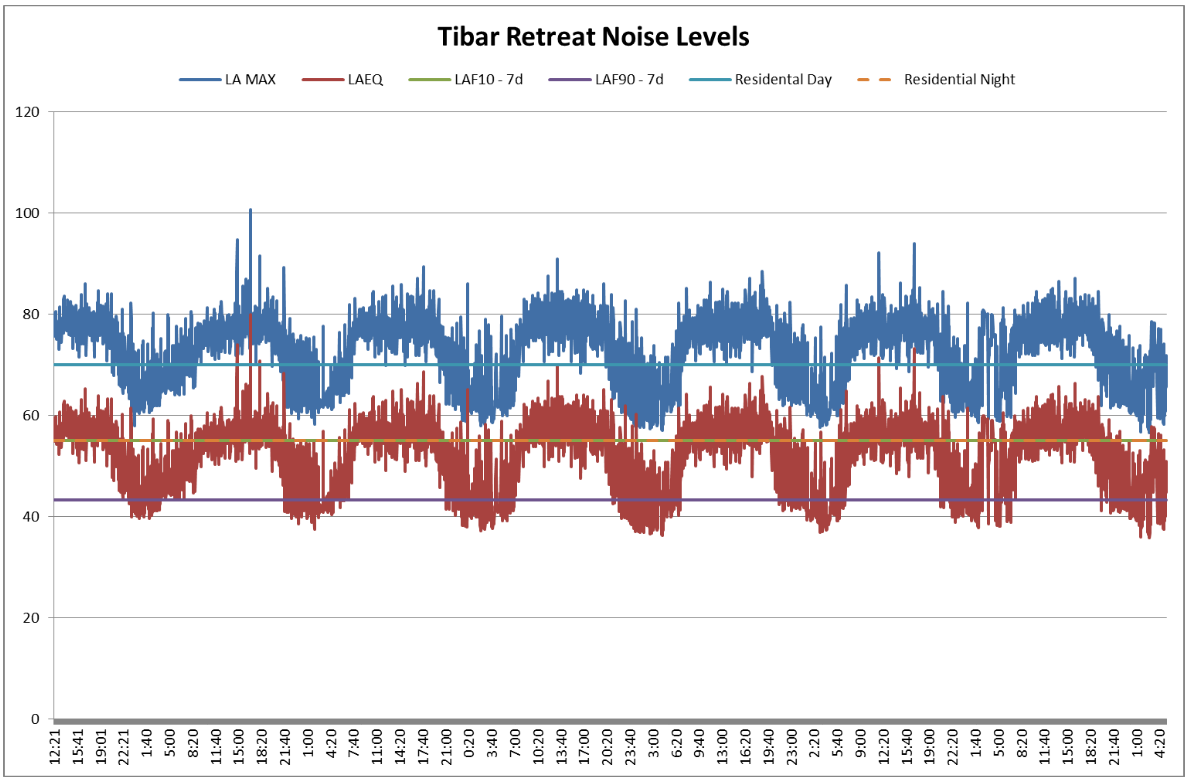


Figure 6-16: Noise levels recorded at the Tibar Retreat (all values in dB)

Noise 02	-8.568887 S 125.490833 E	Tibar Primary School

This noise monitoring station was deployed adjacent to the Tibar Primary School to represent the nearest sensitive community receptor.

Measured parameters:

LA (max)	
LA (min)	
LAEq	
LAI	
Octaves	24
Duration of measurement interval (seconds)	120

Deployed: 27/10/16, 1/10/16 Retrieved: 3/11/10

Duration: 4 days

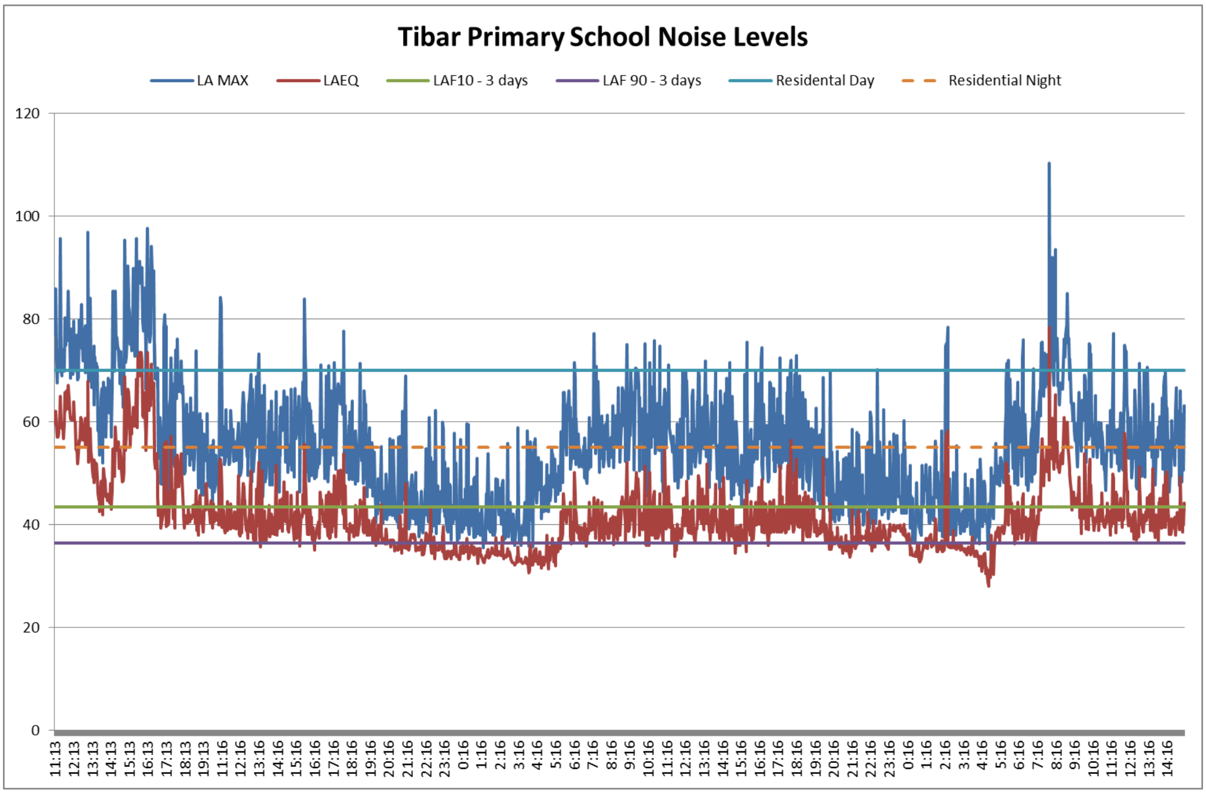


Figure 6-17: Noise levels recorded at the Tibar Primary School (all values in dB)

6.7 Surface water

There are over 100 rivers in Timor-Leste – with 29 main river systems in total; twelve in the north, seventeen in the south. All rivers are generally short and fast-flowing. Most rivers are ephemeral but generally with significant flows in the lower reaches (Costin, G and Powell, B, 2006).

The project area falls into the Comoro River catchment, which is part of the Laclo River System. The nearest rivers to the project area are the Rihui River, which flows directly into Tibar Bay, the Cassalt River which is 2.4 km west of Tibar Bay and flows into the sea at Fahi Obut/Ulmera. The Comoro River flows into the sea 2 km from Dili and 6km from Tibar Bay. The Rauhassa River is located 10 km west of Tibar Bay (
Figure 6-20).

The Tasitolu Lakes are saltwater lakes located 6 km west of Dili and 3.5 km east of the project area. Lake Tasitolu has been visited on more than 170 occasions since 2002. This is the most important saline lake for migrant shorebirds in Timor-Leste (Trainor, 2005)

Calculations of the surface water drainage have been undertaken as a component of the storm water engineering design. The catchments draining into the project site have been delineated based on topographical divides as depicted in Figure 6-18.

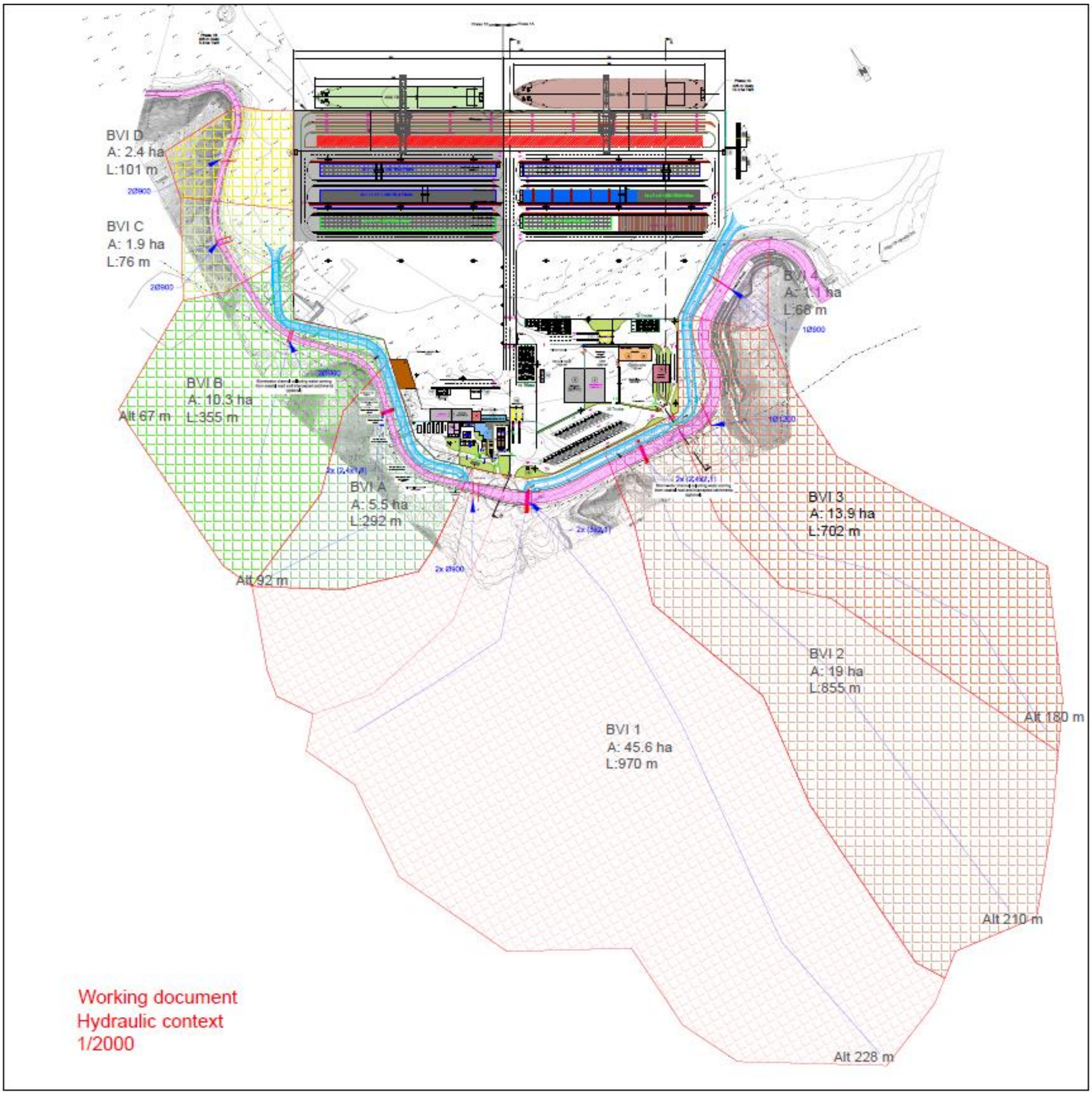


Figure 6-18: Catchments and drainage calculations (Artelia, 2016)

The peak flows for a 50 year ARI event have been calculated for each of the minor drainage catchments as follows:

Catchment designation	Area (ha)	Area (km²)	C (Run-off coefficient)	Return period (Year)	Intensity (mm/h)	Peak flow (m^3/s)
East channel						
BVI 1	45.6	0.456	0.5	50	279	17.67
BVI 2	19.0	0.190	0.5	50	279	7.36
BVI 3	13.9	0.139	0.5	50	279	5.39
BVI 4	1.1	0.011	0.5	50	279	0.43
Total	**79.6**	**0.796**				**30.85**
West channel						
BVI A	5.5	0.055	0.5	50	279	2.13
BVI B	10.3	0.103	0.5	50	279	3.99
BVI C	1.9	0.019	0.5	50	279	0.74
BVI D	2.4	0.024	0.5	50	279	0.93
Total	**20.1**	**0.201**				**7.79**

The peak surface water flows in the minor drainage are 38.64 m^3/s into the project site at Tibar Port.

In the absence of precise information on soil permeability, vegetation cover and possible saturation of the soil by previous rainfall, an average value of 0.5 was used. The watersheds have very high slopes which leads to an increase the runoff coefficient.

The Rainfall intensity has been derived based on 279 mm/h corresponding to a 50 years ARI rainfall calculated with the meteorological data of the station of Darwin (Australia).

The culverts located adjacent to the road at the sites is depicted in

Figure 6-19. The engineering assessment undertaken by Artelia as a component of this project, indicates that the culverts adjacent to the project site are adequately sized for the catchment immediately adjacent to the Tibar Port facility to handle peak flows from a 50 year ARI design event of 10 minutes' duration.

The highest daily recorded rainfall as recorded at Dili Airport is 250mm, in February 2013 at an average intensity of 10.4 mm/hour. The port design has made consideration of a sediment control channel to be located on the northern side of the road. A maintenance plan specification is included in the port operations manual to control sediment movement and the impact from sedimentation. Additional information can be found in Appendix C.

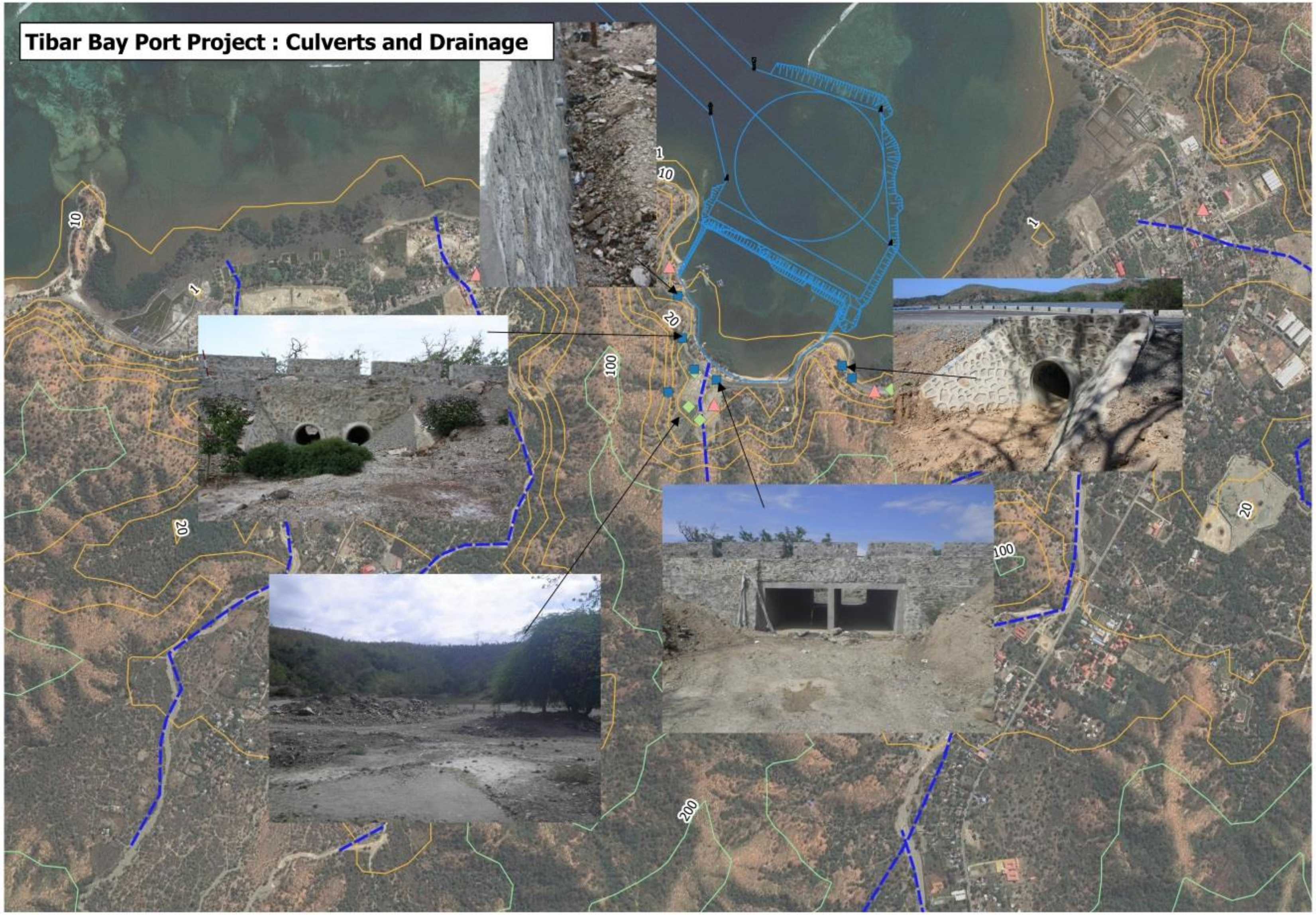


Figure 6-19: Culverts and drainage at the project site

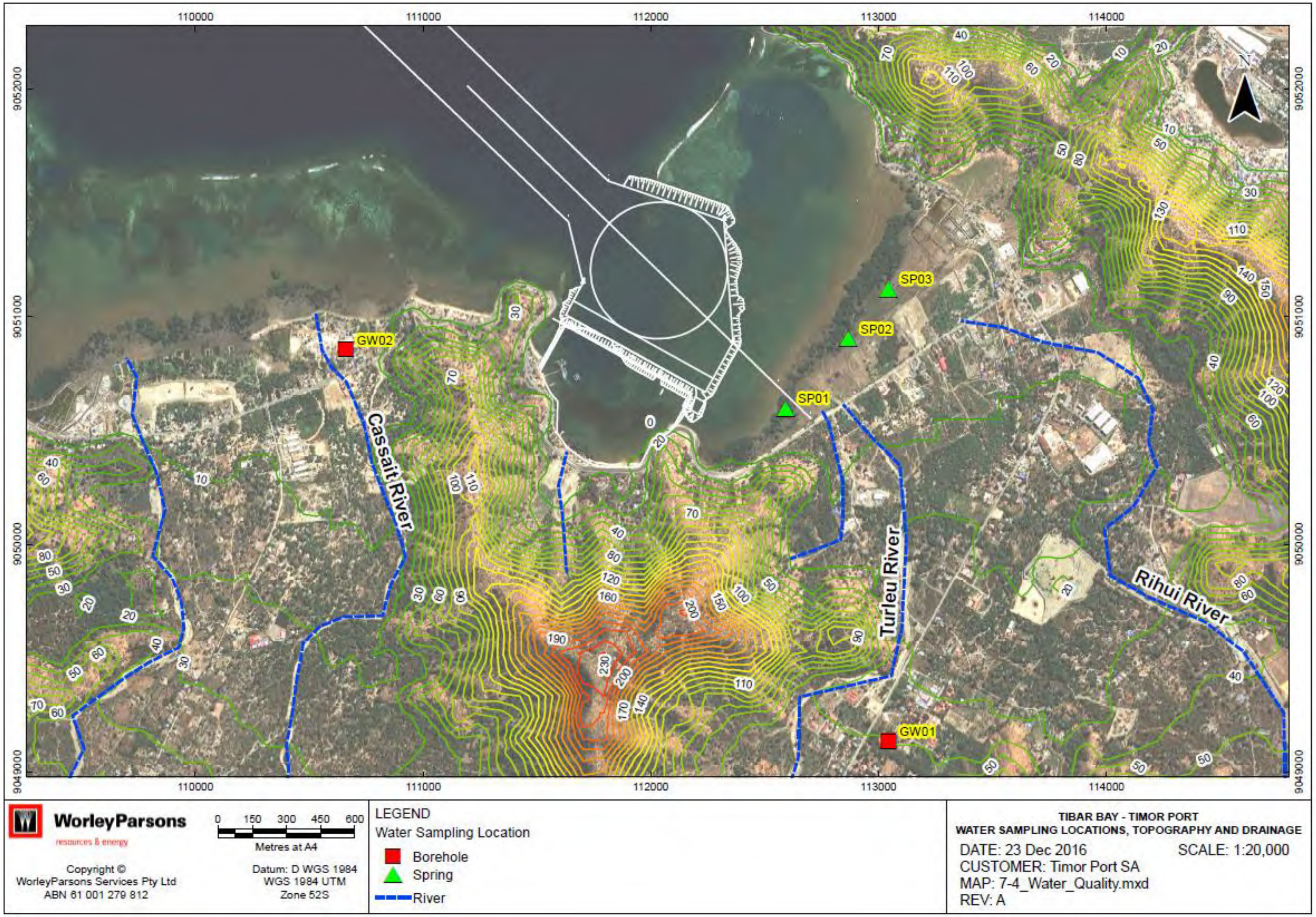


Figure 6-20: Project area topography and drainage

The Project has no impact on surface waters (rivers and floods) and therefore no equipment was used to measure surface water quality. The flows of surface water onto the direct catchment area were calculated and are reflected in Figure 6-17. The analysis of ground water shown on Figure 6-19 is described in the following Section 6.8.

6.8 Groundwater

Within a 10 km radius of the proposed Tibar Bay Port area two aquifer units are identified:

- Quaternary alluvium in the main river valley floors; and
- Permian rocks of the Aileu Formation forming the steep mountainous topography from which the alluvial sediments are derived.

Coastal alluvium

Coastal alluvium is located in the larger river valleys around the coast of Timor-Leste. The alluvial aquifers fill the valley floors and consist of weathered sediments originating from the Aileu Formation as silty gravels and boulders. The alluvium varies from less than a metre to about 80 m thick and contains groundwater of various flows and quality.

Alluvial aquifers exist in the area, specifically near Dili (Comoro River), the Rihui River, Cassalt River complex, and Rauhassa (Moraeloa River complex) and are named here based on the catchments in which they occur. Generally, the groundwater encountered in these aquifers within kilometre of the sea is brackish to salty. Upstream, the groundwater is fresh close to the river beds but becoming brackish away from the rivers. The typical yield of wells in the alluvium is likely to be of the order of 1 – 5 litres/second (L/s) (Furness, 2011).

The alluvial aquifers of the Rihui, Cassalt and Rauhassa River valleys have similar catchment areas of around 25 km^2 each and rise to elevations of 808 m, 807 m, and 1,392 m, respectively. The alluvial aquifers are limited to the valley floor areas where sediments derived from the Aileu formation reach maximum thicknesses of about 70 m. Groundwater in the aquifers is mostly fresh and sufficient for domestic supplies. Between these rivers there are small mountain catchments of about 1 km^2 in area which they contain mainly marine and colluvial sediments with salty groundwater. This includes the Tasi Tolu complex of lakes between the proposed port and the Dili aquifer. The lakes and associated groundwater are very salty.

Alieu formation

The Aileu Formation is found in the mountains surrounding the Tibar Port area. It consists of a series of shales, phyllites, slates and occasional low-grade metamorphosed eruptive rocks (Audley-Charles, 1968). It is a Permian age sequence of hard metamorphosed (heated) deep marine sediments at least 1,000 m thick. The formation is composed of inter-bedded mudstone and sandstone that has been subsequently 'baked' by metamorphism forming hard, coherent rocks. These rocks form a large outcrop that has been faulted horizontally (thrust fault) into its current position and makes up the majority of north-west Timor-Leste.

The hydrogeology of the Aileu Formation is classified as *'Localised, Higher Potential Yield'* (Wallace *et al.*, 2012). The metamorphosed rocks will have little inter-granular flow and the majority of groundwater is present in more localised fractures and faults, forming springs. Groundwater flow is most likely controlled by the secondary porosity created by the high degree of fracturing and faulting which also in turn control the flow in the localised springs. No specific information is available for springs of the fractured rock localised aquifers of the Rihui, Fatunia, Cassalt, Fatocutarapa, Barsasnate and Ikaloa River (Moraeloa River complex) catchments along the north coast. Individual springs, typically with flow rates from 0.1 – 3.0 L/s may be possible and the water is anticipated to be potentially fresh.

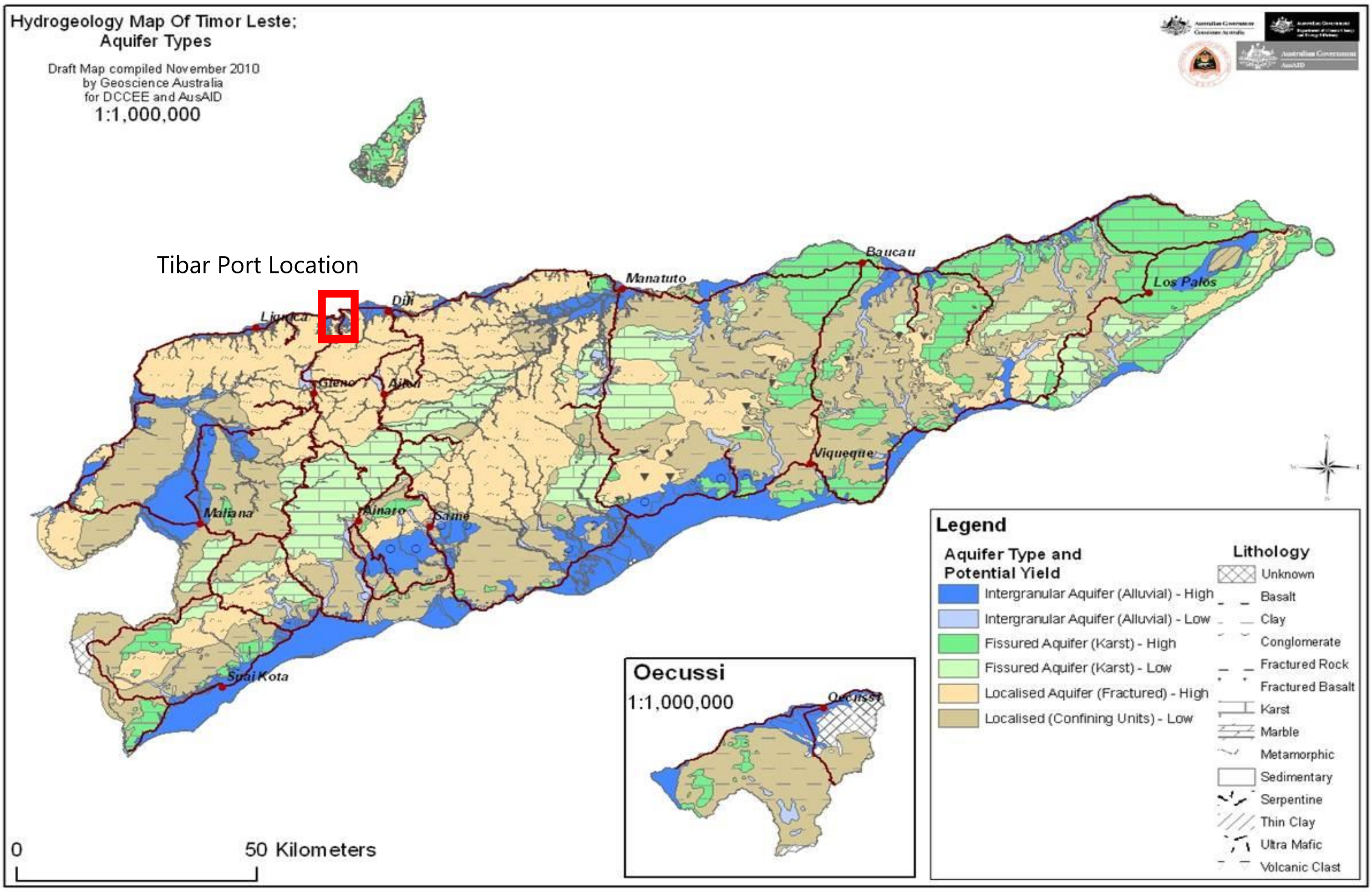


Figure 6-21: Hydrogeology map of Timor-Leste (Geoscience Australia, 2010)

6.8.1 Sensitive receptors

The nearest resident to the project site is the home and retreat, Tibar Bay Retreat located 50 m from the project site. The residence uses water from a tank located on the hill at the Retreat. The water is brought to the Retreat by truck from Dili.

Three houses are located adjacent to the retreat and two use the land for crops. Water is obtained from the tank at the Tibar Retreat.

The nearest sensitive community receptor is the Tibar Primary School, located in Tibar more than 2 km away.

6.8.2 Baseline groundwater quality

Five water samples were taken from the area of Tibar Bay. Three springs and two boreholes were sampled and analysed at a laboratory in Australia for major and minor cations and anions. All samples were analysed for E.Coli at the National Laboratory in Dili. A summary of the results are presented in Table 6-1 and the full results contained in Appendix C.

Table 6-1: Water quality parameters (laboratory)

Analyte	units	Australian Drinking Water Guidelines	WHO Drinking Water Guidelines	GW01	GW02	SP01	SP02	SP03
e.Coli	NTU	0	0	**0**	**0**	**2**	**0**	**15**
Total Dissolved Solids	mg/L		800	**285**	**696**	**916**	**493**	**1590**
Alkalinity (total) as CaCO3	mg/L		400	**207**	**444**	**302**	**292**	**322**
Ammonia as N	µg/L			**20**	**20**	**30**	**20**	**30**
Chloride	mg/L		250	**9**	**53**	**270**	**58**	**557**
Fluoride	mg/L		1.5	**0.4**	**0.6**	**0.6**	**0.5**	**0.8**
Nitrate (as N)	mg/L		3	**0.86**	**0.56**	**1.74**	**1**	**0.58**
Nitrite (as N)	mg/L		50	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total)	µg/L			**1100**	**600**	**2000**	**1200**	**800**
Reactive Phosphorus as P	mg/L			**0.03**	**0.02**	**0.08**	**0.04**	**0.1**
Sodium	mg/L	180	200	**27**	**122**	**180**	**60**	**371**
Sulfate as SO4	mg/L		500	**19**	**81**	**55**	**34**	**109**
Hardness as CaCO3	mg/L	200		**169**	**334**	**301**	**270**	**358**
Arsenic	mg/L		0.01	<0.001	<0.001	**0.001**	<0.001	**0.002**
Barium	mg/L		0.7	**0.012**	**0.075**	**0.018**	**0.014**	**0.046**
Boron	mg/L		2.4	<0.05	**0.1**	**0.18**	**0.06**	**0.27**
Calcium	mg/L			**48**	**81**	**66**	**72**	**66**
Copper	mg/L	1	2	<0.001	**0.002**	<0.001	<0.001	<0.001
Manganese	mg/L	0.1		**0.001**	<0.001	**0.005**	**0.002**	**0.013**
Phosphorus	mg/L			**0.03**	**0.02**	**0.06**	**0.05**	**0.09**
Zinc	mg/L	3	4	<0.005	**0.013**	<0.005	<0.005	<0.005

Figure 6-22: Example of spectrophotometer for groundwater analysis

The water quality is generally good however is classed as 'hard' and would not be aesthetically pleasing to drink but will not cause harm if consumed by humans or animals. Two springs recorded e.Coli counts, which exceeds the WHO Drinking Water Guidelines.

The springs have high sodium values, however this is thought to be a result of them being located in the inter-tidal zone among the mangroves with influence from sea water.

Metals and nitrates are generally not a problem in the samples taken. Nitrates being present are used as an indicator for contamination from sanitation sources.

6.9 Marine water

The north coast seabed profile has a littoral zone that is steep and very narrow. The seafloor drops off sharply into a 3 km deep marine trench approximately 20 km from shore. Within Tibar Bay, the majority of the bay is shallow, with some sections of reef becoming exposed during low tide.

Surface currents in Timor-Leste are influenced by the southeast monsoon May–November and the northwest monsoon November–March. However, a weak drift current flows through the Arafura Sea throughout the year. In the Timor Sea, a southwesterly current prevails all year round, its axis running close to the coast (Salm and Halim 1984, cited in Tomascik *et al*. 1997).

Two major currents influence the waters surrounding Timor-Leste: the Indonesian monsoon current and the Indonesian Throughflow (Wagey and Arifin 2008). The Indonesian Throughflow which plays a significant role in mid-latitude circulation in the Pacific, is strongest in June– August and weakest December–February. The prevailing path of the Indonesian Throughflow is from the Pacific to the Indian Ocean.

While it causes some movement of Indian Ocean water from the south into the eastern seas, most of this water ends up being recycled southward as it flows past Timor Island and back into the Indian Ocean.

The deep flow through the Timor Trough originates in the Indian Ocean and contributes to the formation of a recirculation pattern into the Seram Sea, the North Banda Sea, and back into the South Banda Sea before moving back into the Indian Ocean. Flows through the Timor Straits provide links to the Indian Ocean.

The Indonesian Throughflow is characterized by large internal waves and tides, which are thought to cause the intermittent high primary production events experienced in the predominantly oligotrophic sea (McKinnon *et al*. 2011).

The hydrodynamic conditions (sea currents velocities and patterns) and sediment fluxes into Tibar Bay have been discussed in the 'Hydrodynamic (current) model and sedimentation estimate' Report (Advisian 2017) prepared during the Project's FEED phase. Advisian (2017) report used metocean measurements from the December 2011-January 2012 and October-November 2016 campaigns to validate a hydrodynamic numerical model of the area.

Figure 6-23: AWAC1

Sampling Date	Site	Sampling Depth	TSS (mg/L)	Turbidity (NTU)
12-Nov-2016	METWQ4	2.0	4.0	0.2
12-Nov-2016	METWQ4	10.0	7.8	0.1
12-Nov-2016	METWQ4	19.0	4.9	0.6
12-Nov-2016	METWQ2	6.0	5.4	2.8
12-Nov-2016	METWQ2	2.0	1.8	4.5
12-Nov-2016	METWQ2	4.0	7.7	3.7
12-Nov-2016	AWAC1	10.0	16.6	0.9
12-Nov-2016	AWAC1	2.0	0.4	0.8
12-Nov-2016	ADCP1	15.0	0.6	0.1
12-Nov-2016	ADCP1	2.0	0.2	0.1
12-Nov-2016	PLM01	17.0	3.5	2.5
12-Nov-2016	PLM01	2.0	5.2	10.8
12-Nov-2016	PLM01	11.0	2.8	4.2
12-Nov-2016	PLM02	17.0	9.3	3.5
12-Nov-2016	PLM02	11.0	5.4	7.3
12-Nov-2016	PLM02	2.0	37.5	32.0
12-Nov-2016	PLMEDG01	11.0	1.4	0.9
12-Nov-2016	PLMEDG01	2.0	1.9	3.4
12-Nov-2016	PLMEDG01	17.0	11.3	0.5
12-Nov-2016	PLMEDG02	2.0	2.6	12.4
12-Nov-2016	PLMEDG02	17.0	3.0	2.6
12-Nov-2016	PLMEDG02	11.0	2.2	5.5

Figure 6-24: Results table for Total Suspended Solids (TSS)

6.10 Soil

There are 3 major types of soils found in Timor-Leste: cambisols, vertisols and fluvisols (NAP, 2009). Cambisols are soils with the beginning of a soil formation and are developed in medium and fine-textured materials derived from a wide range of rocks. Fluvisols are young soils of alluvial deposits and the key component of alluvial deposits. Vertisols are clayey soils which have minimal organic matter and are common in regions with distinct wet and dry seasons, such as Timor-Leste (FAO 2007). In this area, the soils are mainly comprised of fluvisols which dry out for more than 9 months of the year (NAP 2009).

The main geological units in the study area are the Quaternary alluvium and the Permian Aileu Formation. The Aileu formation is comprised mainly of shales and slate which weathers to clayey soils.

The soils are prone to erosion due to extensive clearing of native vegetation along the river banks and in creeks; and on the hillslopes. This results in rills, gullies and collapse of river banks, further modifying the soil profile and river flows.

Erosion is recognised as a constraint to agricultural development in Timor-Leste (NAP, 2009). It occurs when high intensity rainfall causes slope collapse and carries sediments downstream into the lower reaches of river basins. Erosion in this area has been aggravated by clearing of hillslope vegetation for firewood (e.g. white barked Eucalyptus trees) and grazing of cattle and goats.

In the project area, there is evidence of erosion and sedimentation as follows:

- Rills and incised drainage on the steep slopes of the hill (Figure 6-25);
- Slope failure aggravated by undercutting for construction of the Tibar-Liquiça road (Figure 6-26);
- Gully formation in the lower sections of the drainage (Figure 6-27);
- Sediment 'trail' and excellent mangrove health in a fan-shaped stand adjacent to the drainage channel at the project site (Figure 6-29); and
- Cleared basin with thick sedimentation layer at the base of the drainage channel (Figure 6-28).

Figure 6-25: Erosion and undercutting collapse on ridges

Figure 6-26: Slope failure aggravated by road cutting in Tibar

Figure 6-27: Gullying erosion in small tributaries west of Tibar Bay aggravated by clearing

Figure 6-28: Gullying on the crest of the hill

The literature is abundantly clear that **sedimentation** occurs in the rivers of Timor-Leste. The rivers are mainly ephemeral and flow only during the monsoon and after significant rainfall events. There are multiple signs of erosion and sedimentation in the rivers in the project area, with braiding in the streams, collapsing riverbanks and thick sediments in the river mouths. On the aerial imagery, clear sediment trails are observed draining from the land into the mangrove areas within Tibar Bay (Figure 6-29).

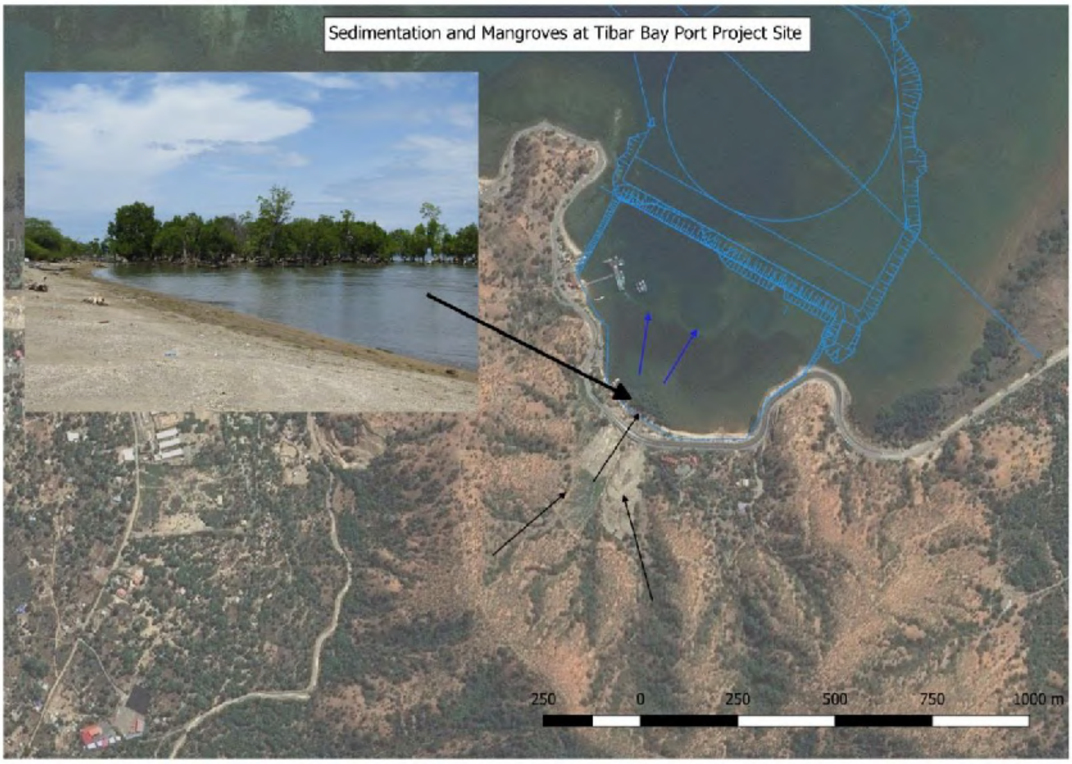


Figure 6-29: Sedimentation and mangroves at Tibar Port Project Site

An attempt was made by Alongi *et al.*, (2009) to quantify the rate of sedimentation in two major catchments in Timor-Leste, the Caraulun and Laclo catchments. The Laclo is the more similar to the Rihui river in terms of its geology and based on a broad similarity, sedimentation may be as much as 10 cm/year. The major cause of this is attributed to deforestation, which results in erosion by sheet and rill processes, gullying, shallow land sliding and streambank erosion.

A full geotechnical survey was performed last quarter of 2016 using the equipment shown below:

Figure 6-30: Cone Penetration Test platform

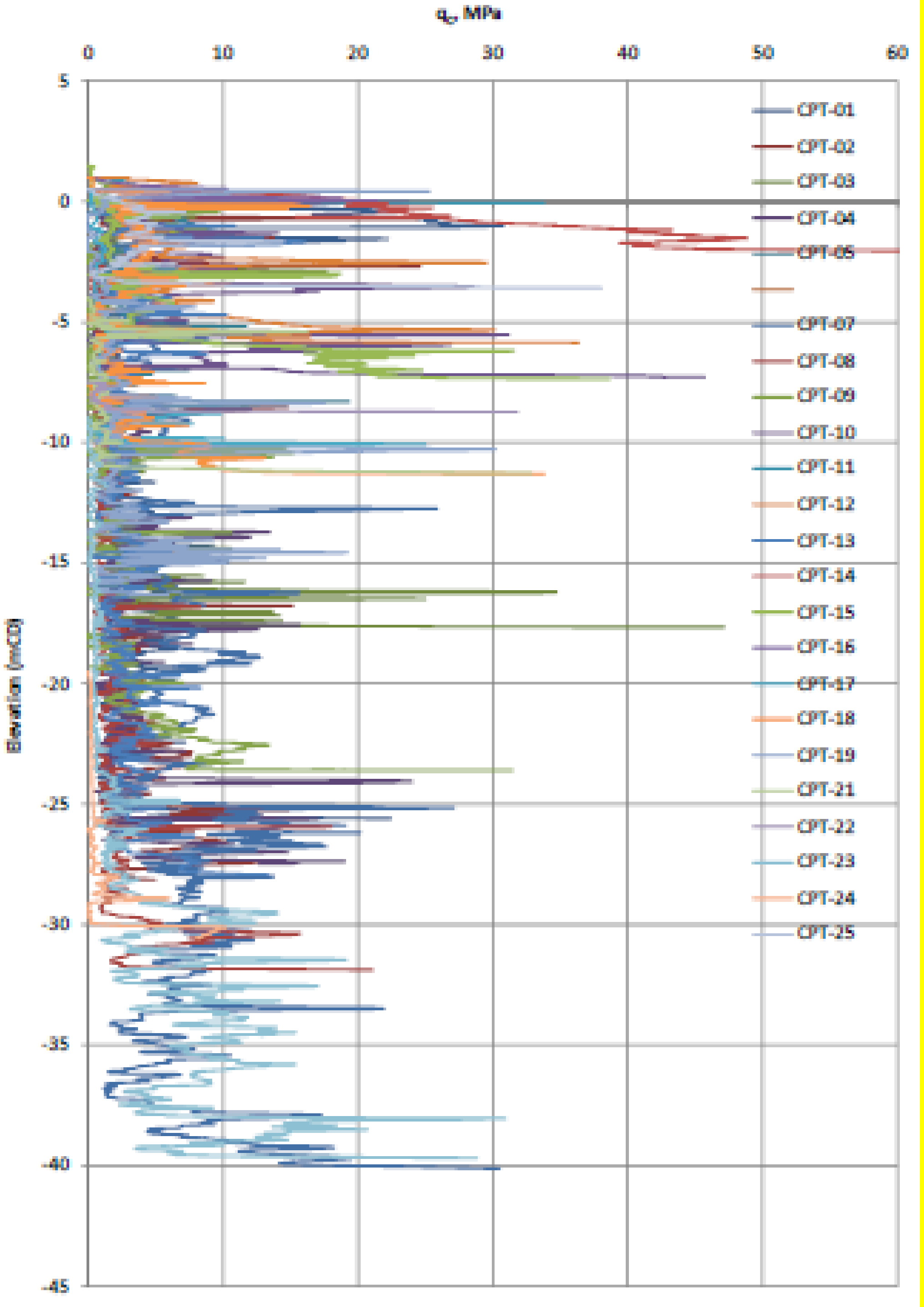


Figure 6-31: CPT cone tip resistance

6.11 Contamination

Contamination was assessed within Tibar Bay in order to assess the potential impact of disposal of dredge material in the marine environment; and to confirm the presence or absence of hydrocarbons in the sediment and water in Tibar Bay. Ecostrategic (2014) identified a hydrocarbons surface spill at the vicinity of the oil terminal at Tibar Bay and this was confirmed by observations in November 2016, where oil was seen leaking into the water from the pipes on the oil jetty (Figure 6-32).

Other potential sources of contamination within the project area include the Tibar Landfill, located more than 5 km from the project site (Figure 6-33).

Figure 6-32: Leaking oil pipe with rudimentary spill catch below the leak

Figure 6-33: Tibar landfill located in Tibar Bay

In order to determine the nature and extent of contamination within the project area, a Sampling and Analysis plan was developed and implemented. The contamination was characterised using field sampling techniques including the taking of water and sediment samples. The full sediment characterisation report is documented in Appendix H.

The assessment complies with the sampling frequency requirements for medium sized capital dredging projects (50.000-500.000 m^3) in Appendix D of the National Australian Guidelines for

Dredging (NAGD) (Commonwealth of Australia 2009), and this program also includes further sampling outside the dredge footprint.

As capital dredging is proposed, the number of sampling locations was based on the upper 1 m of sediments as contamination was unlikely to be present within the underlying natural geological material at a depth greater than 1 m. The number of samples and sample locations were derived from Appendix D, Table 6 within the NAGD.

Contaminant list

A contaminant list was developed in accordance with the NAGD (2009) to follow the requirements of the Terms of Reference (PPP 2015). Page 27 of Appendix A in the NAGD (Commonwealth of Australia 2009) requires that a potential contaminants list be developed and should include:

- Toxic substances known, from previous investigations, to occur in dredge area sediments at levels greater than one tenth of the screening levels
- Based on historical review, substances potentially present at such levels in the sediments to be dredged.

As no historical information was available from the site, a broad list of potential contaminants were analysed:

- Aluminium (Al)
- Antimony (Sb)
- Arsenic (As)
- Cadmium (Cd)
- Chromium (Cr)
- Cobalt (Co)
- Silver (Ag)
- Zinc (Zn)
- Copper (Cu)
- Iron (Fe)
- Lead (Pb)
- Manganese (Mn)
- Mercury (Hg)
- Nickel (Ni)
- Organotins (monobutyltin [MBT], dibutyltin [DBT] and tributyltin [TBT])
- Polycyclic Aromatic Hydrocarbons (PAHs)

Sediments were also analysed for:

- Moisture content
- Particle size distribution (PSD)

Sampling locations and horizons

The number of locations sampled within the dredging area was determined by the volume of ‘potentially contaminated’ sediments (i.e. sediments that could contain contaminants above background) within the dredge footprint, generally treated as the top 1 m of sediment. Overall, a total of 52 locations within the bay were sampled.

Where possible, sample material for laboratory analyses were taken from two horizons, one from the top half metre and one from between the half metre and metre depth below the sediment surface. Refusal of the coring apparatus on stiff substrate typically limited the number of horizons submitted for laboratory analysis. Detailed information is contained in Appendix H.

Results

All metals analysed in the sediment samples were below the assessment levels for sediments as given in the NAGD (2009) and the ANZECC/ARMCANZ (2000). A summary of the results are given below, and a table of results is given in Appendix H.

- There is no guideline for the assessment of aluminium levels in sediments, and the concentrations ranged between 870 and 18400 mg/kg in the samples analysed.
- Antimony was generally below the Limit of Reporting (LOR) of 0.5 mg/kg in all samples, except in three samples, namely the bottom horizons at COP4, C08 and PC06.
- Arsenic was above the LOR of 1 mg/kg in all samples analysed, though all results were below the NAGD screening level of 20 mg/kg. Arsenic concentrations ranged between 4.6 and 18.5 mg/kg.
- Cadmium was below the LOR of 0.1 mg/kg at all sites and depths except in the top horizon at one sampling location E33, where the concentration was equal to the LOR.
- Chromium ranged between 3.2 and 21.5 mg/kg, which were below the screening level of 80 mg/kg.
- Cobalt was also analysed, though there is no screening level within the guidelines for this metal. Cobalt concentrations ranged between 1.3 and 19.3 mg/kg.
- Copper concentrations ranged between 1.1 and 34.3 mg/kg, above the LOR of 1 mg/kg and below the screening level of 65 mg/kg.
- Lead concentrations were above the LOR of 1 mg/kg, ranging between 3 and 38.4 mg/kg. The NAGD screening level for lead of 50 mg/kg was not exceeded in any of the samples.
- There is no screening level for manganese, and concentrations ranged between 87 and 713 mg/kg in the samples analysed.
- Individual nickel results were above the NAGD screening level of 21 mg/kg in 20 samples, though the 95% UCL (17.09) was below the screening level. All individual results were also below the ANZECC/ARMCANZ ISQG-High.
- There is also no screening level for selenium, and values ranged between 0.2 and 0.6 mg/kg.
- Zinc concentrations were all below the screening level of 200 mg/kg, with results ranging between 4.1 and 88 mg/kg.
- Mercury was below or at the LOR of 0.01 mg/kg in most samples except the top horizon at PC20 and the top horizon at EXT3.

Hydrocarbons

Total petroleum hydrocarbons (TPH) and recoverable hydrocarbons (TRH) were analysed in 80 samples, and were found to be comparatively low. As there is no NAGD screening level or ANZECC/ARMCANZ ISQG level for these analytes, the NEPM (2013) Ecological Screening Levels (ESL) were used to compare to the results. All results were below the ESLs.

6.12 Acid sulphate soils

Very little existing information is available about sediment quality of coastal sediments in Timor-Leste. One of the first assessments of sediment quality in Timor-Leste was undertaken by Wyatt (2004) of the nearshore coastal marine environment on the south coast near Betano,

Acid sulfate soil analysis was also undertaken to inform the option of onshore disposal. The acid sulfate soil investigation was undertaken in accordance with the best practice document *Identification and investigation of acid sulfate soils and acidic landscapes* (DER 2015).

6.12.1 Acid sulphate soil sampling

Sediment samples were collected at each location using a drop core or vibrocorer, depending on the type of substrate encountered. A drop corer was preferable, which consisted of a stainless steel barrel with a weight on top for protruding through the sediment. Where the sampling locations could be accessed by foot and where the sediment was soft, the drop corer was placed onto the sediment and then pushed down to 1m or to refusal. If the seabed was hard, the vibrocorer was deployed by placing it onto the seabed from the vessel and then using a generator powered motor push the corer into the seabed.

Once the sample was within the drop corer/vibrocorer, the sampling device was then lifted onto a clean area where contamination could be prevented, either the deck of the vessel or onto the ground. The sediment core was then extruded into a core tray for logging and sample processing.

Due to the short laboratory analysis holding time for analysis such as acid sulfate soils, samples were collected in laboratory-supplied sampling bags and jars with as much air removed from the bags as possible and then dried for handling and transport. Drying samples effectively suspends or significantly slows the oxidation reaction (and resulting acidification) the samples undergo when exposed to oxygen.

92 primary samples were taken and analysed for acid sulfate soils using the Suspension Peroxide Oxidation Combined Acidity & Sulphur (SPOCAS) method, and the results are presented in Appendix H. Some samples were labelled with “AS” or “AR” as replicate samples, however some of these samples did not have a primary sample and therefore these have been treated as the primary sample and not used as a Quality Assurance/Quality Control (QA/QC) sample.

6.12.2 Laboratory analysis

Analysis for the potential for acid sulfate soils (ASS) was conducted to consider the possibility for onshore disposal and re-use of the sediment on the land. The ASS samples were subjected to the SPOCAS analytical method. This included analysis for the following:

- pH measurements
- TAA – Titratable Actual Acidity
- TPA – Titratable Peroxide Acidity
- TSA – Titratable Sulfidic Acidity
- Sulfur trail
- Calcium values
- Magnesium values
- ANC – Acid Neutralising Capacity
- Net Acidity.

6.12.3 Results interpretation method

ASS are naturally occurring soils and sediments that contain iron sulfides which readily oxidise and acidify upon exposure to oxygen. If the material is removed from the seabed and placed onshore, its exposure to the atmosphere can realise the risk of acid generation. Generation of acid can result in a secondary impact through the dissolution and mobilisation of stored metals in the sediment matrix. Therefore, analysis for the presence of ASS was required during this investigation to quantify this risk. The SPOCAS analytical suite was used to determine the presence of ASS, defined by the material’s

Net Acidity. This parameter was compared against the DER Action Criterion of 0.03% w/w S. Net Acidity is determined by the following equation:

$$Net\ Acidity = Actual\ Acidity + Potential\ Acidity - Acid\ Neutralising\ Capacity$$

Actual acidity is assessed by the measurement of TAA.

Potential acidity is assessed through the calculation of S_{POS}.

ANC is a soil's natural ability to buffer acidity either through the dissolution of calcium and/or magnesium carbonates (commonly found in shells), cation exchange reactions, reaction of organic and clay fractions or other soil minerals. The effectiveness of neutralisation can be hindered somewhat depending on the available forms of acid buffering. For example, where carbonates are stored in coarse shells, acid buffering may not be readily available due to the armouring effect of the shell's coating.

In the laboratory, through the sample preparation process, carbonates (such as shell fragments) in the collected samples are physically reduced to finer particles by crushing/grinding, increasing the reactive surface area to volume ratio of the neutralising materials causing the acid neutralization capacity to increase. This can result in overestimation of the ANC of the sample.

The above equation assumes that the acid neutralising capacity is chemically available. However, to calculate the Action Criteria in accordance with Section 6.1 of DER (2015) (as developed by the Queensland Acid Sulphate Soils Investigation Team (QUASSIT) and outlined in the *Guidelines for Sampling and Analysis of lowland Acid Sulfate Soils in Queensland* 1998), the following equation is to be used:

$$Net\ Acidity = Actual\ Acidity + Potential\ Acidity$$

The omission of the ANC component allows for a conservative estimate of the potential acid generation and assists in the determination of resulting treatment requirements, if any.

6.12.4 Results

The net acidity (excluding ANC) was calculated using the actual and potential acidity, and exceeded the DER action criterion of 0.03% S (Sulfur Units) or 18 mole H^+/t (Acidity Units) in all samples except two.

When onshore disposal is to be conducted of the dredge material, due to the PASS exceeding the guideline in most samples, liming should be undertaken. The mass of liming required was also calculated during the laboratory analysis, known as the liming rate. In order to ensure sufficient liming, the maximum liming rate of 14 kg $CaCO_3$/t is recommended to be used to ensure adequate amelioration of generated acid when the dredge spoil is exposed to the atmosphere.

6.13 Protected areas and national parks

Two Key Biodiversity Areas (KBAs) are located within the vicinity of Tibar Bay. These are Atauro Island located 30km offshore and the Tasi Tolu wetlands located immediately east of Tibar Bay.

Atauro Island is separated from the project area by 30km of ocean and a 1,000m deep-water strait. Atauro is uninhabited, with the exception of a resort, Beloi Eco Resort, located on the eastern edge. The coastline comprises rocky cliffs on the south coast, coral and sandy beaches on the remainder of the island, with the eastern edge of the island having the highest sensitivity. This area has fringing reef and extensive seagrass along with mangroves and a hot spring (Ecoscape, 2013).

Tasi Tolu wetlands comprises three saline coastal lakes located immediately east of Tibar Bay. The wetlands constitute an important bird habitat with hundreds of migratory birds arriving from Russia during the northern winter. The marine area immediately offshore has fringing reef and seagrasses and is reported to be frequented by Dugong (Ecoscape, 2013).

6.14 Vegetation and fauna

Vegetation

Timor-Leste can be roughly divided into five major vegetation zones (Monk *et al*. 1997), including thorn forest (dry coastal areas, primarily along the north coast), dry deciduous forest (lower altitude habitats up to ca. 500 m), moist deciduous forest, semi-evergreen rainforest (especially on slopes), and evergreen rainforest (in the few pristine montane areas above 1000 m elevation). Trainor *et al*. (2007) provided a more detailed account of habitat types, which have been used as a basis for this report. Their classification includes tall evergreen forest (tree height up to 40 m), semi-deciduous and tropical dry forest types (tree height up to 20 m), a patchy tropical montane forest (elevations > 1000 m), beach forest and coastal scrub, savanna woodland, open eucalyptus forest, shaded coffee plantations (> 600 m), swamps and swamp forests, rice paddies, and village land. Habitats are generally characterized by sloping terrain (44% of the land in Timor-Leste has a slope of ≥ 40 %), rendering them unsuitable for sustainable agriculture (UNDP 2010). Whereas Timor-Leste is typical of the tropics in possessing only a thin soil layer, there is little bare soil or grassland, and the island appears relatively well wooded (Kaiser *et al*., 2011).

There is little doubt that Timor-Leste was more forested before the arrival of the Portuguese colonists in the early 16th Century, but it is also apparent that some types of agriculture (such as the establishment of rice paddies) caused habitat modifications. However, as first the colonial power and then the Indonesian occupiers exploited tropical woods (notably sandalwood and teak), the effects of ongoing shifting subsistence agriculture became compounded. The reduction in the number of trees has by now dramatically increased the threat of erosion during the infrequent but often torrential rainfall, which may have serious consequences for road infrastructure. The threat of continued deforestation to support unsustainable agriculture techniques and the search for cooking fuel are real in Timor-Leste. These types of threats and the new threat of invasive species make sustainability efforts imperative (Kaiser *et al*., 2011).

Some of the Study Area has been cleared for construction and industry including a coffee processing facility, a landfill, community buildings and construction material storage. These areas are generally barren with some weeds and grasses present.

Vegetation surveying was carried out by one ecologist over two days, covering the hillside and slopes immediately adjacent to the Tibar Port area. The survey included mapping of the broad vegetation types, interpretation of aerial imagery and photographing key vegetation communities (

Figure 6-34).

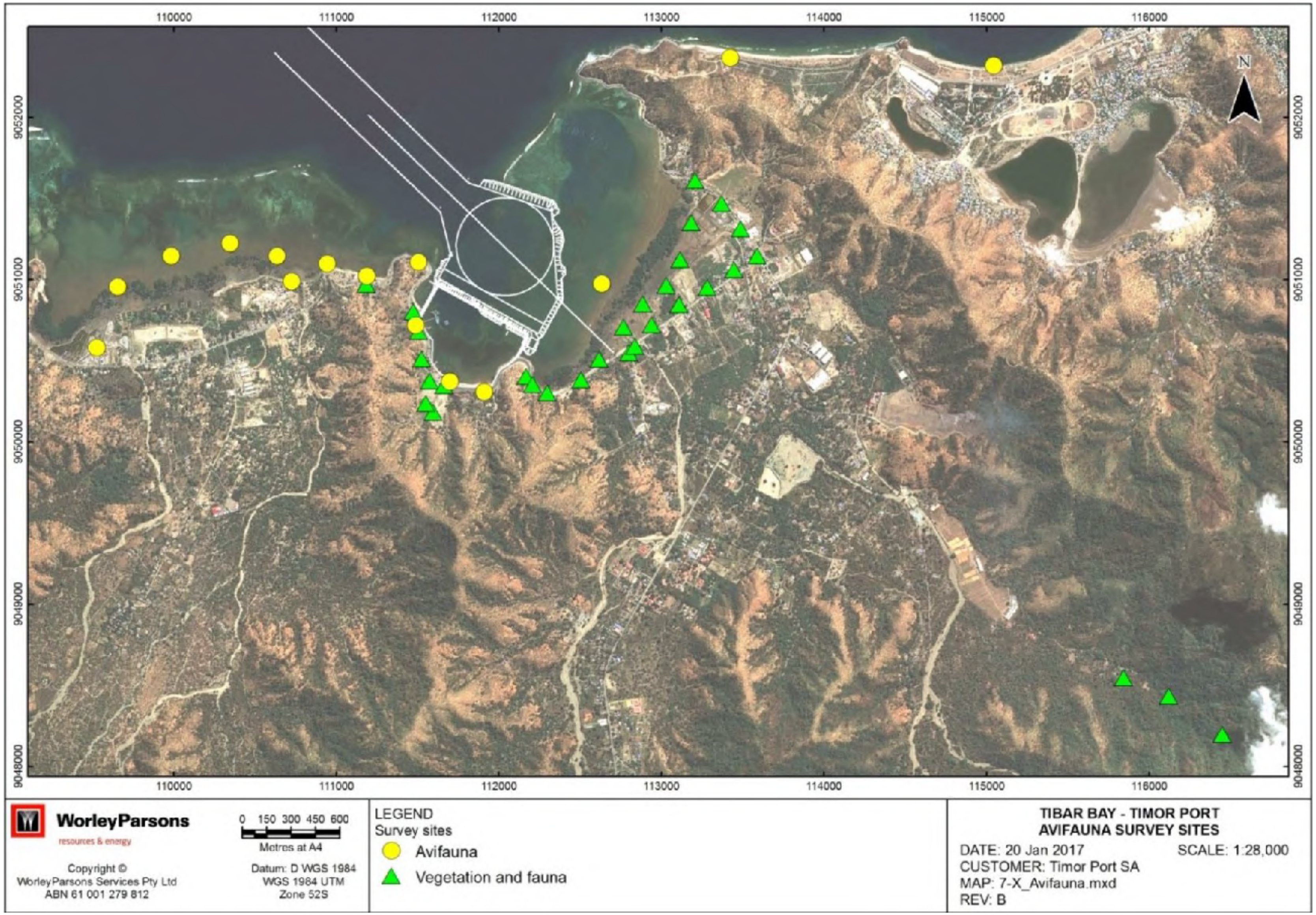


Figure 6-34: Vegetation, fauna and avifauna survey locations

The photographs below depict the most common species occurring between Ulmera and Tibar.


Chromolaena odorata (Siam weed)


Croton bonplandianus (Ban Tulsi)


Eucalyptus alba (Tetum : 'dibubur')


Wild Tamarind (Tetum : 'stone papaya')


Corypha utan (Local name: 'gebang palm')


Prosopsis sp. (Mesquite Tree, foreground) ; *Eucalyptus alba* (upper slopes, white bark)

The survey also concentrated on the vegetation confined within the incised valley of one of the main drainage lines. The geology of the area was predominately exposed hard bedrock in the river bed with limited sedimentation.

Garuga Floribunda (Local name: 'gluma')

Ficus virens (Banyan)

Wild Tamarind (more than 10m tall)

Well developed over and understorey vegetation with grass and shrub ground cover. This was the prevalent vegetation type in most of the upper slopes.

Mushrooms / Fungi

Rocky river bed along the steep slopes in Upper Tibar showing lack of sediment and thick understorey vegetation and woody roots

Overall, the study area is dominated by woodland and grassy slopes with Eucalyptus, Mesquite and palm trees prevailing on the adjacent hill slopes. In the lower slopes, the project area comprises mangrove vegetation with some tussock grass understory on the sandy beaches adjacent to the coastal road.

6.15 Terrestrial fauna

The upper slopes to the east of Tibar village, between Tibar and Tasi Tolu were surveyed on foot over one full day. A survey was undertaken by vehicle from Tibar/Gleno intersection to Ulmera, stopping at locations where key fauna habitat features were identified. These locations were recorded by Global Positioning System (GPS) and are presented in

Figure 6-34.

The survey included opportunistic and intuitive searches for fauna, lifting rocks and listening for animal calls. The survey was guided by a local resident whom the Chief of Tibar recommended for his local knowledge of native fauna. The guide was provided photographs and he listed the animals he has seen in the area, indicating which habitat type (i.e. tree or vegetation community) they prefer and gave the local name for the animal.

Survey locations are depicted in

Figure 6-34. Terrestrial fauna observed during the surveys and known to occur in and around Tibar Bay include:

- Frogs (e.g. *Duttaphrynus melanostictus*)
- Domestic animals (e.g. goats, pigs, cattle, chickens)
- Lizards (e.g. Tokay Gecko (*Gekko gecko*)
- Snakes (e.g. Trimeresurus albolabris insularis, *Dendrelaphis inornatus timorensis (*Timor Treesnake)
- Monkeys and other small forest-dwelling mammals (e.g. squirrels)
- Butterflies and moths
- Bats
- Variety of invertebrates

Duttaphrynus melanostictus (Local name: 'Manduku Interfet')

Domestic pigs (Trainor, 2016)

Long tailed macaque (*Macaca fascicularis*)

Banteng / Bali cattle

Plain Tiger Butterfly (*Danaus chrysippus chrysippus*)

6.16 Avifauna (birds)

There are over 270 bird species in Timor-Leste including 126 resident land birds, together with about 100 resident, visiting and migratory waterbirds. While endemism is high for forest specialized birds, the land birds of savanna woodlands and open terrestrial habitats is dominated by wide-ranging generalist species. Millions of individual shorebirds migrate along the East Asian-Australasian Flyway, with 1,000s of individuals from about 35 migratory shorebirds visiting Timor-Leste annually.

These birds breed in the Palearctic (primarily Siberia, Mongolia and China) during the very short summer period of 6-8 weeks. The juvenile birds grow rapidly and migrate south before winter begins (August to November) with their migration pathway and wintering feeding grounds apparently coded within their DNA. Some migrant shorebirds stay for weeks, or winter on Timor-Leste for months, returning to breeding grounds in March-April and May each year. The main habitat of these shorebirds is wetlands, particularly intertidal mudflats and sandflats and shallow saline lakes (Trainor 2005, 2011).

Shorebirds occurring in Timor-Leste therefore often have highly specialized habitat requirements, being largely dependent on mud which contains food such as marine worms, crustaceans and molluscs. This habitat is highly threatened in Timor-Leste with rapid loss and decline of mangroves and intertidal mudflats, and throughout the East Asian-Australasian Flyway there has been rapid loss and conversion of intertidal mudflats, particularly in the Yellow Sea area of China and also Korea. Consequently, many Palearctic shorebird species are now considered as globally threatened, and are species of elevated conservation concern.

An avifauna survey of Tibar Bay and surrounds was conducted on 25th October 2016 by Timor-Leste avifauna expert Colin Trainor. This survey builds on Colin's 15 years' experience conducting avifauna surveys and research in the Tibar / Tasi Tolu region, including 50+ surveys within Tibar between 2003-2016 (14 years) and 177+ surveys in Tasi Tolu area between 2002-2016 (15 years). Colin is currently the Timor-Leste Country Coordinator for Asian Waterbird Counts by Wetlands International. Refer to Appendix D for the full technical report.

A total of 32 bird species were recorded at in the Study Area on with eight shorebird species including the globally Endangered Far Eastern Curlew *Numenius madagascariensis*, six waterbird species, and 18 landbird species (Appendix D). A total of 96 individual migrant shorebirds were recorded dominated by a flock of 75 globally Near Threatened Red-necked Stints *Calidris ruficollis* that were actively feeding on mudflat behind mangroves at high tide at Tibar Bay.

Shorebirds were observed feeding in the adjacent fishponds, on the mudflat areas behind mangroves at Tibar Bay, on the mudflat opposite the existing Tibar Port facility, actively feeding along beach and shoreline at Tibar Port and resting in aquaculture ponds at Tibar Bay.

A total of 44 bird species were recorded within the Tibar Port area and Ulmera intertidal mudflats including 15 shorebird species (43 individuals), with seven waterbird species and 22 landbird species (Appendix D). The globally Endangered Far Eastern Curlew occurred widely with records at four of 11 sites and the Endangered Great Knot was recorded at Ulmera. Shorebirds were commonly observed actively feeding on intertidal mudflats, sandflats (presumably on worms, crabs and molluscs), beach areas and roosting or resting on rock outcrops at Ulmera.

Figure 6-35: Images 1-6. Shorebird diversity at Tibar Bay, Ulmera and Lake Tasitolu.

1: Pied Stilt *Himantopus* at Tasitolu;

2 Masked Lapwing *Vanellus miles* at Tasitolu;

3: Black-bellied Plover *Pluvialis squatarola* at Ulmera;

4: Kentish Plover *Charadrius alexandrinus* at Tibar Bay;

5: Javan Plover *Charadrius javanicus* at Ulmera;

6: Red-capped Plover *Charadrius ruficapillus* at Tibar Bay (Trainor, 2016)

Figure 6-36: Image 7-12. Shorebird diversity at Tibar Bay, Ulmera and Lake Tasitolu.

7: Greater Sand-Plover *Charadrius leschanaultii* at Ulmera;

8: Oriental Plover *Charadrius veredus* at Tasitolu;

9: Whimbrel *Numenius phaeopus* at Ulmera;

10: Far-Eastern Curlew *Numenius madagascariensis* at Tibar Port;

11: Bar-tailed Godwit *Limosa limosa* at Ulmera;

12: Black-tailed Godwit *Limosa lapponica* at Tasitolu (Trainor, 2016)

Figure 6-37: Images 13-18. Shorebird diversity at Tibar Bay, Ulmera and Lake Tasitolu.

13: Common Redshank *Tringa totanus* at Tibar Bay;

14: Marsh Sandpiper *Tringa stagnatilis* at Tasitolu;

15: Common Greenshank *Tringa nebularia* at Tasitolu;

16: Wood Sandpiper *Tringa glareola* at Lake Tasitolu;

17: Common Sandpiper *Actitus hypoleucos* at Tibar Port;

18: Terek *Sandpiper Xenus cinereous* at Metinaro (Trainor, 2016)

Figure 6-38: Images 19-24. Shorebird diversity at Tibar Bay, Ulmera and Lake Tasitolu.

19: Red Knot *Calidris canutus* at Tibar Bay;

20: Great Knot *Calidris tenuirostris* at Ulmera;

21: Sanderling *Calidris alba* at Tasitolu;

22: Red-necked Stint *Calidris ruficollis* at Tibar Bay;

23: Sharp-tailed Sandpiper *Calidris acuminata* at Tibar Bay;

24: Ruff *Philomachus pugnax* at Tasitolu (Trainor, 2016)

Figure 6-39: Images 25 & 26. Importance of rock outcrops for waterbirds and shorebirds at Tibar Bay and Ulmera: 25: Little Egret Egretta garzetta and Great Egret Egretta alba use small rock stack islets along intertidal sandflats as high tide roosts, together with Whimbrel, other migrant shorebirds and cormorant species (not shown); 26: Greater Crested Tern Thalasseus bergii roosting on small island rock stacks off Ulmera (Trainor, 2016)

6.17 Marine environment

6.17.1 Marine megafauna

The IUCN Red List of Threatened Species is widely recognised as the most comprehensive objective global approach for evaluating the conservations status of animal species including marine fauna. The IUCN red list categorises threatened species into the following categories:

- **Critically endangered** - Species facing a high risk of extinction in the wild;
- **Endangered** - Species likely to become extinct; or
- **Vulnerable** - Species likely to become endangered unless circumstances threatening its survival and reproduction improve.

Information on marine habitats and threatened species of mega fauna that may occur within the Study Area was obtained from the following sources:

- Department of Natural Resources, Environment, the Arts and Sport (2008) Timor a Global Hotspot for Whales and Dolphins
- Tourism and Fisheries Development Project (2009), Marine Megafauna Surveys in Timor-Leste Identifying Opportunities for Potential Ecotourism-Final Report , June 2009
- Tourism and Fisheries Development Project (2009) Marine & Coastal Habitat Mapping in Timor-Leste (North Coast)- Final Report, June 2009
- Tourism and Fisheries Development Project (2012) Marine Megafauna Surveys in Timor-Leste: Identifying Opportunities for Potential Ecotourism-Final Report, November 2012;
- Conservation International Timor-Leste (2016) Timor-Leste Cetacean Scoping Study. November 2016 (*unpublished*)
- Charles Darwin University (2014) Assessment of Marine Megafauna and Potential Critical Habitat in Tibar Bay, Timor-Leste October 2014

IUCN listed species that may occur in the Study Area are listed below in Table 6-2. Descriptions of threatened species, those classified as critically endangered, endangered or vulnerable only are provided in Appendix F.

Table 6-2: IUCN listed species within the project area

Species	Common Name	Status
Cetaceans		
Balaenoptera musculus	Blue whale	Endangered
Balaenoptera musculus brevicauda	Pygmy blue whale	Data deficient
Physeter macrocephalus	Sperm whale	Vulnerable
Balaenoptera borealis	Sei Whale	Endangered
Globicephala macrorphyncus	Short-finned pilot whale	Data deficient
Pseudorca crassidens	Pygmy killer whale	Data deficient
Peponocephala electra	Melon-headed whale	Least concern
Ziphius cavirostris	Curvier's beaked whale	Least concern
Pseudorca crassidens	False killer whale	Data deficient
Grampus griseus	Risso's dolphin	Least concern
Lagenodephis hosei	Fraser's dolphin	Least concern
Tursiops truncatus	Bottlenose dolphin	Least concern
Stenella attenuata	Spotted dolphin	Least concern
Steno bredanensis	Rough toothed dolphin	Least concern
Stenella longirostris	Spinner dolphin	Data deficient
Stenella longirostris roseiventris	Pygmy spinner dolphin	Data deficient
Stenella attenuata	Pantropical spotted dolphin	Least concern
Dugongs		
Dugong dugong	Dugong	Vulnerable
Manta rays		
Manta birostris	Manta ray	Vulnerable
Whale Sharks		
Rhincodon typus	Whale shark	Endangered
Marine Turtles		
Eretmochelys imbriate	Hawksbill turtles	Critically Endangered
Chelonia mydas	Green turtles	Endangered
Caretta caretta	Loggerhead turtles	Endangered
Lepdochelys olivacea	Olive Ridley turtle	Vulnerable
Dermochelys coricea	Leather back turtle	Vulnerable
Crocodiles		
Crocodylus porosus	Crocodile	Least Concern

Blue whales

The IUCN Red List status for blue whales is endangered. There are two recognised sub-species of blue whale in the Southern Hemisphere, which are both recorded in the waters surrounding Timor-Leste. These are the Antarctic (or 'true') blue whale (*Balaenoptera musculus)* and the pygmy blue whale. Antarctic blue whale numbers have been severely depleted by historic whaling and numbers are slowly recovering. There is a lack of information surrounding the numbers of pygmy blue whales pre exploitation and the current total worldwide population is unknown (Commonwealth of Australia, 2015). Blue whales generally migrate between warmer, lower latitude breeding grounds, where mating and calving takes place during winter months, and colder, higher latitude feeding grounds in the summer months (Commonwealth of Australia, 2015). Feeding of blue whales is likely to occur in water depths of 500 to 1000 m (McCauley *et al.,* 2004, Jenner and Jennser, 2008).

Blue whales have been observed 3 km from the proposed Project Area following the 200 m depth contour, headed West in the Ombai Strait. This confirms that Timor-Leste as an important migratory corridor for blue whales. As the waters of the Project area are less the 25 m deep and the 200 m depth contour is 3 km north-west of the project area, it is unlikely that whales will be encountered within the Study Area.

Sperm whales

Sperm whales (*Physeter macrocephalus*) are found worldwide and are the largest of all the toothed whale species. Their global distribution is comparable to the killer whale, with regular observations from both polar and equatorial waters (Whitehead, 2002). The IUCN Red List status for sperm whales is Vulnerable.

Sperm whales are sighted frequently in deeper waters and form large aggregations (100–1,000 animals) in foraging grounds of high oceanic productivity (Whitehead, 2002). Female sperm whales have restricted home ranges in water deeper than 1,000 m and less than 40° latitudes (Whitehead, 2002). Male sperm whales will remain with their mothers for several years until early adulthood (4–21 years), at which time they will join larger male-only herds that will migrate to polar waters to feed, and return back to tropical and temperate waters to breed (Whitehead, 2002). No global population estimates for sperm whales are available.

A marine mega fauna survey undertaken in Timor-Leste in 2008 identified a single sperm whale in the south eastern coast (Tourism and Fisheries Development Project, 2012).

Considering the widespread distribution of sperm whales in deep waters, it is highly unlikely that sperm whales will be encountered in the Study Area.

Sei whales

The IUCN Red List status for Sei whales is endangered. The Sei whale (*Balaenoptera borealis*) has a patchy and wide-ranging distribution, favouring deep, offshore habitat more than other large whale species. During the summer they are found between latitudes of 40° to 50° south, and lower winter latitudes are unknown (DotE, 2016b). As Sei whales are not often found near the coastline, the species is infrequently recorded in Timor-Leste waters. The marine mega fauna survey undertaken in Timor-Leste in 2008 recorded one potential sighting of a Sei whale but it was not conclusive (Tourism and Fisheries Development Project, 2012).

As they prefer higher latitudes and colder waters, it is considered unlikely that species will be encountered in the Study Area.

Dugongs

Dugongs (*Dugong dugon*) are often found in shallow waters protected from large waves or storms where seagrass beds flourish. The IUCN Red List status for dugongs is Vulnerable. Dugongs can be found along the sheltered waters of Indonesia and Timor-Leste (UNESCO, 2016). Although the Project Area contains extensive areas of sea grass recent mega fauna studies undertaken in the area have observed low dugong numbers.

The mega fauna survey undertaken in 2008 sighted one dugong in June and five in November in north-western coastal waters offshore from the Dilli and Liquisa districts.

One dugong was observed in the vicinity of Tibar Bay during an aerial survey in undertaken 2014. Interviews undertaken with fisherman as part of the 2014 survey confirm sightings of the dugong in the vicinity of Tibar Bay; however encounters were described as rare. On this basis low numbers of dugongs may be encountered in the Study Area.

Manta ray

Manta rays consist of two individual species; the giant manta ray (*manta birostris*) and the reef, or coastal manta ray *(manta alfredi*). The IUCN Red List status for Manta rays is Vulnerable. The Giant Manta Ray is the largest ray species in the world and is found in tropical marine waters worldwide and only on occasion in temperate regions (DoF, 2011). The Giant Manta ray spends time on the surface, sometimes even jumping out of the water, and has also been observed diving to depths of over 1,000 metres (Arkive, 2016). The species is a seasonal visitor to coastal and offshore sites and is commonly recorded on productive coastlines with regular upwellings. Giant manta rays also visit shallow reefs to be cleaned by 'cleaner fishes' and to feed (Arkive, 2016).

The mega fauna survey undertaken in 2008 sighted several groups of 5 or more Manta ray in Timor coastal waters during the month of November. No sightings were recorded during the preceeding 6 months. Therefore low numbers of Manta rays may be encountered seasonally in the Study Area.

Whale shark

The whale shark *(Rhincodon typus*) has a broad distribution in tropical and warm temperate seas, usually between latitudes 30° N and 35° S (Wilson *et al*., 2001, Wilson *et al*., 2006). The IUCN Red List status for Whale sharks is Endangered. Whale sharks are highly migratory and the species' movements are closely associated with productivity pulses, ocean circulation and water temperatures, although this is little understood (DoEE, 2016c). Whale shark presence coincides with the coral mass spawning period, when there is an abundance of food (krill, planktonic larvae and schools of small fish) in the waters adjacent to the reef.

Frequent sightings of the whale shark have been recorded during the east monsoon period from August until the beginning of the west Monsoon in November (Stacey *et al*. 2008). According to fishermen in the area whale sharks occur regularly in the Timor Passage south of Roti island and also offshore from Suai (south-western Timor-Leste) as well as in the Savu Sea between Timor and Flores Island (Timor & Fisheries Development Project, 2012). The marine mega fauna survey undertaken in 2008 sighted only three whale sharks in May, June and November; all sightings were recorded in the north-west near Dili. On this basis low numbers of whale sharks may be encountered in the Study Area.

Turtles

A number of studies between 2008/2014 and 2017 have identified three species of turtles using the waters and beaches of the Tibar Bay region, Green Turtles (*Chelonia mydas),* Hawksbill Turtles (*Eretmochelys imbricata*) and Loggerhead turtles (*Caretta caretta*).

In July 2017 Dr Kellie Pendoley, an experienced marine turtle biologist, was engaged by Advisian to provide a Subject Matter Expert assessment of the available habitat for turtles within Tibar Bay and surrounds. With her extensive knowledge of marine turtle biology and ecology, Kellie has designed and implemented an array of research programs that manage industrial activities in the vicinity of marine turtle habitats.

Kellie has over 30 years' experience as an environmental practitioner within the oil and gas and mining sector. She has participated in the environmental management of more than 40 large- scale oil and gas and mining developments in Australia and internationally, providing advice on all aspects of development from seismic through to drilling, oil spill contingency planning and monitoring, dredging, onshore and offshore plant and port construction, and operations.

Kellie's PhD studies on marine turtles and the environmental management of industrial activities in northwest Western Australia, developed novel techniques for monitoring marine turtle populations in industrial settings. Her study of the biological impacts of light pollution spans more than 25 years, culminating in the in-house development of a novel technique for quantifying and monitoring light pollution that is now recognized nationally and internationally.

Kellie routinely works with Local, State and Federal Government departments and currently serves on two international and four national Boards and Technical Panels. Kellie has over 20 publications in the scientific literature and regularly presents at national and international conferences on marine turtle biology, light pollution and wildlife conservation.

Kellie is an active member on a range of panels and professional associations, including:

- Commonwealth Government Marine Turtle Recovery Plan team (2003 - present)
- UNEP, Australasian Regional Vice Co-Chair of IUCN Marine Turtle Specialist Group (2013 - present)
- WA Department of Parks and Wildlife, Northwest Shelf Flatback Turtle Conservation Program Scientific Panel Member, Ministerial Appointment (2013 - present)
- Chevron, Gorgon Marine Turtle Expert Panel Member, Ministerial Appointment (2005 - present)
- International Dark Sky Association, Elected Board member (2016 - present)
- Perth Zoo Board, Ministerial appointment (2016 - present)
- WA Department of Parks and Wildlife, Marine Parks & Reserves Authority Board, Ministerial appointee (2011 - 2016)
- Department of Environment and Conservation, Montebello/Barrow Islands Marine Conservation Reserve Advisory Committee, Ministerial appointee (1995 - 1999)

The following summarises Dr Pendoley's assessment of turtle habitat in the Tibar Bay area and surrounds.

<u>Species Conservation Status</u>

Green Turtles (*Chelonia mydas)* are listed as Endangered under the IUCN Red List and are found in tropical and subtropical waters throughout the world. Green turtles feed in intertidal and subtidal habitats, including coral and rocky reefs, seagrass meadows, and algal turfs on sand or mud flats (Limpus, 2009).

Hawksbill Turtles (*Eretmochelys imbricata*) are listed as Critically Endangered under the IUCN Red List and are found in tropical, subtropical and temperate waters in all oceans of the world. Hawksbill turtles feed primarily on sponges, but also forage on cephalopods, gastropods, cnidarians, seagrass and seaweed (Carr & Stancyk, 1975; Witzell, 1983; Limpus, 1992; Spotila, 2004) and are likely to be found foraging in habitats that support these organisms, i.e. coral reef or hard bottom habitat.

Loggerhead turtles (*Caretta caretta*) are listed as Endangered under the IUCN Red List and are known to have a broad tropical and sub tropical distribution (DotE, 2016q), occurring in proximity to coral and rocky reefs, seagrass beds and muddy bays. Loggerhead turtles are carnivorous, feeding primarily on crustaceans and molluscs (Spotila, 2004) and are likely to be found foraging in areas that support high densities of these organisms.

Olive Ridley (*Lepidochelys olivacea)* are listed as Vulnerable under the IUCN Red List and are known to have a wide tropical and sub tropical distribution. Olive ridley turtles feed on jellyfish, tunicates, sea urchins, bivalves and crabs. (National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1998. Recovery Plan for U.S. Pacific Populations of the Olive Ridley Turtle (*Lepidochelys olivacea*). National Marine Fisheries Service, Silver Spring, MD.)

Existing information

A country wide survey of mega fauna was conducted in 2008 reported turtles during all field programs. The survey took place between April and November 2008, with the number of turtle observations peaking in November at forty-four recorded sightings. The survey was part of the 'Timor-Leste Coastal Marine Habitat Mapping, Tourism and Fisheries Development Project' funded by the Ministry of Agriculture and Fisheries (MAF) of Timor-Leste. The project included monthly aerial surveys; field ground-truthing using boats; and training of TL Government staff in aerial survey techniques and GIS analysis of data. A light plane was used for aerial surveys of megafauna within two nautical miles of the coastline on a monthly basis from April to November 2008. During four days in November megafauna were also surveyed using a boat along the Dili region of the coast.

The greatest abundances occurred at the far north-eastern tip of Timor-Leste, offshore from the Lautern district and southeast of Jaco Island. This survey did not distinguish between turtle species. The increase in turtle sightings in November were likely foraging animals and not indicative of a nesting season peak.

Two subsequent field investigations were undertaken in 2014 for this project; The Critical Habitat Assessment by Ecological (2014), and the Marine Megafauna survey by Charles Darwin University (July 2014). These reports provide baseline data on marine turtle observations, and an assessment of Critical Habitat distribution within Tibar Bay.

The primary methods used during these surveys to document marine turtle activity included:

1. Shore-based surveys; systematic ground based surveys to search beach for evidence of adult and hatchling tracks, adult nesting body pits and nests, stranded carcasses or skeletons, predation of nests and egg shell material,
2. Boat based surveys; comprising georeferenced survey lines located up to 400m from shore and parallel to the coast; three on-board observers documented megafauna presence/absence along 3 transect lines
3. Aerial surveys; a fixed wing aircraft flew 3 offshore georeferenced transect lines perpendicular to the coast, 5km east and 5 km west of Tibar Bay, turtle species were identified by the on-board observers.
4. A 4th method was trialled which utilised 4 team members scanning sections of the bay with powerful binoculars for presence of megafauna from an elevated observation point on the hill overlooking the project area. The surveys were conducted over 20mins on one day.

Secondary evidence of regional turtle presence was the discovery of turtle eggs for sale at a local market which had been dug up from the beach at Fahi Obuk.

The results of these surveys were used to carry out a Critical Habitat Assessment of the Tibar Bay region for marine turtles. The justification for the critical habitat assessment results are summarised below.

Tibar Bay is considered likely to be a Tier 2 critical habitat for Green turtles.

- Observations of green turtles nesting on the beaches of the Tibar bay region-Tasi Tolu to the east and Kaitehu to the west by fishermen (Charles Darwin University, 2014).
- Anecdotal evidence of Green turtles feeding on seagrass meadows in the bay (Charles Darwin University, 2014).
- The presence and abundance of seagrass beds

Tibar Bay is considered a Tier 2 critical habitat for Hawksbill turtles.

- One Hawksbill turtle was observed in Tibar Bay (Ecological 2014)
- The presence and abundance of crustaceans and molluscs

Tibar Bay is considered to be Tier 2 critical habitat for the Loggerhead turtle.

- The presence and abundance of crustaceans and molluscs
- It is likely that loggerhead turtles may be encountered in the Study area since they are observed elsewhere in Timor-Leste waters

Subsequent to the above surveys, five separate surveys were conducted over a 3 month period between September 2016 and January 2017. During these surveys qualified marine scientists visited Tibar Bay to deploy, maintain and retrieve instrumentation and to undertake marine habitat and megafauna data collection. The surveys and opportunistic observations included:

- September 2016 – Geotechnical and geophysics survey observation by qualified scientists from Advisian over 8 weeks. The tasks included using a motorised boat to traverse the bay visiting drilling sites and making boat based health, safety and environmental observations. No records of marine megafauna were recorded.
- October 2016 – Marine Habitat surveys over 10 days including boat based sampling and camera surveying and land-based sampling in the Mangrove habitat. No marine megafauna were recorded and no secondary signs identified from the fish markets or consultation with the local fishermen during the community survey.
- November 2016 – Metocean instrumentation maintenance visit by a qualified scientist. A boat was used to visit the site of the instruments and at least 4 hours spent on the vessel observing the local environment and undertaking instrument repairs. No marine megafauna were recorded.
- January 2017 – Site visit and Community EIA presentation visit by qualified environmental scientists included 2 days of survey time, including a visit to the mangrove habitat along the Tibar Bay to collect observational data and photographs of habitat types. No marine megafauna were observed.
- February 2017 - Metocean instrumentation recovery visit and dredge spoil ground sampling event by a qualified scientist. A boat was used to visit the site of the instruments and the dredge spoil ground and at least 8 hours spent on the vessel observing the local environment and retrieving instrumentation. No records of marine megafauna were collected.

Advisian did not duplicate the 2014 Marine Megafauna survey during the 2016 and 2017 field programs because;

- The very high probability of the area being a marine turtle foraging habitat was recognised from the 2014 surveys by Ecological and Charles Darwin University.
- The detailed habitat surveys failed to find any good quality nesting habitat within the bay, i.e. sand must be 50-100cm deep to lay their eggs and the nest cannot be regularly inundated by seawater. The sandy beach habitat on the margins of Tibar Bay is very limited and does not provide these conditions for successful turtle nesting.

The findings from the available literature, data collected during the 2014, 2016 and 2017 field surveys can be summarised as follows :

1. Interviews with local people confirmed green, hawksbill, loggerhead, olive ridley and leatherback turtles are found in the waters of Timor- Leste

2. The results from the field surveys and interviews with local people suggest year round nesting with no distinct seasonal peak. Given that a low but distinct peak has been recorded for rookeries elsewhere in Timor Sea region (e.g. Tiwi Islands, Sandy Island Scott Reef and Bare Sand Island) it is likely the collection of additional year round data will identify a peak (K Pendoley pers obs).
3. No turtles were observed to use Tibar Bay, apart from the single observation of a hawksbill in 2014 (Charles Darwin University);
4. A reasonable effort was expended on collecting evidence of marine turtle activity in the region, however it is recommended surveys be expanded into the mid year (February to October months to increase the opportunities for observing marine turtles nesting.
5. Tibar Bay contains abundant seagrass, coral and mangrove habitats, all of which are potential food sources and habitat for turtles including the Hawksbill, Olive ridley, Loggerhead and Green Turtles.
6. Tibar Bay is characterised by very limited sandy beach habitat which lacks a supratidal zone and together with the shallow sand depth, prevents marine turtles successfully constructing and incubating their nests;
7. The lack of supratidal zone on Tibar Bay sandy beaches together with the tidal water movements in the bay mean the entire beach is submerged for part of every day and therefore unsuitable nesting habitat for marine turtles;
8. There are good quality nesting beaches located to the west and east of Tibar Bay at Fahi Obuk and Dili rock west. The location, orientation, subtidal, intertidal and supratidal characteristics of these regional beaches suggest Fahi Obuk (the beach to the west) may support hawksbill and/or olive ridley nesting while Dili Rock west (the beach to the east) is more characteristic of a green and loggerhead nesting beach;
9. The only eggs found during the 2014 (Charles Darwin University) survey were from a nest dug up by pigs confirming that these predators are actively destroying turtle nests in the region;
10. Breeding turtles that have migrated from remote foraging grounds to nest in the Tibar Bay area will be found mating and internesting (the period between laying successive clutches of eggs) in the shallow waters off the nesting beaches and are also likely to use the sheltered waters inside Tibar Bay;
11. Nesting species are likely to include green, hawksbill, olive ridley and loggerhead turtles. The nesting season for these species is expected to be characteristic of other tropical zones with a year-round low level and spatially dispersed nesting effort and a 2 – 3 month midyear peak which will fall at different times through the “dry season” (nominally April to October), according to species; and
12. Resident foraging green, hawksbill, olive ridley and loggerhead are likely to use Tibar Bay.

Crocodiles

Although the IUCN Red List status for crocodiles is Least Concern, they are included as they are culturally significant in Timor-Leste.

Anecdotal evidence suggests that there are frequent crocodile sightings in the mangroves along the western edge of Tibar Bay, with the most recent event in November 2016 when a pig was taken from the waters’ edge nearest to SP02.

On this basis it is likely that crocodiles may be encountered in the Study Area.

6.17.2 Benthic habitat distribution

The side scan sonar and drop camera survey found that the surficial substrates in the bay consisted predominantly of sand-silt (41%).

Approximately 15% of benthic coverage consists of up to 20% live coral, occurring in the highest areas of raised reef, while up to 100% live coral covers a further 12.9% of the bay, distributed along the boundary of the raised reef. A small portion of the area (1.6%) across the mouth of the bay consists of sparse sponges-gorgonians.

Seagrass covers 7.2% or 17.3 ha of the bay, growing in sheltered silty-mud areas, with two distinct patches, one in the north-east corner of the bay and the other in the south-west.

Coastal mangroves are also present, with a long grove situated along the south-eastern shore of the bay 15.8 ha in size. A smaller stand also exists in the south-western corner of the bay (~2 ha).

Table 6-3: Area of benthic habitats within Tibar Bay

Benthic Habitat Type	Coverage (ha)	Percent cover (%)
Seagrass	17.3	7.2
Sand-Silt	99.0	41.0
Coral ≤100% Live	31.2	12.9
Sparse Sponges-Gorgonians	4.0	1.6
Mangroves	17.8	7.4
Silt-Mud	35.7	14.8
Coral <20% Live	36.7	15.2
TOTAL	**241.8**	**100.0**

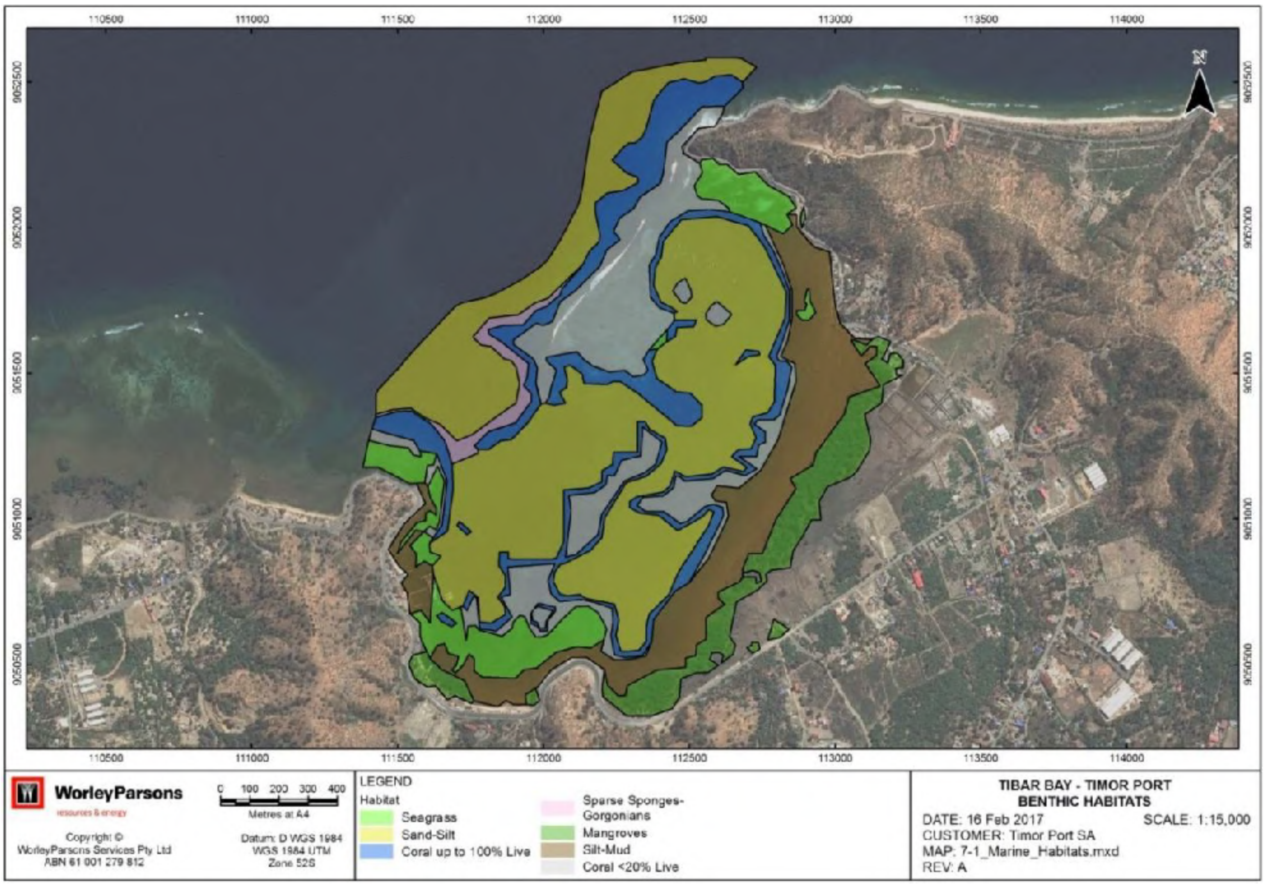


Figure 6-40 Benthic Habitat Map

6.17.3 Seagrass

Seagrass composition was determined along each transect with five seagrass species and four macroalgae species identified. These are:

Seagrasses:

- *Cymodocea rotundata*;
- *Enhalus acoroides*;
- *Halodule pinifolia*;
- *Halophila spp*.; and
- *Thalassodendron ciliatum*.

Macroalgae:

- *Padina spp*.;
- *Halimeda spp*.;
- *Green Macroalgae spp*.; and
- *Caulerpa spp*.

The percentage cover of each species and total percent cover of seagrass and macroalgae was estimated.

Water clarity at site SG3 was very poor due to resuspended sediment causing high levels of turbidity during the survey.

Figure 6-41: Seagrass bed in south-west corner of Tibar Bay

Seagrass is the predominant macrophyte at the four seagrass monitoring sites accounting for between 30% and 80% of the cover at SG1, SG2 and SG4 (Figure 6-42). Macroalgae makes up a much smaller percentage of cover at all sites, with around 5% to 15% at all transect locations. The percentage cover at SG3 is generally lower than at the other locations (even when accounting for the undetermined proportion).

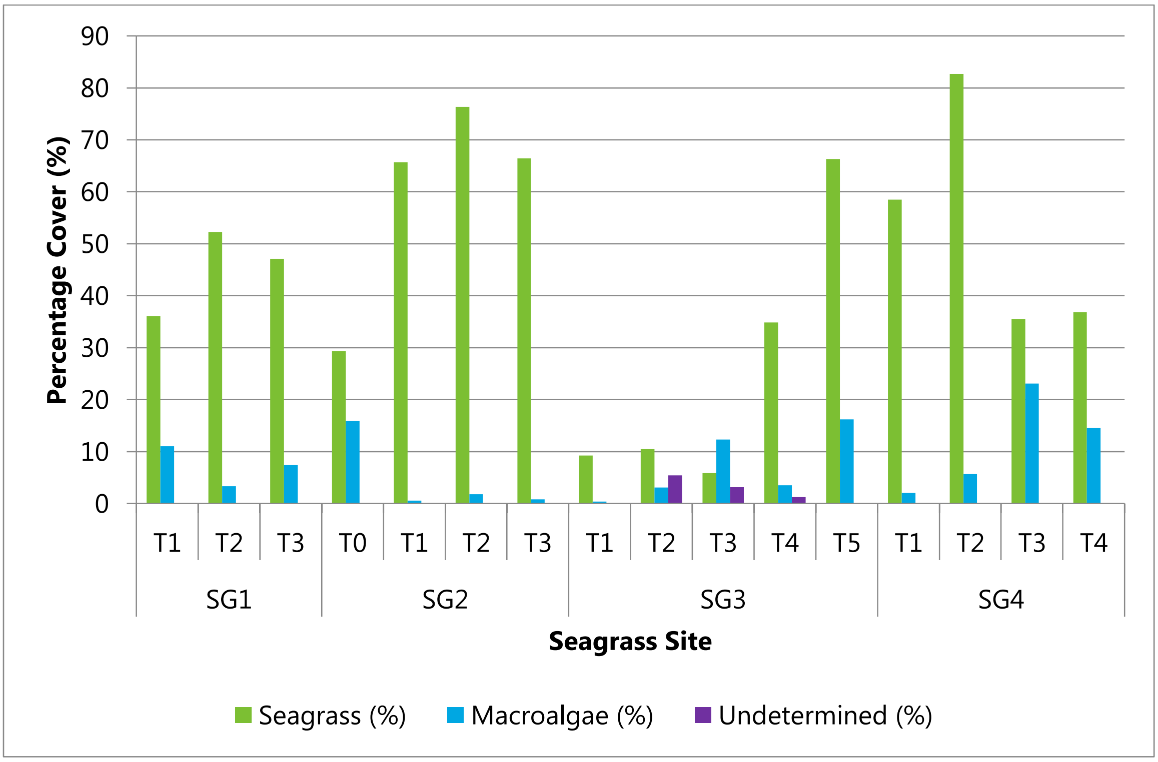


Figure 6-42: Percentage cover of seagrass and macroalgae

The majority of the seagrass consists of *Enhalus acoroide*. The other two species found at most sites, making up between 2% and 25% of the seagrass cover is *Cymodocea rotundata*, and *Halodule pinifolia*. Some *Halophila* sp. was also found as SG2 and SG3, while small percentages of *Thalassodendron ciliatum* was found at two transects, SG3 T4 and SG4 T4.

The predominant macroalgae species was Green Macroalgae sp1 which accounted for up to 15% cover at some sites.

The seagrass survey identified five seagrass types while the previous survey reported seven. The two not recorded during the 2016 survey were *Syringodium isoetifolium* and *Halophila minor* (Eisemberg, Costa & Edyvane 2014). This is likely due to the fact that the West Tibar site was previously surveyed, and was not resurveyed in 2016. This site was reported as the most diverse, with all seven seagrass species found. This site did present the lowest average total seagrass cover (18.3%).

Fahi Obut was resurveyed (SG3) with the previously reported 37.8% average total seagrass cover higher than that recorded three years later (25.3%). Also resurveyed was Port West (SG1) with a previous 28.4% of average total seagrass cover now consisting of 45% total seagrass cover. These changes reflect the ephemeral and natural variation often seen with seagrass monitoring.

The majority of the seagrass found across the sites during the survey consists of *Enhalus acoroide*. The other two species found at most sites, making up between 2% and 25% of the seagrass cover is *Cymodocea rotundata* and *Halodule pinifolia*. The results are in agreement with Eisemberg, Costa & Edyvane (2014), with the predominant species *E. acoroide* and *C. rotundata*. The percentage of seagrass cover was comparable to the previous report, with some sites finding up to 100% seagrass cover over some quadrats, which is slightly higher than the 90% reported previously.

6.17.4 Mangroves

Fourteen mangrove health belt transect sites were preselected prior to mobilising to the field. These sites were based on the proposed port design and existing mangrove locations surveyed from a previous survey undertaken by Eco-Strategic in 2013. Transects were 25 m wide and started from approximately the mean high water line and ended at the seaward most extent of the mangrove canopy. A GPS waypoint was taken at the beginning and end of each transect. Transect locations are shown in Appendix E, and are numbered transect MANG E1 to MANG E4 and MANG N1 to MANG N10.

Four transects are replicate mangrove sites recorded by EcoStrategic in 2013. The mangrove data collected was designed to replicate the data parameters collected during the previous survey undertaken in 2013. The purpose of this was to be able to validate the previous data collected for the mangroves located in the south-west bay as well as collect the same data with other local mangrove communities. The four sites that were replicated from the previous survey were used to compare data between the two surveys on a like for like basis and note any temporal changes that may have occurred in the three years since the survey.

The health of the mangrove trees at all sites was found to be good. The mangrove stands in Tibar Bay were older and well established while those outside of the bay to the west are generally younger and shorter. The mangroves in Tibar Bay are also under more pressure from use by the community than the mangroves outside the bay. The condition of the mangrove stand within the bay was more degraded than those sampled outside the bay. This was highlighted by the amount of rubbish found in the Tibar Bay mangroves, and almost no saplings being present. This is thought to be due to the close proximity to the town site and the prevalent use of the mangroves by the local community and their livestock for foraging.

Many domestic animals (goats, cows and pigs) were observed in the Tibar Bay mangroves foraging on the roots and saplings of the trees. This has resulted in very little under-storey being present, also due to the animals trampling through the area to forage. The mangroves within Tibar Bay were also observed as being frequented by people washing clothes in the three fresh water springs present in the north-west corner of the mangrove stand.

The mangroves within Tibar Bay in addition to the mangroves immediately west of the bay, (new sites MANG N5 – MANG N10), there is additional pressure from salt and fish farming, which back directly onto the mangroves.

Mangroves are also a source of firewood by the local communities, with the condition that only dead branches and trees are collected. This has resulted in mangroves being ringbarked in order for the trees to die and be harvested. This practise is now banned by law and interviews with locals revealed an overall acceptance and adherence with this practise had been adopted.

Two areas of revegetation were observed, with mangroves being replanted at two sites, one in each of the western bays (MANG N5 and MANG N1 (Figure 6-43). This indicated people want to improve the health of the stands. The replanted areas were all *R. stylosa* but interviews were unsuccessful in establishing the person or company behind the work, or when the replanting had occurred. It is estimated by the size of the saplings that furthest western site (MANG N1) was possibly a year old and MANG N5 was approximately three or four years old.

Figure 6-43: Evidence of replanting of mangroves at MANG N1

Within the mangrove stand within Tibar Bay, three large dead patches of mangroves were observed outside the surveyed transects (Appendix E). These were reported by locals to have only died in the previous two to three years. The patches were approximately 50 m by 100 m where the mortality rate was estimated to be approximately 70% (Figure 6-44). No new land uses during that time were reported when interviews occurred.


Figure 6-44: Left: Mangrove mortality seen at MANG D1. Right: Mortality seen at MANG D2

Insect damage

Observed insect damage was very similar between sites, with overall spatial differences of 20 – 50% recorded at MANG E2 and MANG E3 (Appendix E). In general terms, all sites were healthy and had minimal impact from leaf insect damage. What little damage that was present was more prevalent at the existing sites compared to the new sites.

Leaf health

Qualitative leaf health was very high across all sites surveyed. Yellowing of leaves based on the Duke classification system did not detect any spatial differences between sites, with all being deemed healthy (< 20% yellow leaves).

No dust covered leaves were evident at any sites.

Species composition

S. alba was the most abundant species at both existing and new sites, representing 62.2% of species density across all surveyed sites and being present at all sites except MANG N7. *R. stylosa* was the next most abundant species with 37.6% species density and being present at all sites bar three (MANG N2, MANG N3 and MANG N10). A. marina was the least abundant species (0.2%), recording only a single tree at MANG E4.

A total of 342 *S. alba* trees were measured, while 207 trees were *R. stylosa*.

Recruitment

Mangrove saplings were found in very low numbers, or were absent at most sites. MANG N7 was the only site to record large numbers of naturally occurring saplings with > 100 saplings counted. MANG N1 also had large number of saplings present but the large majority were found inside an established mangrove rehabilitation area that was not subject to the local environmental pressures. All other sites had less than seven saplings counted. Saplings all belonged to *R. stylosa* species of mangrove.

Figure 6-45: *R. stylosa* saplings at MANG E3 (left) and MANG N2 (right)

Mangrove health

S. alba had the largest DBH of the three species, with an average DBH of 0.43 m, while *R. stylosa* had an average of 0.12 m (Appendix E). The largest DBHs were *S. alba* recorded at sites MANG N9 and MANG N10, with 2.09 m and 2.27 m diameters respectively. The largest *R. stylosa* was recorded at MANG N5, with a DBH of 0.69 m. The single *A. marina* recorded had a DBH of 0.52 m at MANG E4.

The importance value of each species was calculated, which showed that predominant species of importance is the *S. alba* (), with 67.5% relative importance attributed to this species. This is followed by 32.3% of the relative importance of *R. stylosa*. Importance value is the sum of the relative frequency, the relative dominance and the relative density of a species.

The highest importance value was *S. alba* recorded at three sites, MANG N2, MANG N3 and MANG N10 with a value of 252. The highest *R. stylosa* importance value was 244 recorded at MANG N7. The lowest importance value was *A. marina* with 8.25, recorded at MANG E4. The lowest *R. stylosa* importance value was recorded at MANG E1 at 46.08, while the lowest importance value for *S. alba* was 56.9 recorded at MANG N5. *S. alba* had the greatest importance value of the three species at all transects except MANG N5, MANG N7 and MANG N8. This is likely due to the relatively larger size of *S. alba* and subsequent the higher DBH and densities observed.

6.17.5 Coral

Benthic cover at sites included hard and soft corals, algae, macroalgae, and sponges. Percentage benthic cover found during the baseline survey is presented in Appendix E.

Being part of the Indo-Pacific 'coral triangle' Timor-Leste's marine resources are characterised by the high biodiversity associated with coral reefs. Fringing reefs form an almost continuous strip along the coast of East Timor, with the topography along the north coast ranging from gentle slopes to sheer walls (FAO 2015).

Timor-Leste hosts a diverse reef coral fauna, with a confirmed total of 367 reef-building (hermatypic) coral species. An additional 27 species were unconfirmed, requiring further taxonomic study. Three species (*Echinophyllia*, *Goniopora* and *Montipora* spp.) show significant morphological differences from their closest congeners, and are likely new to science, though requiring additional taxonomic study . In total, there are likely to be approximately 400 hermatypic *Scleractinia* present in Timor-Leste waters (Erdmann *et al.* 2013).

Boggs *et al*. (2009) estimated nearshore coral reef habitat in Timor-Leste was limited (~2,000 ha), with little lagoonal reef flat development (~458 ha).

6.17.6 Coral Condition

During the survey of the coral inspection at Tibar Bay, the condition of the coral was observed. More than 54% of the coral found within Tibar Bay is found in a bad condition.

Table 6-3-1: Area of benthic habitats within Tibar Bay

Benthic Habitat Type	Coverage (ha)	Percent cover (%)
Coral ≤100% Live	31.2	45.9
Coral <20% Live	36.7	54.1
TOTAL	**241.8**	**100.0**

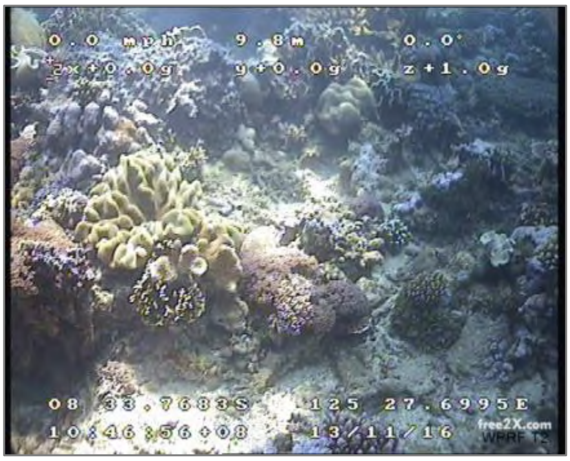
Benthonic assemblage with dominant tabular formation

Acropora cervicornis

Benthonic assemblage in pinnacle formation

Acropora prolifera

?Agaricia tenuifolia



Benthonic assemblage on seabed

Figure 6-46: Example of coral species recorded at Tibar Bay

Coral biodiversity

Hard coral was identified to be the dominant community at all sites and species distribution was calculated to family level. Acroporidae, Agaraciidae and Poritidae were the families with the highest abundance at all sites.

The remaining classes were grouped into four types as follow: soft coral, sponges, hydroids and algae.

Values for the Shannon-Weiner Diversity Index are shown in Table 6-4: Mean percentage cover per classes present

Site	ACRO	AGAR	DEND	FAV	FUNG	MERUL	MILLEP	MUSS	OCULIN	PECTIN	POCILLO	PORIT	Soft Coral	SPONG	HYDR	ALGAE	Other Live
Site 01	23	5.3	0	2	0	0.2	1.5	0.1	1.2	0.6	5	9	11.4	0	0	2.5	1.02
Site 02	10	0.4	0.2	2.3	0.2	0	0.3	0	0.1	0.7	3.35	7.76	35.7	0.6	0	2.3	7.7
Site 03	12.66	0	0.18	3.12	0.18	0	1.47	0.28	0	0.18	1.28	8.26	12.75	1.01	0.18	0.37	1.74

LEGEND

ACRO	Acroporidae	MUSS	Mussidae
ACAR	Agaracidae	MERUL	Merulinidae
DEND	Dendrophyllidae	MILLEP	Milleporidae
FAV	Favidae	OCULIN	Oculinidae
FUNG	Fungidae	PECTIN	Pectinidae
POCILLO	Pocilloporidae	PORIT	Poritidae
Other Live	Unclassified Coral	SPONG	Sponges
HYDR	Hydroids	ALGAE	Algae

Table 6-5. These results show the diversity index f and the Equitability Index or the benthic communities present at each site. Site 02 had the highest biodiversity with an index of H 1.68.

Table 6-4: Mean percentage cover per classes present

Site	ACRO	AGAR	DEND	FAV	FUNG	MERUL	MILLEP	MUSS	OCULIN	PECTIN	POCILLO	PORIT	Soft Coral	SPONG	HYDR	ALGAE	Other Live
Site 01	23	5.3	0	2	0	0.2	1.5	0.1	1.2	0.6	5	9	11.4	0	0	2.5	1.02
Site 02	10	0.4	0.2	2.3	0.2	0	0.3	0	0.1	0.7	3.35	7.76	35.7	0.6	0	2.3	7.7
Site 03	12.66	0	0.18	3.12	0.18	0	1.47	0.28	0	0.18	1.28	8.26	12.75	1.01	0.18	0.37	1.74

LEGEND

ACRO	Acroporidae	MUSS	Mussidae
ACAR	Agaracidae	MERUL	Merulinidae
DEND	Dendrophyllidae	MILLEP	Milleporidae
FAV	Favidae	OCULIN	Oculinidae
FUNG	Fungidae	PECTIN	Pectinidae
POCILLO	Pocilloporidae	PORIT	Poritidae
Other Live	Unclassified Coral	SPONG	Sponges
HYDR	Hydroids	ALGAE	Algae

Table 6-5: Diversity Index for each monitored site

Site	Shannon-Weiner Diversity Index	Equitability Index (E_H)
Site 01	1.48	0.21
Site 02	1.68	0.21
Site 03	1.59	0.2

Following analysis, it was evident that high coral biodiversity is present at all sites with *Acroporidae*, *Agaraciidae* and *Poritidae* having the highest distribution among the twelve (12) families identified.

Acroporidae was the family with the highest distribution at Site 01 and Site 03 with 23% and 12.7% of coral cover, with soft corals also important (11.4% and 12.74% of cover). Site 02 was mainly dominated by soft corals and *Agroporidae* with 35.7% and 10% of coral cover respectively. *Poritidae* was however largely present at all sites, accounting for over 25% of the total hard coral cover across all sites.

Other encrusting invertebrate groups were uncommon, with hydroids and sponges abundant at only 0.18% and 1.7% cover of the substratum respectively.

6.18 Fisheries

Previously, a number of extensive fish surveys have been undertaken in Timor-Leste creating a good baseline for species present in the area. The methodology for this survey was designed to indentify gaps in the data, mainly, what species the local fisherman were targeting and catching on a regular basis in and around Tibar Bay.

A Rapid Fisheries Assessment by Market Survey (RFAMS) method was implemented for assessing catch composition at fish landing sites and local markets. The RFAMS data was also integrated with opportunistic visual analysis undertaken on video and images collect for a benthic habitat mapping of the area where fish could be identified. A description of species habitat (including all stages of their life cycle), and species distribution was collected.

Four fish landing sites in proximity of Tibar Bay and at fish markets east of Tibar Bay and along the main road connecting Tibar Bay to Dili where used for this assessment. This methodology provides a rapid assessment of the abundance and diversity in the wild catch over a wide variety of taxonomic groups. The approach has wider application for species-rich fisheries in developing countries where there is limited literature available and there is urgent need for better data collection protocols, monitoring future changes in market demographics, and evaluating health of fisheries (White WT, et al.2014)

The flowing information has been collected:

- Locations of commercial fishing activities;
- Confirm presence and locations of rumpons;
- Fishing device identified;
- Main seasons of local fishing activities; and
- Average annual income per fishing boat.

Using a local translator, the fishermen were also asked were they usually fished and what method of fishing they used. All information was recorded in field notes which were later transcribed.

Photos were also taken of fisherman setting their net in the west corner of Tibar Bay on the 19 November 2016 and the 20-22 April 2017. A detailed field report is contained in Appendix L.

Results

The approximate locations of fishing activities and fishing devices identified during April 17 survey are depicted in Figure 6-47

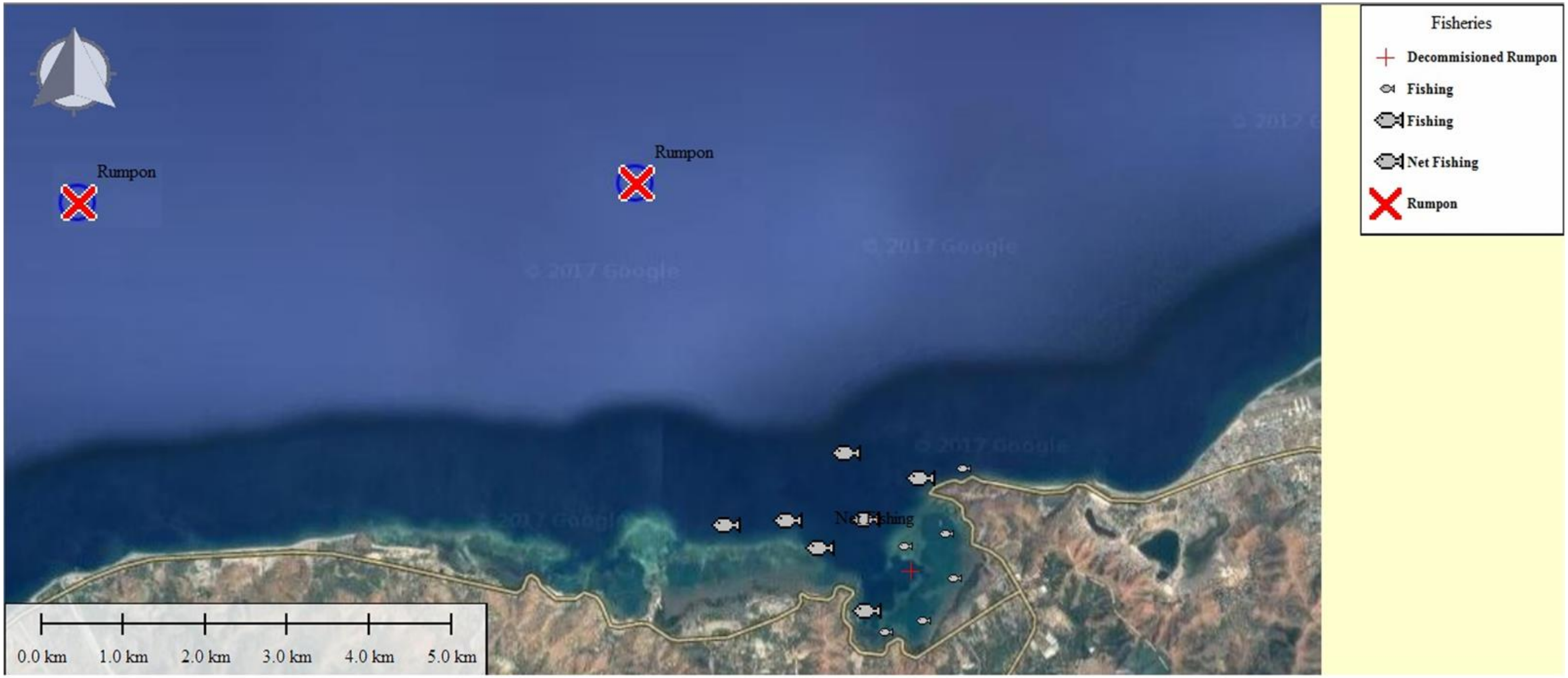


Figure 6-47: Approximate location of fishing activities and fishing devices.

Over the course of the survey 26 different genuses and at least 29 separate species were identified (Table 6-6). Scad (*Decapterus sp.*) was the most frequently caught catch with 140 specimens recorded. Squirellfish (*Holocentrus sp.)* and various species of snapper (*Lutjanus sp.)* were next most common with 50 and 35 respectively. Jewfish (*Johnius sp.)* and hairtail (*Trichiurus lepturus*) were the only other two species to record more than ten individuals. A sample of some of the fish photographs is contained in Table 6-7.

Fisheries Data analysis results:

Genus	Species	Family	Suborder	Comman Name	Number Caught	Ave. Size (cm)
Trichiurus	*lepturus*		-	Hairtail	10	70
Lutjanus	-		-	Snapper sp.	35	18
Lutjanus	*argentimaculatus*		-	Mangrove Jack	2	62
Epinephelus	*hexagonatus*			Hexagon Rockcod	1	40
Heniochus	*acuminatus*			Pennant coralfish	1	14
Plectropomus	-		-	Coral Trout/Coral Grouper	2	42
Kyphosus	-		-	Sea Chubs sp.	1	18
Scolopsis	-		-	Threadfin bream sp.	3	15
Johnius	-		-	Jewfish sp.	13	18
Plectorhinchus	-		-	Grunts/Sweetlip sp.	2	17
Acanthistius	-		-	Perch/Sea bass/Wirrah sp.	6	18
Cephalopholis	*urodeta*		-	Flagtail Rockcod	1	23
Decapterus	-		-	Scad sp.	140	20
Tylosurus	-		-	Needle Fish/Garfish sp.	3	76
Caranx	-		-	Trevally sp.	5	31
Caranx	*melampygus*			Bluefin Trevally	1	58
Scomber	-			Mackerel sp.	1	50
Holocentrus	-		-	Squirrelfish sp.	50	13
Lethrinus	*olivaceus*		-	Longface/Longnose Emperor	1	53
Lethrinus	-		-	Emperor sp.	4	30
Abudefduf	-		-	Sergeant-majors sp.	1	18
Scarus	-		-	Parrot Fish sp.	4	44
Acanthurus	-		-	Surgeonfish sp.	2	17
Centroberyx	-		-	Nannygai sp.	1	20
Aprion	*virescens*		-	Green Jobfish	1	62
Thunnus	-		-	Tuna sp.	1	121
-	-	Balistidae		Triggerfish sp.	5	34
Panulirus	*versicolor*		-	Painted Rock Lobster	1	Unknown
-	-		Myliobatoidei	Stingray sp.	Unknown	Unknown

Table 6-6: Fish species identification

Table 6-7: Fisheries assessment – daily catch photography and consultation

	**Hairtail** ***Trichiurus lepturus***
	***Lutjanus sp***
	***Kyphosus sp.***

Scolopsis sp.

Plectorhinchus sp.

Day's catch – Tibar Bay 5 November 2016

Overall there was a large range of species caught during the four days the fish markets were surveyed. It is evident that both nearshore, demersal and pelagic fish are all caught by local fisherman, which would suggest that no one fish species is under more targeted pressure than another.

The multitude of fishing methods employed also means a wide variety of fish are regularly caught. Through verbal communications with the local fisherman we ascertained fishing methods range from set line fishing, hand line fishing, gill netting (drag, set and throw) and spear fishing. There is a permanent set gill net that is checked twice daily in the south western corner of Tibar Bay (Figure 6-50). This area is set to be reclaimed during the dredge and construction phase of the project.

Through liaising with the local fisherman, it was determined that while the majority of fisherman who live in the Tibar Bay locality do fish the inner bay and reef areas, a lot of their catch come from areas further offshore (3+ nm). These areas often have rompongs (a fish attraction device) present to help draw and concentrate fish from nearby reefs onto the sunken structure. Fishing in these areas would have minimal direct impact from the proposed Tibar Port project.

Rompong Assessment

Three rompongs were identified during the survey in October and April 2017. One rompong was identified inside Tibar Bay in close proximity of the internal reefs. This rompong is located near the mouth of Tibar Bay at the co-ordinates -8 34.0183 S; 125 28.7271 E. However the condition of this device, the information gathered from local resident and its location suggests that this unit is not in use for fishing purposes. Refer to Figure 6-48

This assumption has been made on the following information:

1. During the two fisheries survey (Nov 16 and Apr 17) and during the additional 4 site visits undertaken by Advisian marine team for the installation and maintenance of metocean instrumentation (Sep 16, Dec 16, Jan16 and Feb16) no fish activities were seeing or reported by our local personnel and subcontractor on site at this rompong
2. A rompong is an fish attractive device (FAD) and is usually deployed in open water to create an artificial substrate that attract fish that usually feed on algae , gasteropodos and other marine life that grows on the mooring and around the structure of the rompong. It is largely demonstrated that when those device are deployed in close proximity of reef they are not effective in attracting fish.
3. The bad maintenance condition of the device suggested that the unit is not in use

Figure 6-48 Rompong identified during the field survey, October 2016

Figure 6-49: Active Rompong

Figure 6-50: Fishing net being set in Tibar Bay (top). Fishing net on low tide in Tibar Bay (bottom).

Discussion

The majority of fish that hold commercial value outside of Timor-Leste (Snapper, Cod, Trout, Mackerel, Trevally, Emperor, Tuna etc.) were all approximately around legal size (using a variety of Australian state standards) or classes as mature fish. This is a positive sign that indicates that fishing pressure isn't reducing fish stocks to dangerous levels for those species. However, some of the smaller reef fish which are not usually targeted for human consumption in western countries are being caught and taken while still in their juvenile life cycle.

Out of the 26 genus' of fish caught, three have species within their genus that are listed as something other than Least Concern (LC). The *Plectropomus* genus (coral trout/coral grouper) includes seven species of which two a listed as vulnerable (V), 3 Near Threatened (NT), one data deficient (DD) and one LC. The parrot fish (*Scarus*) genus has one species that is found within the water of Timor-Leste that is listed as NT, while all other species are classified as LC. Tuna (*Thunnus*) are the most at risk species that was identified during the survey to have been caught in the area. There are eight species of tuna, one LC, one DD, two NT, two V, one endangered (E), and one critically endangered (CE). Tuna are an infrequent prize catch for the local Timorese fisherman as they either provide a large amount of food or hold high commercial value.

The team consulted with the local community fishermen and the people walking in the mudflats at low tide and confirmed they are fishing for small fish in traps and with spears. During the survey in 2016, there was no evidence that molluscs are collected by local people in the mudflats of Tibar.

6.19 Economic component

6.19.1 Employment sectors

A Labour Force Survey (LFS) was conducted in 2013 in Timor-Leste incorporating the new international standards concerning measurement of employment and labour underutilization. It was estimated that for Liquiça, about 45.2% of population 15 years old or over are in labour force meaning that they are working for pay or profit[2]. Of the working age population in the labour force, most are employed (44.7%) and only 0.5% have been found to be unemployed at the time of survey. This employment profile has put Liquiça in much better status than the national average where it was found that 11% of the working age population are unemployed. It should be noted that the employment profile does not take into account those working exclusively to produce subsistence foodstuff, which has been estimated to absorb about 29% of working age population nationally (Figure 6-51).

The main source of employment for people residing in Liquiça is "Agriculture, Forestry and Fishery" sector while the next largest employment generation sectors have been found to be "Elementary Occupation[3]" and "Craft and Related Trade.[4]" These three largest employment sectors are

[2] *For the LFS 2013 study, working age population (those 15 years old or over) has been categorized into – (i) those in labor force or economically active; (ii) those producing foodstuff for subsistence purpose and (iii) those outside of labor force. The first group is further divided into employed and unemployed groups. This distinction is in line with the new international standards concerning the statistics of work, employment and labour underutilization adopted by the 19th International Conference of Labour Statisticians (Geneva, October 2013).*

[3] *Defined in the ILO International Standard Classification of Occupation (2012) to involve the performance of simple and routine tasks which may require the use of handheld tools and considerable physical efforts.*

[4] *25 LFS Study 2013, excluding subsistence foodstuff producers*

absorbing about 90% of the employed population suggesting an overall lack of skills or employment opportunity in sectors that require higher educational attainment and skill level.

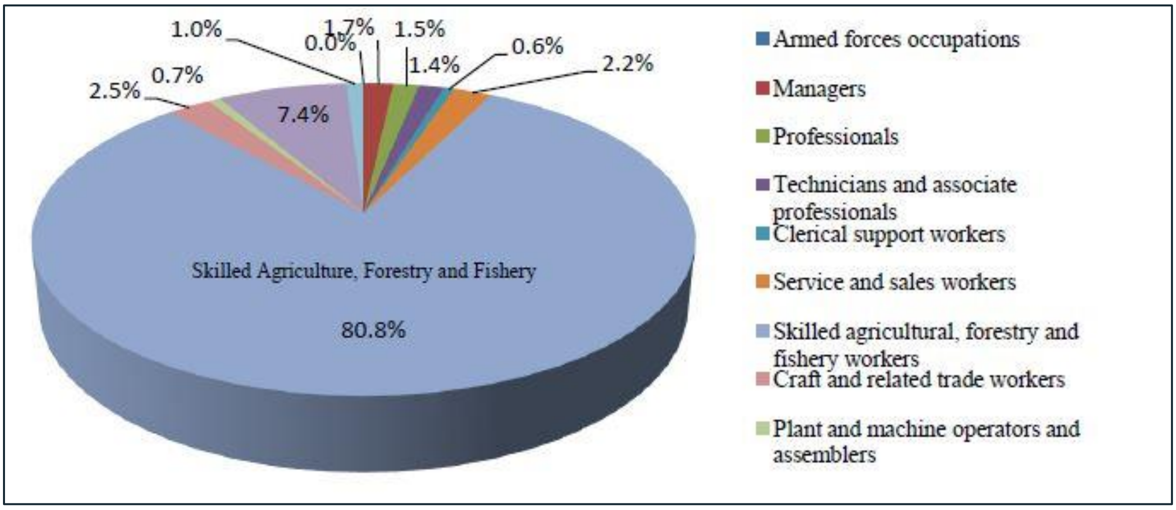


Figure 6-51: Source of employment for population of Liquiça (Labour force Survey, 2013)

Most households (HHs) in Liquiça grow maize, cassava and coconut (Census 2010). More expensive cash crops such as fruit and coffee area also produced from the area. Large livestock includes cattle, buffalo, ponies, pigs, goats and sheep.

Despite its long coastline, fishery is deemed an underdeveloped sector in Timor-Leste. Currently, there are only a few large-scale commercial activities, however, smaller scale fishing communities are robust especially along the northern coast of the country. The Ministry of Agriculture, Fishery and Forestry identifies more than 10 boat launching sites along the northern coast of Liquiça.

6.19.2 Infrastructure

The Tibar area has a local authority representation and Maritime police. The non-governmental organisation (NGO) called Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance (ADCI/VOCA) is implementing an economic development program through mud crab and fish pond establishment. Two ponds were established on the middle forershore of the Bay (west of salt pond). Additionally, the ACDI/VOCA program also includes a mangrove rehabilitation program.

Tibar Suco has several schools, a technical training centre, a health clinic and police post. Timorcorp has a coffee processing plant in Tibar and an abattoir has been built but is yet to commence operation. One chapel is located near the indirectly impacted area along the straight road to the south of the Bay. Please refer to Figure 6-52, Figure 6-52 and Figure 6-54

Figure 6-52: Tibar Centro Nacional Emprego e Formacao Profissional (CNEFP) Training Centre

Figure 6-53: Tibar Primary school

Figure 6-54: Tibar Clinic

6.19.3 Land use

Coastal lands in direct and indirectly impacted areas are extensively utilized for fishery use. Temporary structures have been enacted by fishermen serving either as temporary or permanent shelter. Fish farming and salt making activities can be found in the south-eastern corner as well as mid area of the coastal land while natural uses including mangrove and mesquite communities. A small port is located in the western side of the bay mainly serve as the disembarkation point for fuel import into the country. Refer to Figure 6-55.

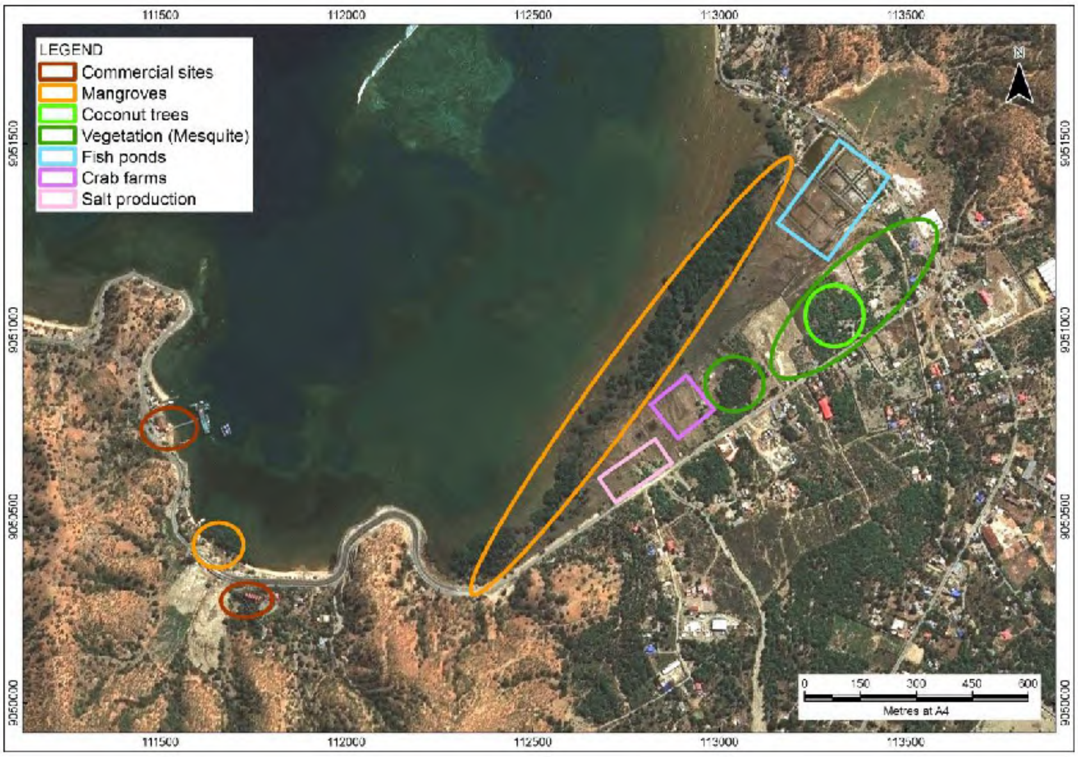


Figure 6-55: Land Use in the Tibar area (DNTPSC)

All lands to be utilized for the development belong to the government confirmed through a cadastral survey conducted by the Direcção Nacional de Terras, Propriedade e Serviços Cadastrais or National Directorate of Land, Property and Cadastral Services (DNTPSC). Communities using the area, therefore, will be compensated for structures that they own and the impact on their livelihoods.

6.19.4 Traffic and transportation

A number of national road sections converge at the Project Area. National Road A03-01 (7.2 km) runs from Dili, along the eastern side of the Bay and stopped at the intersection on the south-eastern side of the Bay. From the intersection, National Road A03-02 runs on the straight road along the south-eastern part of the way heading to Liquiça for 21.4 km. Additionally, the National Road A04-01 branches off the intersection toward Gleno, Emera. The Road A04-01 runs for 31.9 km.

Figure 6-56: Typical road users at Tibar Bay

6.19.5 Use of forests and other natural resources

Communities in direct and indirect area of influence of the Project are heavily reliant on the marine resources of the bay either for their own consumption or for trade[5]. Fishermen crab and clam gatherers, fish culturist in man-made ponds and salt makers can be found within the area.

The bay also provides an ideal anchorage area for vessels in close proximity to highly valued deep water fishing ground, while providing deep water access via a natural channel through the reef. The conditions allow for round the clock access to the wider shore despite changes in tide level. Therefore, the coastal area, as well as the bay area is extensively used areas for boat parking and launching.

6.19.6 Agriculture

Agriculture is the main activity in Timor-Leste, providing subsistence to an estimated 80% of the population (MAFF, 2004). It also generates an average of 90% of the exports, mainly due to coffee. Most farmers practice subsistence farming, planting and harvesting what they need for a simple life-style, collecting wild foods and traditional medicines, and the animals are very much left free to grow and reproduce. There are almost no large scale farms except for missions (MAFF, 2004).

In 2010, is was reported that about 85% of the population of Timor-Leste is related to cultivated land or the cultivation of land (Valdivieso, 2001) with poverty levels higher among the rural

[5] *Based on EIA scoping report conducted by ECOSTRATEGY, 2014*

population than urban populations (Grantham *et al*,. 2010). Approximately 50% of the population lives in rural areas and most of these practise subsistence agriculture.

Communities in direct and indirect area of influence of the Project are heavily reliant on the marine resources. Therefore predominantly aquaculture including fishermen crab and clam gatherers, fish culturist in man-made ponds and salt makers can be found within the area. Refer to Figure 6-57.

Figure 6-57: Local fishermen's afternoon catch

6.19.7 Tourism

There are very few tourism areas and/or activities found near or adjacent to the Project site. One notable exception is the The Tibar Bay Retreat, which is boutique hotel offering 8 exclusive individual bungalows and a unique restaurant. It is located on a hilltop amongst the coastal mountains of Tibar, it offers views out to Atauro Island and is the nearest sensitive receptor to the project site.

Figure 6-58: Tibar Bay Retreat Bungalows

Figure 6-59: View of Tibar Bay from Tibar Beach Retreat

6.19.8 Other industries

Timorcorp has a coffee processing plant in Tibar and an abattoir has been built but is yet to commence operation. There is also construction company that's head office is based in Dilli however it has an equipment storage premises on the main road into Tibar.

Figure 6-60: Timor Corp Coffee logo seen on truck in Tibar

Figure 6-61: Timor Corp truck in Tibar Bay

6.20 Social component

A SIA was prepared in the framework of the planned Tibar Port development located within the sucos or villages of Tibar and Ulmera in the District of Liquiça, Timor-Leste.

The findings of this data collection will be outlined in the social sections below.

6.20.1 Population and communities

According to Census 2010, the suco of Tibar has a total of 3,096 population, while Ulmera has 2,916 population. There are typically more men than women in both sucos.

Table 6-8: Population for Tibar & Ulmera

Suco	Total	Number	Percentage	Number	Percentage
		Male		Female	
Tibar	3096	1580	51%	1516	49%
Ulmera	2916	1521	52%	1395	48%

Both *sucos* have young population structure and more than 50% of population within the age bracket of 15 years old and above. As shown in Figure 6-62 and

Figure 6-63.

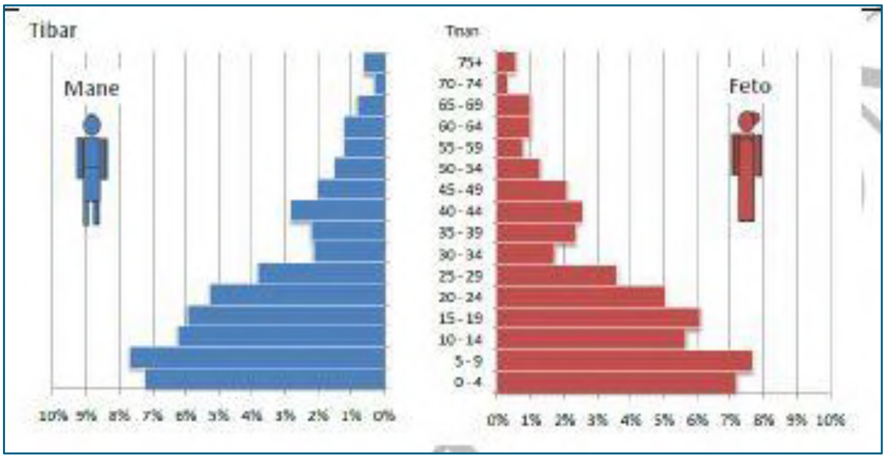


Figure 6-62: Population pyramid of Suco Tibar (Census Fo Fila, 2013)

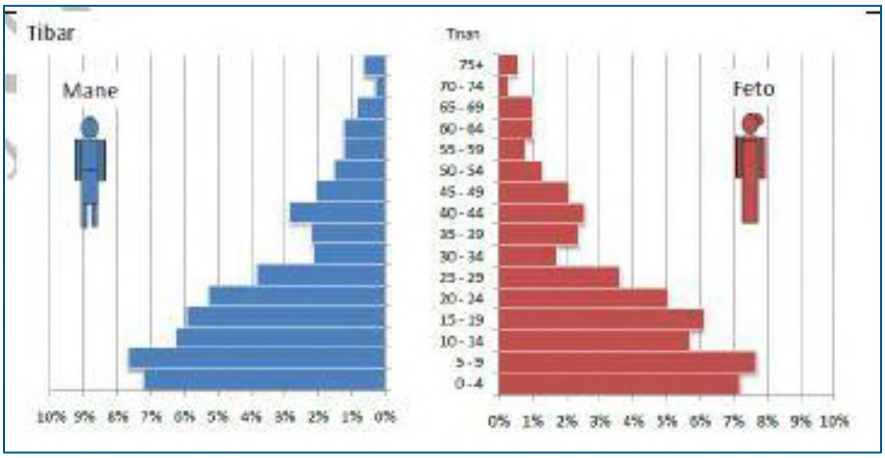


Figure 6-63: Population pyramid of Suco Ulmera (Census Fo Fila, 2013)

Languages

In addition to the national language, Tetum (Prasa), population in Tibar and Ulmera speaks mainly Mambae or Tokodede to a lesser degree, a composition that is also reflected in the portion of population speaking the languages in the sub-district of Bazartete and in the nearby Ermera district. (Census Atlas 2010 and Census Fo Fila Fali 2010). As shown in Table 6-9.

Table 6-9: Percentage of Mambae and Tokodede speaking population in Tibar and Ulmera

Administrative area	% of Mambaoe speaking population	% of Tokodede speaking population
Tibar Suco	27%	1%
Ulmera Suco	35%	15%
Bazartete Suco	39%	35%
Liquiça Suco	16%	63%
Ermera District	36.8%	0.24%

Religion

The population of Timor-Leste is overwhelmingly Catholic with Census 2004 reported that 96.5% percent of the population to be affiliated to the Catholic church. Other religious groups include the Protestant Church (2.24%), Islam (0.33%), and Buddhist (0.07%). No updates have been produced during Census 2010 for religious affiliation of the population.

Gender

In Timor-Leste, gender role of women focus more on domestic affairs, trade and businesses, and social affairs. Women are not well represented in more formal sectors of the economy and women reproductive health issue remains an important concern due to persistent high maternal mortality rates (557 per 100,000 live births) coupled with high fertility (5.7 per woman) (Demographic and Health Survey,2009).

It is thought that the country has made progress towards gender equality and women's empowerment, especially through improvement in several indicators including increases in female school enrolment, women's participation in national politics and the passage of law on domestic violence. Women in rural areas, however, remain highly vulnerable due to a combination of poor infrastructure, socio-economic and cultural factors including persistent tradition of patriarchal family system leading to the primary roles of women continue to be defined by their family and household responsibilities (GoTL SIA, 2016).

Poverty

Poverty in Timor-Leste is disproportionally rural with local studies found that about three quarters of the poor live in rural areas while the rest live in urban areas (Poverty in Young Nation, 2007). Poverty incidence in Liquiça is 44.9%, which is the 5th lowest poverty rate in Timor-Leste (the lowest being Lautem District at 21.3%). The depth of poverty, i.e. how far below the poverty line the poor fall is 11.9% for Liquiça. More recent analysis of Timor-Leste poverty by the ADB utilizing both the 2007 poverty study and the 2009 Living Standards Assessment concluded that along with the expansion of the economy, incidence of poverty has decreased, however, living standards improvement and inclusive growth should continue to be pursued through increase in access to basic infrastructure and improvement in education and health care systems.

A survey conducted by PPP-LU on affected households highlighted the following characteristics of employment for community located within and surrounding project site:

No	PAHs	Main Livelihood	Additional Livelihood	Fishing Equipment
1	A1	Fishing	Subsistent farming[1]	Fishing utilizing traditional non-motorized boat
2	A2	Fishing	None	Fishing utilizing motorized boat
3	A3	Fishing	None	N/A
4	A4	Business Owner	None	N/A
5	A5	Employee at Atauro Express	A variety of odd jobs needed at the existing jetty	N/A
6	A6	Daily Labor	Seaweed farming in Atauro, trainer for seaweed farming	N/A
7	A7	Daily Labor	None	N/A
8	A8	Fishing	Subsistent farming[1]	Fishing utilizing traditional non-motorized boat
9	A9	Fishing	None	
10	A10	Fishing	Subsistent farming[1]	
11	A11	Fishing	Fish/crab culturist, salt making[1]	
12	A12	Fishing	None	
13	A13	Fishing	Selling firewood	
14	B1	Fishing	Subsistent farming[1]	
15	B2	Fishing	Fish culturist	Fishing utilizing motorized boat
16	B3	Fishing	None	Fishing utilizing traditional non-motorized boat
17	B4	Fishing	None	Fishing utilizing motorized boat
18	B5	Police Officer	Fishing business (rompong[1]) owner	Fishing utilizing motorized boat
19	B6	Fishing	None	Fishing utilizing traditional non-motorized boat
20	B7	Fishing	None	
21	B8	Fishing	None	
22	B9	Fishing business (rompong[1]) owner	None	Fishing utilizing motorized boat
23	B10	Fishing	Daily labor at construction projects	
24	B11	Fishing	None	
25	B12	Fishing	None	
26	B13	Fishing	None	
27	B14	Fishing	None	
28	B15	Businessman	Fishing business (rompong[1]) owner	
29	B16	Fishing	None	
30	B17	Fishing business (rompong1) owner	None	
31	B18	Fishing	Making ice for fish preservation	
32	B19	Fishing	Fish vendor	
33	B20	Fishing	Kiosk owner	
Fish Culturist				
34	B21	Kiosk owner	Fish culturist	N/A
35	B22	Fish culturist	Fish vendor	N/A
36	B23	Security guard	Fish culturist	N/A
37	B24	Selling fuel	Fish culturist	N/A
38	B25	Transportation business owner	Fish culturist	N/A
Gatherer				
39	B26	Clam gatherers	Gather used cans for sale	N/A
Fish Vendors				
40	B27	Kiosk owner	Fish vendor	N/A

41	B28	Fish vendor	Daily worker at local restaurant	N/A
42	B29	Fish vendor	Carpenter	N/A

Education and literacy

Literacy is a major problem for Timor-Leste where close to fifty percent of population 15 years old or over cannot read or write in any of the official or working languages in the country. Illiteracy is also affecting more women than men, consistent with the generally lower educational attainment of women in the country.

For population in the age bracket of 15 to 24 years old, literacy is generally higher in Tibar and Ulmera Suco compared to the national average. (Census Fo Fila Fali, 2010) This is most likely due to the close location of the two sucos to urban Dili, making education more accessible for the residents.

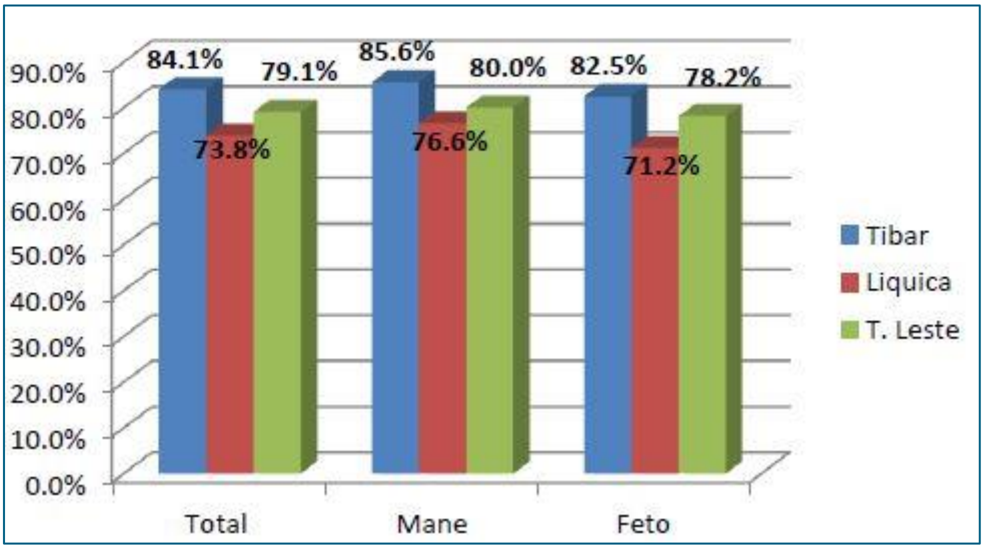


Figure 6-64: Literacy rates in Suco Tibar and Ulmera, District of Liquiça and Timor-Leste

6.20.2 Health profiles

The National Directorate of Statistics, under the Ministry of Finance conducted a Demographic and Health Survey (DHS) in 2003 and 2009. Data from Tibar Health Centre confirmed national statistics are applicable surrounding the Project.

Infant and child mortality

There has been a substantial improvement in Timor-Leste's child survival rate. The decline in the neonatal, post neonatal, infant, child and under-5 mortality rates as reported in DHS 2009 indicated clearly that Timor-Leste is on track to reach the target for Millennium Development Goal (MDG) 4, which is to reduce under- 5 mortality by two thirds by 2015.

Maternal mortality

As documented by DHS 2009, Maternal Mortality Rate (MMR) in Timor-Leste remains one of the highest in the world.

Child health

Combined with data on child mortality, information on child health depicts children as a vulnerable sub-group in the community. Children's health remains a great concern for both urban and rural children in Timor-Leste, as shown in Table 6-10. Of particular concern is the high rate of no-vaccination to children in rural area (25%).

Table 6-10: Health indicators for children in urban and rural areas (DHS, 2009)

Type	Health Indicator	Urban	Rural
Children's weight and size at birth	% of all live births found to be very small or smaller than average at birth	15.2%	15.7%
Vaccination	% of children age 12 -23 months who have received no vaccination at any time before the survey.	14.5%	25.3%
Prevalence of Acute Respiratory Infections (ARI)	% of children < 5 y.o who had ARI in the 2 weeks preceding the survey	2.8%	1.8%
Prevalence of fever	% of children < 5 y.o. who had fever in the 2 weeks preceding the survey	24.1%	17.6%
Prevalence of diarrhoea	% of children < 5 y.o.who had diarrhoea in the 2 weeks preceding the survey	18.9%	14.5%

DHS data from 2003 and 2009 indicate that there has been a slight increase in the level of stunting (height for age), wasting (weight for height) and underweight among children. Stunting increased from 49 to 53%, wasting increased from 12 to 17%, while underweight is reported to have increased from 46 to 52%. Additionally, malnutrition was reported to remain high in general with the proportion of children who have chronic malnutrition increased between 54 to 58%.

Malaria

Malaria remains a leading public health problem in Timor-Leste with 80% of the cases concentrated especially to only 4 of the 13 districts in the country – Dili (at the western boundary of Tibar Suco), Viqueque, Covalima and Lautem. As reported in DHS 2009, the number of confirmed cases of malaria has risen three folds between the year 2000 and 2008, however, caution should be taken as some of the increase could be due to a case of better diagnostic capacity, monitoring and surveillance on the field

Institutions, schools and health facilities

Tibar Suco hosted several schools, a technical training centre, and a health clinic and police post. (Refer to Figure 6-52 ,Figure 6-52 and Figure 6-54) Timorcorp has a coffee processing plant in Tibar and an abattoir has been built but is yet to commence operation. One chapel is located near the indirectly impacted area along the straight road to the south of the Bay. A NGO ACDI/VOCA has been implementing economic development programs through mud crab and fish pond establishment. Two ponds were established on the middle foreshore of the Bay (west of salt pond). Additionally, the ACDI/VOCA program also includes a mangrove rehabilitation component.

Type of Sickness in Tibar obtained from Tibar Health Centre

The data shows in the Tibar Health shows that the main prevalence illnesses are stomachache due to diarrhoea and respiratory infection as similar to the national data. Tibar Area also shows relatively high number of "Other skin condition" that covers various conditions that the doctors cannot be specifically classified as one single group.

SICK CASES IN TIBAR YEAR 2016

No.	SICKNESS	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Total M-F		Grand Total
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
1	Stomachache	72	71	22	30	16	22	12	13	18	13	30	25	45	45	42	42	36	39	39	41	32	36	29	38	393	415	808
2	Internal Disease	0	1	0	0	0	0	0	0	0	1	0	1	0	0			0	0	0	0	0	0	0	0	0	3	3
3	Respiratory infections	87	86	85	90	101	99	65	92	82	92	84	117	96	139	96	138	79	119	84	129	72	103	66	85	997	1289	2286
4	Pneumonia	2		1	2	0	0	2	2	0	1	3	3	1	0	1	0	1	0	0	1	1	0	0	0	12	9	21
5	Scabies			0	0	0	0	0		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
6	Other Skin condition	9	1	60	69	26	24	34	18	70	84	56	77	77	89	83	92	71	80	78	81	56	64	51	47	671	726	1397
7	Hypertension	5	4	8	9	7	5	9	10	19	15	15	14	7	6	9	8	10	5	11	4	12	5	6	10	118	95	213
8	Accident of Traffic	2	0	2	0	1	0	2	1	0	1	0	1	1	0	1	0	0	0	1	0	1	0	2	0	13	3	16
9	Other Accident	4	0	2	2	3	1	1	2	7	0	3	0	1	2	3	2	3	0	3	0	2	0	2	0	34	9	43
10	Malaria		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Malaria La Compri		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Eye Sickness	3	4	2	5	7	8	7	10	13	14	9	7	6	4	3	4	2	4	5	4	4	5	3	6	64	75	139
13	Gastritis	4	15	6	13	9	15	10	12	17	20	6	17	5	9	4	10	3	7	7	10	4	5	7	8	82	141	223
14	Ear Sick	5	3	4	2	6	5	7	8	7	8	4	6	3	4	2	4	4	5	2	3	3	6	2	5	49	59	108
15	Mouth & Throat	5	6	4	5	4	7	3	4	7	5	4	5	4	4	6	3	2	5	4	3	4	7	4	6	51	60	111
16	Mentality	2	4	2	4	2	4	2	4	2	4	2	4	2	5	2	4	2	4	2	4	2	4	2	4	24	49	73
17	Other sickness	113	212	98	140	84	113	62	92	74	184	84	165	126	218	158	241	128	140	130	173	118	136	133	139	1308	1953	3261
	Sub Total	313	407	296	371	266	303	216	268	316	442	300	442	374	525	410	548	341	408	366	453	311	371	307	348	3816	4886	8702
	TOTAL	720		667		569		484		758		742		899		958		749		819		682		655		8702		

SICK CASES IN TIBAR YEAR 2017

No.	SICKNESS	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Total M-F		Grand Total
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
1	Stomachache	31	39	20	22	26	25	43	42	19	25															139	153	292
2	Internal Disease	0	0	0	0	0	0	0	3	2	3															2	6	8
3	Respiratory infections	73	89	70	99	90	104	122	146	72	103															427	541	968
4	Pneumonia	0	0	0	0	0	0	0	3	1	0															1	3	4
5	Scabies	0	0	0	0	0	0	0	0	0	0															0	0	0
6	Other Skins Condition	52	51	56	61	72	82	37	36	73	66															290	296	586
7	Hypertension	6	4	7	8	5	4	7	8	6	10															31	34	65
8	Accident of Traffic	0	0	1	1	0	0	0	0	3	1															4	2	6
9	Other Accident	1	1	2	0	2	1	22	4	0	2															27	8	35
10	Malaria	0	0	0	0	0	0	0	0	0	0															0	0	0
11	Malaria La Compri	0	0	0	0	0	0	0	0	0	0															0	0	0
12	Eye Sickness	4	3	5	3	6	7	5	4	6	7															26	24	50
13	Gastritis	5	12	10	9	7	8	10	12	9	10															41	51	92
14	Ear Sick	4	3	2	6	5	2	4	3	5	6															20	20	40
15	Mouth & Throat	6	5	4	7	4	3	2	6	4	2															20	23	43
16	Mentality	2	4	2	4	2	4	2	4	2	4															10	20	30
17	Other sickness	132	153	122	138	168	162	135	195	159	171															716	819	1535
	Sub Total	316	364	301	358	387	402	389	466	361	410	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1754	2000	3754
	TOTAL	680		659		789		855		771		0		0		0		0		0		0		0		3754		

6.20.3 Community structure, family structure

Marital status

About 34% of PAP in Group A and B reported that they are married while the rest are considered minor, divorced/separated or widowed (Table 6-11).

Table 6-11: Marital status of Project Affected People (PAPs)

Marital Status	Number	Percentage
	Group A	
Minor (under 18)	31	46%
Unmarried	14	20%
Married	23	34%
Divorced/separated	0	0%
Widow/Widower	0	0%
Total	**68**	**100%**
	Group B	
Minor (under 18)	79	53%
Unmarried	13	8.7%
Married	51	34.2%
Divorced/separated	0	0
Widow/Widower	6	4%
Total	**149**	**100%**

Family structure

There are a total of 12 in Group A and 29 PAHs in Group B. The majority of the PAHs surveyed are nuclear family households consisting of parents, children. Maximum household members are found to be 10 among those PAHs in Group A and 9 for those in Group B. The minimum household member in both groups is (Table 6-12)

Table 6-12: Family structures (GoTL socio-economic survey)

Family structure	Number of AH
Group A	
Nuclear family Households [6]	12
Extended family households[7]	0
Maximum number of people in AH	10
Minimum number of people in AH	1
Group B	
Nuclear family Households	26
Extended family households	3
Maximum number of people in AH	9
Minimum number of people in AH	1

[6] *Parents and children*
[7] *Parents, children and grandparents or any other married relatives*

Land ownership

The Project construction and operation has been awarded to Timor Port SA ("The Concessionaire"), in accordance with the PPP Legal Regime and the Specific Decree-Law for the Tibar Bay PPP the GoTL shall, under the terms of the law and of the Concession Agreement, make available to the Concessionaire or, as appropriate, shall assist the Concessionaire in obtaining rights related to the site of the Port Facility. Furthermore, as the project will require land acquisition and will result in involuntary resettlement, the GoTL should develop a RAP which will include also the livelihood restoration component dedicated to those affected by economic and physical displacements and to those affected by economic displacement only.

The GoTL developed a RAP in July 2016. This report outlines that State-owned land and real estate is divided into two categories: (1) public domain and (2) private domain. Land and real estate in the public domain belongs to the State and, in addition, it cannot be privately owned. Assets, including land in the public domain are those either expressly qualified as such by Law or those which are not allowed to be subject to economic/commercial transactions (non-tradable due to their nature and/or social value[8] . State-owned land and real estate that is not in the public domain constitutes the State private domain. Land and other assets in the private domain are those that can be traded and that can be owned and disposed of by the State and public institutions. The general rule is that the provisions of the Civil Code are applicable[9] , unless otherwise legally stated.

Land of Tibar Bay

According to land confirmation process undertaken by the DNTPSC, the land plots included in the Project site are State-owned land falling under the public domain. The Project will not affect any private landowners (GoTL RAP, July 2016)

Economic displacement

The economic displacement compensation approach results from an exceptional provision inserted in the Specific Decree Law for the Tibar Bay PPP (D.L. No 43/2015) requiring for a resettlement plan for anyone whose land is acquired or whose livelihood is otherwise adversely affected by the Port Facility. Where a project results in both physical and economic displacement, the requirements of IFC's Standard (PS) 5 paragraphs 25 and 26 (Economic Displacement) should be incorporated into the RAP (i.e. there is no need to have a separate RAP and LRP). Therefore, the RAP was developed for those affected by economic and physical displacement during pre-construction.

Magnitude of displacement

The GoTL carried out a socio-economic census from December 14 to 16, 2015 as part of the RAP and identified PAPs and PAHs who will be directly affected by the project (either physical and economic displacement). The census identified 12 PAHs who will be affected by permanent physical displacement. A total of 29 PAHs were identified to be affected by temporary loss of

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[8] *Cfr. Article 3.1 of Law No. 1/2003; articles 1.8, 2 and 3 and articles 2 (b) and 7 of Decree-Law 27/2011 also use the same definition.*

[9] *Cfr. Article 1224 of the Civil Code*

livelihood. A number of businesses were also identified to be operating at the small jetty in Tibar Bay. The businesses consisted of 13 oil import businesses and 1 fishing business. Only five businesses have been found to have been administratively active status, meaning they have a current business licence.

Based on data gathered on eligible PAPs, the following categories have been identified to be entitled to receive compensation and/or assistance for their losses as recognized through a process identified in the RAP:

1. Those with no legal right or claim to the land they are occupy but own a house/other structures including trees are eligible to receive compensation at replacement cost and some amount for reconstruction grant.
2. Those that earn income from the marine-based products sourced from the bay area are entitled to receive a transitional allowance as determined based on consultation with concerned parties.
3. The vulnerable PAHs defined as those entitled PAHs falling under poverty line and/or woman-headed PAHs will be entitled to an additional transitional allowance.
4. No compensation is due to those businesses operating at existing jetty at Tibar. The government sees it inappropriate to compensate them as this group has the financial capacity to construct own facility; the old port they are currently occupying is government-owned and the government allows them to use it temporarily for their own economic benefits with no obligation or charges required of them to pay in return since 2002. Another important government consideration on this issue is that only 3 of the businesses are actually eligible to continue importing fuels since November 7, 2015. The rest of the businesses failed to meet ANP safety standards and has signed an agreement with ANP that they will cease to operate starting November 7, 2015 date. These 3 businesses with proper license have been found to have secured their own land with the help of the National Directorate of Land, Property and Cadastral Services and started planning for the construction of their own jetty. The businesses have been given written notice to clear out the area within 6 months and should cease all operation by December 20, 2016.

For full details of the RAP methodology, compensation and implementation refer to Appendix J for the SIA and full RAP Report.

6.20.4 Any other types of rights on natural resources

Communities in direct and indirect area of influence of the Project are heavily reliant on the marine resources of the bay either for their own consumption or for trade. Fishermen crab and clam gatherers, fish culturist in man-made ponds and salt makers can be found within the area.

The bay also provides an ideal anchorage area for vessels in close proximity to highly valued deep water fishing ground while providing deep water access via a natural channel through the reef. The conditions allow for round the clock access to the wider shore despite changes in tide level. Therefore, the coastal area as well as the bay itself are well used area for boat parking and launching and are held in common among those utilizing it.

Therefore, The RAP specifies the detailed procedures to be followed by GoTL and the actions it will take to resettle and compensate affected PAPs in a way consistent with national legislation and IFC PS 5. While the national law does not define what should be considered humanitarian for compensation, IFC PS 5 provides the reference in the preparation of this RAP, which states that: " When displacement cannot be avoided, displaced communities and persons will be compensated for loss of assets at full replacement cost and other assistance to help them improve or restore their standards of living or livelihoods".

Included in the RAP are the livelihood restoration components that provide the entitlements of those economically affected. The mitigation of economic displacement will be considered complete when – (i) affected persons have received compensation and other assistance according to the requirements of the IFC PS 5, and (ii) affected persons are deemed to have been provided with adequate opportunities to re-establish their livelihoods. Please refer to Appendix J for the RAP Report

6.21 Cultural component

The project's Cultural Heritage and Archaeological assessment was undertaken by Dr. Nuno Oliviera.

A first exploratory visit to the project site took place on December 6, in the company of Mr Bere Hunu, Lian'ain from Bilimau. However, heavy rains and the State Secretariat of Arts and Culture's (SSAC's) staff ongoing work elsewhere prevented fieldwork from being completed in 2016.

On January 19, 2017, fieldwork resumed and a second visit to Tibar took place with Mr Sarmento, from SSAC. A meeting with Mr Bento da Conceição Correia, Head of Tibar Suco, was held to keep him informed of the present study.

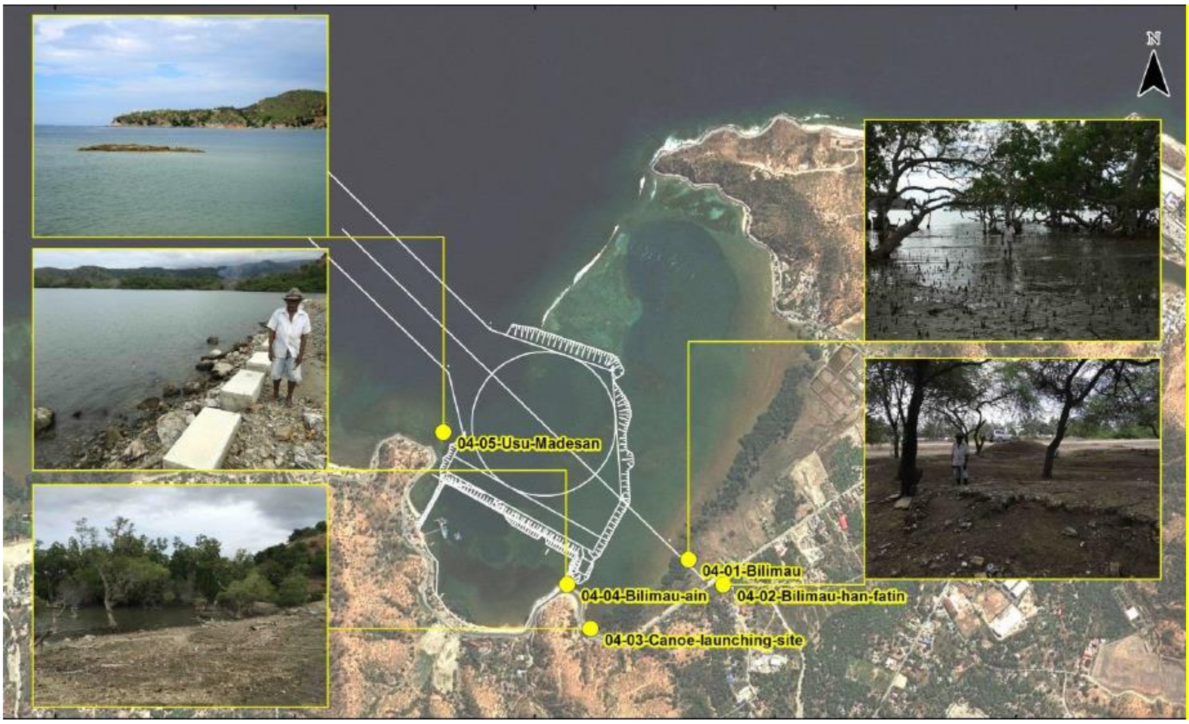
One last visit to the project site was undertaken on January 28, 2017, in the company of Mr Bere Hunu. Potential negative impacts on cultural heritage sites within the project's footprint were discussed, as well as appropriate mitigation measures. A final meeting was held on this day with Mr Domingos Serrão Fátima da Conceição, Head of Libaulelu Village, in Tibar.

6.21.1 Cultural heritage

Five cultural heritage sites were located in the project area or near the project area. Of these, two had been previously recorded in 2013, in the course of the Environment and Social Scoping Study.

Only two sites (site no. 04-04 and site no. 04-05) are located in the project's footprint and will be directly affected by construction. The remaining three sites (sites no. 04-01, 04-02 and 04-03) are located outside but very close to the project's footprint. No additional archaeological or cultural heritage sites were detected in the area.

Site Name	Site Location	Site Significance	Impacted by the project
04-01 -Bilimau	The spring is considered sacred and used for ceremonial purposes within the Sau Batar traditional ceremony, which relates to corn harvesting.	Sacred heritage site	Indirectly
04-02 -Bilimau Han Fatin	Ruins and altar are still used by Communities at Tibar for ceremonial purposes	Sacred heritage site	Indirectly
04-03 -Canoe launching site	Small beach cove and sparse mangrove area, used by community at Tibar to house and launch fishing canoes	Ethnographic site	Access restrictions likely
04-04-Bilimau ain #NEW	Small outcrop next to the margin which is submerged during high. It is marked by two poles at sea	Traditional heritage site	**Yes**
04-05 -Usu Madesan #NEW	The site is related to the Sau Batar traditional ceremony and is used in connection with Bilimau freshwater spring and other sites at Tibar Bay	Sacred heritage site	**Yes**



6.21.2 Archaeological sites

No significant archaeological or anthropological work is known to have taken place within the study area. No additional archaeological or heritage sites were found during the 2016-17 survey.

7 Climate Change Impacts

This section describes relevant climate change considerations relevant to the construction, operation and decommissioning of the proposed Tibar Port Project. Most of the background information in this section is based on the Timor-Leste National Adaptation Programme of Action to Climate Change (NAPA) adopted in December 2010.

7.1 Description of the historic weather observations and trends

According to the NAPA, there are no national country-specific studies and insufficient historical weather data for Timor-Leste to provide comprehensive analysis and evidence of how its climate has changed. However, a number of preliminary studies, including analysis of data from West Timor, can be used to provide indication of possible changes in climate in the region. In addition, global models are also used to extrapolate information to Timor-Leste level. IPCC global models indicate that in South-East Asia extreme weather events associated with El-Niño have been both increasing in frequency and intensity in the past 20 years. This has had an impact on Timor-Leste climate patterns with estimated decreases in mean rainfall indexes, in particular for the dry season and increased incidences of extreme weather events.

7.1.1 Temperature

An analysis of global data by the IPCC shows that in the Timor-Leste region, temperature from 1901 -2005 has increased 0.5 °C – 0.8 °C over the century, while data for 1979 - 2005 suggests a lower decadal increase of 0.1 °C - 0.3 °C with a mild acceleration over the later decades.

The Seeds of Life/*Fini ba Moris* program in the Timor-Leste Ministry of Agriculture and Fisheries (MAF) used Portuguese era climate data for 7 weather stations across the country from 1954 to 1974 and compared these to automated weather stations in the same locations for the period of 2004 to 2012.[10] This comparison showed an average increase in maximum temperature of 1.7 °C; however, there was considerable variability between sites based largely on elevation.

The maximum temperature recorded at the Dili Airport Meteorological Station in 2014 was 32.4 °C.

7.1.2 Rainfall

Analysis of total rainfall in Timor-Leste indicates a reduction in mean annual rainfall from 1961 - 1990 as compared to the 1931 - 1960 period, the decrease being mostly felt in the December-February rain period Since 1976 there has been a tendency for the El Niño - La Niña normal alternation to be dominated by El Niño events that associated with lower levels of monsoonal rainfall.The MAF Seeds of Life study found that, on average, mean annual rainfall decreased by 19% in 2004 - 2012 compared to the 1954 - 1974 period. However, similar to temperature, there was a great deal of regional variability.
The 2014 annual rainfall total for the Dili Airport Meteorological Station was 620 mm.

[10] Seeds of Life, Timor-Leste Ministry of Agriculture and Fisheries, Climate Change Research in Timor-Leste (Summary Release), 2013.

7.2 Future projections of climate change

7.2.1 Temperature

The projections for temperature indicate a trend towards temperature increases for the target years of 2020, 2050 and 2080 in the order of 0.8 °C, 1.5 °C and 2.2 °C respectively, in relation to the 1961 - 1990 reference period. Extreme temperature events are also expected to increase. By 2050, 7-day or 30-day heat wave events can be expected to increase by up to 2.3 °C and that the length of such events can be expected to increase by two days.

7.2.2 Rainfall

Rainfall is also expected to increase, in relation to the 1961 - 1990 reference period, by 2%, 4% and 6% by 2020, 2050 and 2080, respectively. This is different to the scenario in Indonesia where decreased rainfall is projected, but is similar to northern Australia. Due to the lack of specific studies on Timor-Leste and the coarseness of the climate models, the NAPA cautions that these projections may be inaccurate.

In addition to an expected overall increase in rainfall for Timor-Leste, extreme rainfall events are expected to increase. Overall, rainfall events are expected to become less frequent but more intense.

7.2.3 Sea level rise and acidification

Sea level rise figures for Timor-Leste are expected to be close to the global averages. However, it should be taken into consideration that Timor-Leste is estimated to have an annual uplift of 1 cm given tectonic activity. The Pacific Climate Change Science Program forecasts the following scenario for sea level rise:

	2030 (cm)	2055 (cm)	2090 (cm)
Low emissions scenario	6–15	10–27	17–47
Medium emissions scenario	6–15	12–30	21–59
High emissions scenario	6–15	12–29	22–62

Figure 7-1 Sea Level Rise information from the Pacific Climate Change Science Program (http://www.pacificclimatechangescience.org/: accessed 07/11/2016)

It is also expected that given an increase in absorption of carbon dioxide (CO_2), sea water pH will lead to acidification, impacting upon marine life. Projections indicate a pH decline of -0.16 to -0.17, by the 2070s, relative to 1990s in the Timor-Leste region.

7.3 Implications for the proposed project

The NAPA process identified potential climate change vulnerabilities and adaptation options.
The below Table 7-1 describes the impacts of Global Climate Change on the Project
On the other hand, the impacts of the Project on Climate Change are summarized in Section 7.10.
Table 7-1: Vulnerabilities for climate change impacts

Source of Impact	Affected Aspect	Impact on Project	Environmental Factor impacted	Relationship to Proposed Project and/or local environment
Global Climate Change	Sea Level	▪ Inundation of lower lying areas ▪ Changes to flow and flooding regimes of rivers and drainages ▪ Saltwater intrusion of aquifers	▪ Groundwater ▪ Flora ▪ Fauna	▪ Potential impacts to the coastal infrastructure inaccessible or unsafe ▪ Potential impacts to the water supply with increased salinity due to intrusion ▪ Potential impacts to long term land use and decrease in success of rehabilitation due to inundation
Global Climate Change	Rainfall	▪ Changes to rainfall patterns with increased or decreased rainfall ▪ Increase in extreme rainfall events e.g. cyclones ▪ Changes to flow and flooding regimes of rivers and drainages	▪ Surface Water ▪ Groundwater ▪ Flora ▪ Fauna	▪ Potential impacts to infrastructure and accommodation from flooding and cyclones ▪ Potential impacts to the productivity due to extreme weather delays (e.g. shipping) ▪ Potential impacts to the post-closure land use and decrease in success of rehabilitation due to a drying climate
Global Climate Change	Air temperature	▪ Changes to ambient temperature ▪ Increased evaporation	▪ Community Health ▪ Infrastructure ▪ Flora ▪ Fauna	▪ Potential impacts to human health and comfort due to increasing temperature ▪ Potential increase in power consumption due to increased use of air conditioning

7.4 Adaptation measures

The NAPA process identified priority adaptation strategies for food security, water supply, and human health. Any project-related mitigation measures recommended in this EIS and the project EMP should reflect these priorities in addressing climate change impacts. Adaptation measures required to mitigate potential adverse climate change related impacts to the proposed project or affected environment are described in Table 7-2.

Table 7-2: Climate change adaptation measures

Activities	Impact by Activities	Proposed Adaptation
Pre-Construction. Construction, Operation	Surface Water	Refer to mitigation measures recommended for impacts related to drainage described below: ▪ Cleaning of all oil, fuel and waste spills immediately ▪ Waste management procedure to control litter ▪ Correct operation and maintenance of waste water treatment unit ▪ Mitigation of sedimentation of the culverts and on site drainage by means of an active drainage maintenance programme. ▪ Mitigation of flooding during extreme runoff events through the use of berms and diversion drains to limit flooding of the construction site. ▪ Regular bathymetry to monitor sedimentation during Operations The port terminal construction plan should consider the potential adverse effects of future climate change. In particular, roadway benches and slopes should be designed to address the increased potential for landslides. Infrastructure plan should also account for an increased need for dewatering and flood control.
Pre-Construction. Construction, Operation	Coastal processes	Mitigation measures included in the Biodiversity Action Plan are applicable to mitigating the impact from rising sea levels and increased storm frequency. The Biodiversity Action Plan is contained in the Tibar Port Environmental Management Plan.
Pre-Construction. Construction, Operation	Groundwater	Refer to mitigation measures recommended for impacts to water supply described below: ▪ Cleaning of all oil, fuel and waste spills immediately ▪ Waste management procedure to control litter ▪ Correct operation and maintenance of waste water treatment unit ▪ Mitigation of sedimentation of the culverts and on site drainage by means of an active drainage maintenance programme. ▪ Mitigation of flooding during extreme runoff events through the use of berms and diversion drains to limit

Activities	Impact by Activities	Proposed Adaptation
		flooding of the construction site. ▪ Regular bathymetry to monitor sedimentation during Operations
	Flora and Fauna	Refer to mitigation measures recommended for impacts to terrestrial ecology described below: ▪ Reclamation of land through alternative use of dredge spoil material if possible, thereby reducing the need to clear terrestrial vegetation for infrastructure. ▪ Selection of the site to limit impact on habitat with the site selected having the lowest possible clearing footprint of all the configuration options. ▪ Reduction in dust generated through the implementation of a Dust Management Plan including wetting of unsealed roads, limiting dust generating activities when it is windy and monitoring of dust levels in the project area.
	Infrastructure	Refer to mitigation measures recommended for impacts to infrastructure described below: ▪ Maintenance of the Grievance Redress Mechanism
	Community Health	Workers should be provided with adequate shade, water and appropriate clothing including wide-brimmed hats and long-sleeves. Workers should be closely monitored for symptoms of heat sickness and dehydration. During extreme heat events, working hours should be adjusted to avoid the hottest parts of the day. Refer to mitigation measures recommended for impacts to community health below: ▪ Maintenance of the Grievance Redress Mechanism established pre-construction and expansion to include construction impacted stakeholders ▪ Facilitate education and awareness programs throughout the lifespan of the port ▪ Establish access controls to the site activities posing health and safety risks to the community. ▪ Develop strict protocols for increased traffic safety.

7.5 Management objectives

The following international standards may be applicable in relation to climate and greenhouse gas emissions:

- To ensure the atmospheric emissions (i.e. carbon monoxide) are minimized as much as practicable; and
- To ensure design of project components accommodate climate change, including sea level rise and severe weather events etc.).

7.6 Applicable standards and legislation

The following international standards may be applicable in relation to climate and greenhouse gas emissions:

- United National Framework to Combat Climate Change (1992) and the Kyoto Protocol; and
- Australian National Greenhouse and Energy Reporting Act (2007);
- Intergovernmental Panel on Climate Change; and
- Australia Clean Energy Act, 2011 detailing similar industry emissions in the Liable Entities Public Information Database.

7.7 Climate change impact assessment

It is considered that the development of the Project will have a limited and insignificant impact on the regional and local climate through its contribution of greenhouse gases and resulting effect on global climate.

The construction and operational phase of the Project is likely to see a localized increase in CO_2 emissions, which is considered to be the main greenhouse gases (GHG) contributing to man-made global warming. The following are the main sources of direct CO_2 emissions from the Project:

- Combustion of fuels for on-site vehicles and power; and
- Combustion of carbon contained in wastewater (WBCSD, 2011).

In accordance with the NGERS Facility reporting threshold (NGER Act, 2007), facilities with an emission of 25 kt or more of greenhouse gases (CO2 –e) are required to report emissions to the regulator. There is no similar mechanism in place in Timor-Leste. According to the results of the Greenhouse Gas assessment undertaken for this project (Appendix A):

- Projected increase in Greenhouse Gases, up to 80,000 t CO2 e- per year in year 2045 of operation
- This represents less than 4% of Timor-Leste's forecasted emissions for 2020.

- Under Australian legislation, Tibar Port would be required to report emissions annually due to reporting thresholds being exceeded, however neither Australia or Timor-Leste have a carbon price, so there are no commercial implications of exceeding this threshold.

The meteorological parameters of concern which relate to climate change for the Project site are: sea level rise, cyclone intensity and frequency, rainfall and extreme wind speed. Within the lifetime of this Project (50+ years), climate change projections in CSIRO, 2010 indicate that the following may occur:

- Cyclone frequency is to reduce but the intensity is projected to increase; and
- Extreme rainfall events are to become fewer, but more intense, with similar trends projected for extreme wind speeds (CSIRO, 2010).

These projections are uncertain and by nature are subject to change. However, as the Project is located in a coastal region, the engineering design will need to take into account the following factors for the lifespan of the Project:

- The projected rise in sea level;
- Cyclones and severe storms, which can potentially cause widespread damage to property and endanger human life;
- High-energy waves may interfere with construction and/or operational activities for the jetty and may pose a safety risk to site personnel;
- Lightning can also pose a safety risk for personnel, particularly where tall metal structures or machinery can attract lightning strikes;
- Vegetation conservation in the intertidal zone to mitigate the impact from storms and rising sea levels, particularly mangrove habitat; and
- Adequate stormwater and wastewater management.

Pre-construction, construction [note: no decommissioning phase]

Based on the impact assessment the potential impacts to climate during the pre-construction, construction phases are considered to be '**Low**' due to the negligible potential impacts.

Operations

The potential impacts to climate during the operation of the Project are considered to be '**Low**' based on the localized and short-term nature of the potential impacts associated with the increased emissions of greenhouse gases.

The poter … ct on the project is addressed in Section 7 Climate Change Impacts.

	2030 (cm)	2055 (cm)	2090 (cm)
Low emissions scenario	6–15	10–27	17–47
Medium emissions scenario	6–15	12–30	21–59
High emissions scenario	6–15	12–29	22–62

7.8 Mitigation measures

The following general mitigation measures will be implemented for the duration of the Project.

- Potential cyclone/earthquake/tsunami identification methods ;
- Cyclone and earthquake proofing for structures/objects/machinery;
- Construction and operational policies for lightning strikes and high energy waves;
- Lock down procedures for securing structures/objects/machinery;
- Emergency action plans and evacuation procedures; and
- Distress notification if additional aid is required

Operation

- Adoption and implementation of clean technology to ensure emissions of greenhouse gases are minimized.
- Ensure vehicles and equipment are regularly serviced and maintained to minimize potential emissions of greenhouse gases.
- Limit vehicle idling time and keep vehicles well maintained to minimize gaseous emissions.

7.9 Monitoring and reporting

It is recommended that an automated weather station (AWS) is installed near the Project site to record and monitor the following parameters on an hourly basis for the duration of the Project (i.e. construction, operation and decommissioning):

- Station identification number;
- Sate and time of record/observation;
- Air, wet bulb and wet dew point temperatures.
- Precipitation and evaporation;
- Relative humidity;
- Wind speed and direction;
- Solar radiation;
- Barometric pressure (relative, absolute, and QNH (Barometric pressure adjusted to sea level for aviation purposes));
- Visibility;
- Cloud cover; and
- Cloud ceiling height, if practicable.

The recording and monitoring of these parameters will provide input information for various environmental management measures (including, but not limited to, dust suppression and cyclone management) and reporting requirements on the Project.

The installation of the AWS should be conducted in accordance with AS 3580.14-2011 - Methods for sampling and analysis of ambient air Part 14: Meteorological monitoring for ambient air quality monitoring applications, or an equivalent guideline.

Until the GoTL implements a Carbon Pricing mechanism or issues a National Communication (NC) under the United Nations Framework Convention on Climate Change (UNFCC), there is no formal requirement in place to record, monitor and report on greenhouse gas emissions at a country level.

Monitoring of greenhouse gas emissions is therefore *not recommended* for this Project. Annual calculation and reporting is recommended, however is optional.

7.10 Summary climate change mitigation

	Preconstruction	Construction	Operation
Type of Activity	No site activity	Power Generation Diesel Generators Vehicles and Ships	Vehicles and Ships
Potential Impact		Greenhouse Gas increase	Greenhouse Gas increase
Mitigation Measure		▪ Potential cyclone /earthquake/tsunami identification methods; ▪ Communication methods for workers; ▪ Cyclone and earthquake proofing for structures/ objects/machinery (temporary and permanent); ▪ Construction and operational policies for lightning strikes and high energy waves; ▪ Lock down procedures for securing structures/objects/machinery (temporary and permanent);	▪ Adoption and implementation of clean technology to ensure emissions of greenhouse gases are minimised. ▪ Ensure vehicles and equipment are regularly serviced and maintained to minimise potential emissions of greenhouse gases. ▪ Limit vehicle idling time and keep vehicles well maintained to minimise gaseous emissions. ▪ Cyclone and earthquake proofing for structures/objects/machinery (temporary and

	Preconstruction	Construction	Operation
		▪ Emergency action plans and evacuation procedures; and ▪ Distress notification if additional aid is required	permanent); ▪ Policies for lightning strikes and high energy waves; ▪ Lock down procedures for securing structures/objects/machinery (temporary and permanent); ▪ Emergency action plans and evacuation procedures; and ▪ Distress notification if additional aid is required

 # note there is no decommissioning phase of this project

8 Alternatives considered

The *Timor-Leste Strategic Development Plan 2011-2030* (GoTL, 2011), developed through a lengthy and intensive national consultation process, identifies the need for a new port on the north coast of Timor-Leste in proximity to the majority of the national population living within and around the capital Dili. The port is needed to replace Dili Port, Timor-Leste's only international seaport, that has become an economic bottleneck. Limitations of Dili Port capacity and function include:

- a building and cargo shed layout more suited to a coastal port mainly handling general cargo (the port's previous function) rather than international container shipping;
- harbour limitations, especially draught restrictions, that restrict port access to small ships, thereby preventing access by competing shipping lines operating larger vessels and the productivity gains that would result;
- no available land to extend the port;
- road congestion within Dili and a poor entry road intersection into the port; and
- no landing facilities or export capacity for the fishing industry. (GoTL, 2011)

Dili Port is too shallow for ships above 500 twenty foot equivalent (TEU) capacity and the Port is expected to reach capacity by 2018, resulting in further congestion, delays and higher costs. The limited capacity of the Port, with a wharf length of 380 m, already results in a berthing backlog of between three and eight ships (GoTL, 2011). The port is located in the centre of town with no realistic expansion options. Unless a new port is installed the only option will be to truck goods in from Indonesia at great expense.

All consumer and capital goods are imported into Timor-Leste, with the country's population expected to more than double to 2.3 million by 2040. This, coupled with economic growth, is expected to increase container traffic from around 45,000 TEU in 2013 to 350,000 TEU by 2040. Additionally, 0.5 million tons of non-containerized dry cargo is expected by 2040. A new port, designed to handle containers and general cargo, will increase transport efficiency, allowing larger vessels up to 3,500 TEU to be accommodated and thus capitalizing on sea transport economies of scale.

Timor-Leste has port facilities at Hera, Tibar, Oe-Cusse Ambeno, Kairabela, Atauro and Com, but each of these ports is in a poor state of repair and has limited function and capacity. There are no ports or small ship facilities on the south coast and hence all agriculture and industry in this region is reliant on road transport from the north. The transport of goods through other existing ports has many disadvantages. Moving cargo through the Indonesian port of Kupang, approximately 410 km by road from Dili, is not ideal given the long haulage distance and difficult road conditions, while this port is similar to Dili Port in that it has no known expansion plans.

The planned port at Suai on the south coast of Timor-Leste, 179 km by road from Dili, may handle some containers in the long term and is well placed to service the south coast (where about 20% of the population resides), but the capacity of this port is expected to be limited, while the road travel time to Dili is considerable at over six hours and roads unsuited to heavy vehicle traffic. All container shipping lines, mainline and regional services alike, presently sail north of Timor Island, therefore a north coast location is far better suited to servicing this trade.

Selection of the port location on the north coast was undertaken by GoTL, while IFC-supported project planning prepared by HPC and EcoStrategic considered some additional location alternatives to ensure that no options had been overlooked. After GoTL had selected Tibar Bay as the location, selection of the preferred port site within Tibar Bay was undertaken as a component of (i) HPC's conceptual design of the Port, and (ii) EcoStrategic's environmental and social scoping work.

8.1 High Level Options Assessment

8.1.1 Dili Port Upgrading

The upgrading of Dili Port (Figure 1) was considered to meet port needs into the foreseeable future, based on either expanding the onshore facilities, creating offshore facilities or a combination of these two options. Onshore expansion would involve the acquisition and development of land opposite the existing port to substantially increase the landside area. Offshore expansion would involve reclaiming new land by building an artificial island on top of Dili Port Reef, connected via a causeway to the existing onshore port facilities and creating a breakwater for the port.

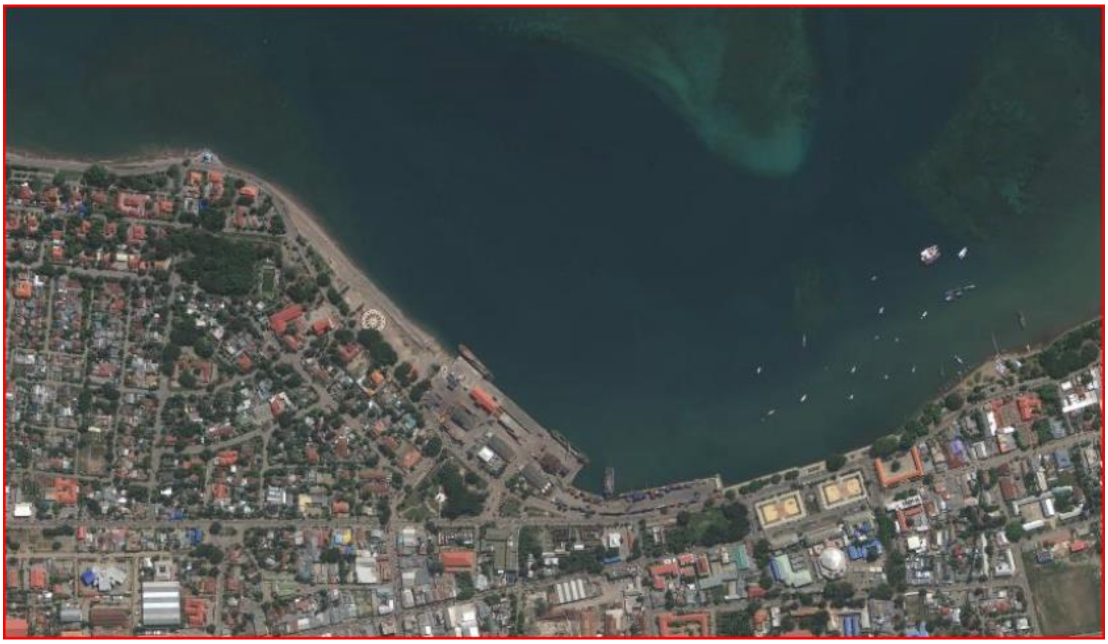


Figure 8-1 Dili Port (HPC, 2014)

While the Dili Port area is free of many natural features (i.e. mangroves, tidal flats, seagrasses), onshore expansion would require the acquisition of a large area of urban land immediately southwest of the existing port, as well as substantial business displacement and some resettlement. The cost of land acquisition would be considerable, while a large increase in port activity will only add to traffic congestion in Dili.

Given land availability issues in Dili, offshore expansion of the port provides a conceptual alternative to landside expansion. Offshore land reclamation would result in the total loss of the small Dili Port Reef located 550 m from the main wharf, whilst substantially altering and detracting from the appearance of the city shoreline.

Expansion of the port in either form would require dredging to create additional depth to cater for larger vessels (3,500-7,000 TEU capacity container ships), therefore the existing berths would have to be reconstructed to cope with the increased draught. Dredging could result in turbidity and sedimentation impacts on the reef.

A survey of this reef found that despite its close proximity to a functioning commercial port, it appears to very healthy with high coral species diversity and up to 100% live coral cover in many areas, although very few fish larger than 10 cm were observed.

The transport of containers and cargo to and from the expanded port would be undertaken by truck via the already highly congested and narrow city roads. Increased land transport would add to existing traffic congestion in the city, constraining the movement of containers and general cargo to and from the port. In addition, port expansion on the Dili shoreline would detract from this significant natural feature in the heart of the capital, whereas eventually moving container and cargo traffic out of the city will allow this section of the city's shoreline to become a landmark feature.

The Government intends to convert Dili Port into a tourism feature more in keeping with its vision for the development of Dili and the broadening of Timor-Leste's economic base. While planning is at an early stage, it is expected that the port will accommodate ferry services, marina development and related tourism facilities.

8.1.2 North Coast Locations

The selection of a suitable location for the port along the north coast was undertaken by GoTL based on the following general considerations:

- **proximity to Dili** – within relatively close proximity to Dili to minimize land transport (i.e. within 50 km);
- **sheltered conditions** – little current, wave action, low potential tsunami impact
- **free of landside congestion** – allowing ample development potential due to absence of settlements and businesses, and ease of heavy traffic movement to and from the port;
- **minimal environmental and social impact** – avoidance of/minimal impact on significant ecosystem features, settlements, livelihoods and cultural features
- **minimal development cost** – primarily for the main features (wharf, foundation conditions, dredging volume, breakwater, landside areas); and
- **port capacity to handle traffic for the next 30 years plus the potential to expand beyond 2044**.

The range of location alternatives considered by the IFC team in providing advice to GoTL was:

- open (unsheltered) coastline;
- man-made sheltered areas: Dato and Lake Maubara - to be created by excavating out low lying coastal land or lakes (Figure 2); and
- natural sheltered bays: Hera and Tibar Bay - no other natural sheltered marine areas within 50 km of Dili (Figure 3).

Figure 8-2 Potential Port Locations West of Dili

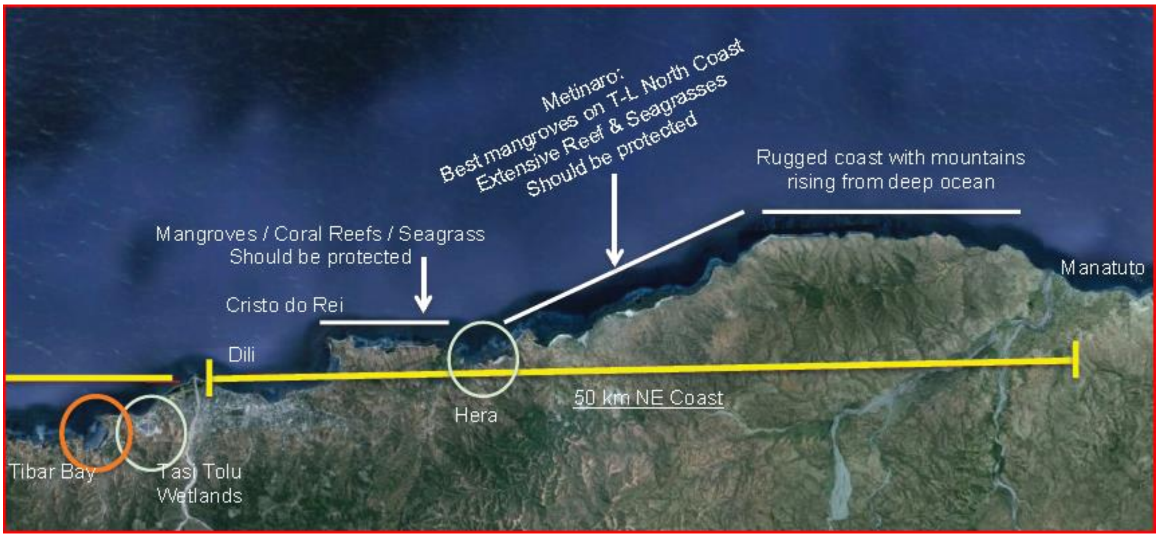


Figure 8-3 Potential Port Locations East of Dili

8.1.3 Open Coastline

Much of the unsheltered coastline within 50 km of Dili drops away steeply into the sea, having narrow coastal shelves with little protection from currents and waves and difficulty in finding suitable anchor grounds. These geological characteristics make port construction difficult water depth increases dramatically very close to the coastline. This makes the construction of a breakwater problematic and costly.

Many areas along this coastline support coral reef immediately offshore, with shoreline mangroves also found along stretches of the coast, particularly to the east of Dili. Additionally, relatively flat landside areas are limited at many sites. For these reasons open coastal locations were considered to be unsuitable for a new port to handle the capacity of containers and general cargo required.

8.1.4 Man-made Sheltered Areas

The IFC team briefly reviewed several landside locations where potential man-made ports could be excavated to ensure that all feasible location options were considered. The excavation of Lake Maubara, a saltwater lake located 36 km west of Dili and separated from the sea by approximately 200 m of land, was considered to construct a port. Use of this site for a port would destroy this significant ecological feature that is home to a large flock of pelicans and other coastal birds. Additionally, the cost of the port is likely to be higher than seaward locations as the full depth of the approach channel, turning area berths would have to be excavated. The greater road distance to Dili would also add significantly to transport costs.

Dato, consisting of seaside river delta land 29 km west of Dili, could form a port with the excavation of riverine material on low-lying coastal land. Despite this potential, the site has a number of major limitations that include more than 300 households living on the potential port site, 200 fishermen using the adjacent coast, and the loss of a large area of land production resources at the site. This section of coast has a water depth of up to 200 m at less than 50 m distance from the beach, making it difficult to find suitable anchor grounds, while the sea has a very strong current parallel to the beach.

The area is subject to drainage and sedimentation issues as the two rivers either side of the site carry large volumes of sediment, therefore a port would be subject to high rates of sedimentation. The cost of port construction is likely to be high due to the full excavation of the approach channel, turning area and berths. The condition of the road to Dili is poor and it passes through five villages, therefore added traffic will create a safety hazard while transport costs would also be higher, similar to Lake Maubara.

Accordingly, both Lake Maubara and Dato were not considered to be feasible locations for the port.

8.1.5 Natural Sheltered Bays

The only naturally sheltered marine areas within proximity to Dili are Hera and Tibar Bay. Hera, 12 km east of Dili, is home to the port Hera Navy Base (Figure 4). Accordingly, this location was ruled out by GoTL for a container and bulk cargo port for national security reasons. A limitation of this site is the difficult land transport connection to Dili via a narrow road that includes sections with steep gradients.

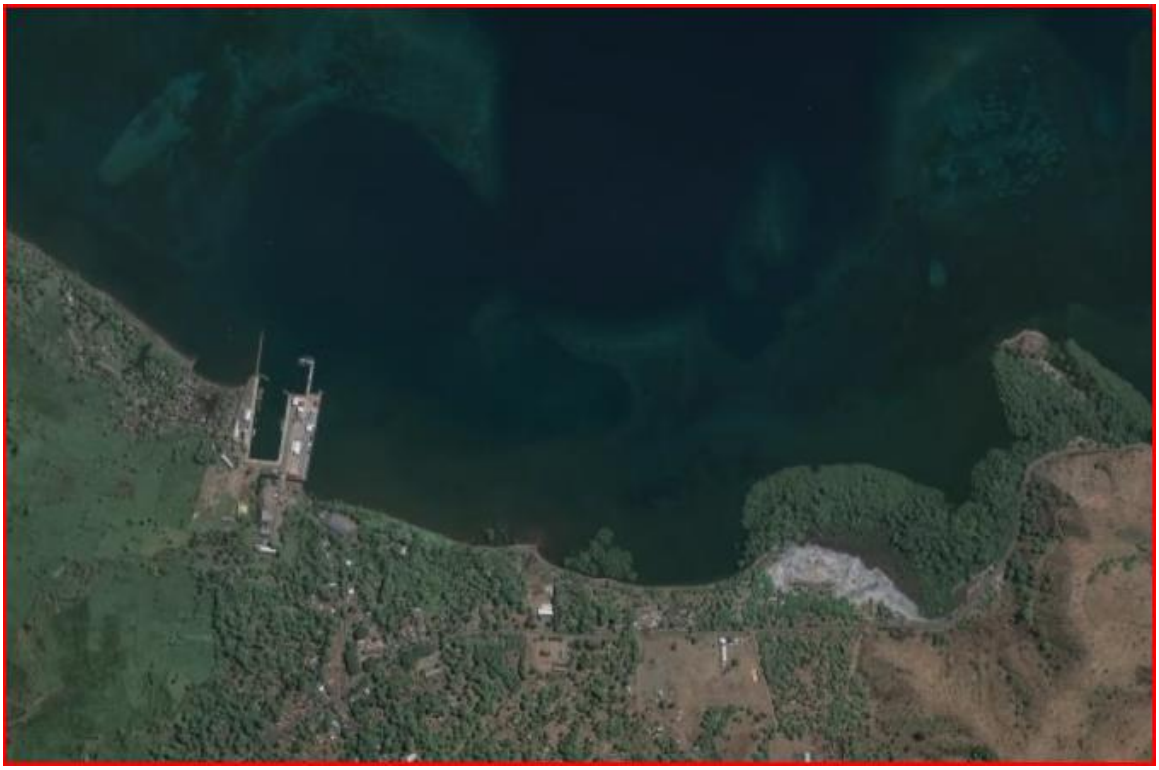


Figure 8-4 Port Hera Navy Base

Tibar Bay, 10 km west of Dili, is a relatively undeveloped natural Bay, currently supporting a small fishing community, 29 nearby coastal households and several businesses on the shoreline. The Bay is well sheltered, having a coral reef mainly consisting of dead coral across almost the entire mouth of the Bay. An operational limitation of this site is the lack of suitable anchor grounds immediately offshore of the Bay, but areas offshore of Dili can be used for this purpose. This site was primarily chosen by GoTL as the preferred location for the port due to the degree of shelter, lack of existing marine and landside development and close proximity to Dili.

8.2 Tibar Bay Site Options

The optimization of port site selection within Tibar Bay was based on consideration of and a trade-off between five factors:

- operation;
- engineering;
- cost;
- environmental; and
- social.

The requirement for the Port to have good navigational access and adequate landside area to operate effectively could not be compromised, but optimization of other port operation considerations could be foregone if other factors such as environmental considerations warranted this.

8.2.1 Operation, Engineering and Cost Factors

The IFC team assessed the operational, engineering and cost considerations of seven alternative port sites within Tibar Bay (Figure 5), rating each criterion based on how conducive it was to port development, operation and future expansion (Table 1). A general rating was assigned to each factor, identifying where limitations or difficult conditions exist.

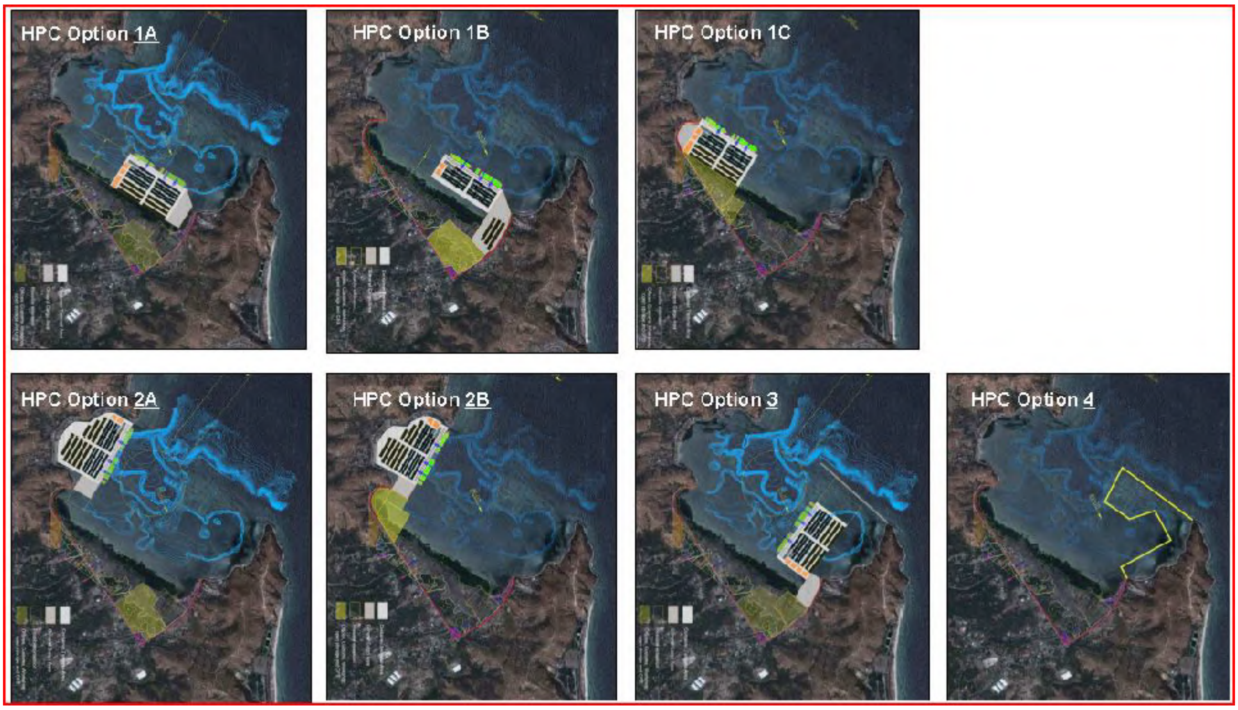


Figure 8-5 Port Site Options in Tibar Bay

Table 8-1 Operational, Engineering and Cost Evaluation of Alternative Port Sites

Factor	Criterion	Site Options						
		1A	1B	1C	2A	2B	3	4
Port Operation	Navigational access	Good	Good	Good	Good	Good	Good	Difficult
	Wave protection	Very good	Very good	Good	Good	Good	Very good	Very good
	Land area availability	Good	Moderate	Good	Difficult	Moderate	Moderate	Limited
	Berth extension	Possible	Possible	Possible	Limited	Limited	Not possible	Not possible
	Yard extension	Possible	Possible	Possible	Difficult	Difficult	Limited	Difficult
Engineering / Construction	Dredging volume	Medium	Medium	Low	Low	Low	Medium	Very high
	Dredge material dumping	Low	Low	Low	Low	Low	Medium	Very high
Cost	Quay wall construction	Medium	Medium	Medium	High	High	High	High
	Land operating cost	Low	High	Low	High	Medium	Medium	Highest

Colour ratings: Green – no significant impediment or limitation. Yellow – some limitation. Red – a significant limitation.

The most obvious finding from the ratings was that Option 4 has considerable limitations for almost all operational, engineering and cost criterion that was considered. Option 1C was the most favourable with no operational, engineering, or cost limitations. Options 1A and 1B were almost as favourable, having few limitations. Options 2B, 3 and 2A have additional limitations relating to land area availability and the potential to eventually extend the berth and yard areas.

8.2.2 Environmental and Social Factors

Environmental and social factors were evaluated for four generic port site options in Tibar Bay, covering each side of the Bay. These sites cover HPC's seven sites as follows:

HPC	EcoStrategic
1A, 1B, 3	East
1C	Southwest
2A, 2B	West
4	Northeast

Notable environmental and social features that the port has the potential to adversely impact upon were identified. A weighting between 1-3 was then assigned to each feature based on the environmental and social significance of that feature as described in Tables 2 and 3.

Table 8-2 Environmental Factor Weightings

Environmental Feature	Weighting	Weighting Rationale
Mangroves	3	The most significant ecological resource in the Bay, having national importance given the loss of 80% of mangroves country-wide since 1940. *S. alba*-dominant mangrove is unique on the north coast, being the only example of a mature, apex community of this species. Provides fisheries value, wildlife habitat and coastal protection. Highest blue carbon value. Heavily utilized by the local community.
Seagrass	2	Links mangroves to offshore reefs. Provides fish nursery values and coastal protection. Not as rare as mangroves as there are extensive areas of seagrass along the north coast.
Tidal flats	2	Provides habitat for two IUCN Red List bird species and other bird species. High blue carbon value. Heavily utilized by the local community.
Coral reef	1	High species diversity and live coral cover on slopes, but low/no live coral cover on reef flats. Provides coastal protection. Not as rare as mangroves as there are extensive areas of reef along the north coast.
Terrestrial habitat	1	Heavily used as a resource by the local community, but there appears to be no species of ecological significant (e.g. Mesquite is an introduced species). Resources can be replaced or offset.
Bay/coast hydrodynamics	2	Changes will impact on all other aspects of the Bay, including indirect impacts on mangroves, seagrass and tidal flats.

Source: adapted from EcoStrategic, 2013.

Table 8-3 Social Factor Weightings

Social Feature	Weighting	Weighting Rationale
Resettlement	2	Directly affects people's lives but it can be effectively managed to ensure that resettled households are no worse off.
Fisheries	3	The Bay is the only sheltered harbour for fishing vessels with direct access to deep water fishing grounds along the north coast near Dili.
Salt production	1	Alternative livelihoods can be established for the affected households, which is also essential for mangrove preservation.
Fish ponds	1	Alternative livelihoods can be established for the affected households.
Other resources	2	Immediate coastal community of 29 households is highly dependent on these resources, but loss will permanently alter their livelihoods.
Bay access	2	Will directly affect people's lives but can be managed.
Cultural heritage	3	Loss is irreversible and commonly irreplaceable, usually permanently altering cultural aspects of local community life.

Source: adapted from EcoStrategic, 2013.

A score of between 0-4 was then subjectively assigned to each feature based on the relative severity of the likely impact of the Port (area of impact; type of impact - destruction, degradation or change) on that feature, then weighted scores were calculated (Tables 4 and 5).

Table 8-4 Environmental Evaluation of Alternative Port Sites

Primary Environmental Issue	Feature	Weighting	East		Southwest		West		Northeast	
			Score	Weight. Score	Score	Weight. Score	Score	Weight. Score	Score	Weight. Score
Habitat loss	Mangroves	3	4	**12**	3	**9**	2	**6**	0	**0**
	Seagrass	2	1	**2**	1	**2**	4	**8**	3	**6**
	Tidal flats	2	4	**8**	4	**8**	3	**6**	2	**4**
	Coral	1	1	**1**	1	**1**	2	**2**	3	**3**
	Terrestrial	1	4	**4**	3	**3**	1	**1**	0	**0**
Bay/Sea Hydrodynamics	Hydrodynamics	2	3	**6**	3	**6**	1	**2**	4	**8**
Total Weighted Score		-	-	**33**	-	**29**	-	**25**	-	**21**

Source: adapted from EcoStrategic, 2013.

Table 8-5 Social Evaluation of Alternative Port Sites

Primary Social Issue	Feature	Weighting	East		Southwest		West		Northeast	
			Score	Weight Score	Score	Weight Score	Score	Weight Score	Score	Weight Score
Resettlement	Resettlement	2	4	**8**	2	**4**	2	**4**	0	**0**
Loss of livelihoods	Fisheries	3	4	**12**	3	**9**	3	**9**	2	**6**
	Salt production	1	4	**4**	4	**4**	0	**0**	0	**0**
	Fish ponds	1	4	**4**	0	**0**	0	**0**	0	**0**
	Other resources	2	4	**8**	3	**6**	1	**2**	0	**0**
Reduced Bay access	Access	2	4	**8**	3	**6**	2	**4**	1	**2**
Loss of cultural heritage	Sites	3	4	**12**	3	**9**	2	**6**	0	**0**
Total Weight. Score		-	-	**56**	-	**38**	-	**25**	-	**8**

Source: adapted from EcoStrategic, 2013.

The combined total weighted environmental and social scores for the four alternative sites, in order of site preference, were: Northeast - 29; West – 50; Southwest – 67; and East – 89.

8.2.3 Preferred Port Site

The ratings for Tibar Bay port sites for the two sets of factors assessed (i. Operation, Engineering and Cost; and ii. Environmental and Social) were combined to select the preferred port site. Site 4/Northeast, despite being the best site in terms of having the lowest potential adverse environmental and social impacts, was rejected primarily due to difficult navigation access even before a number of other operation and engineering limitations were considered.

Site 2B/West, rated as having the second lowest adverse environmental and social impacts, was selected as the preferred port site as there were no operation, engineering or cost factors that prohibited or overly restricted development at this site, with each limitation being manageable. The most significant environmental impact associated with Option 2B/West will be the loss of a large area of seagrass bed (15-18 ha), but this impact is seen as preferable to the loss of a large area of mangroves (up to 20 ha at other sites) as seagrass has a lower conservation value.

The main adverse impacts that are likely to result from the use of port site 2B/West and the severity of these impacts are:

- loss of 15-18 ha of seagrass - major;
- loss of 1-3 ha of mangrove – minor to moderate;
- loss of some tidal flats – moderate;
- loss of up to 1 ha of live coral – minor to moderate;
- altered Bay hydrodynamics – minor;
- resettlement of around 3-4 households - minor;
- impact on fisheries – minor to moderate;
- loss of other livelihood resources - minor;
- blocking local access to much of the western shoreline of the Bay; and
- loss of a traditional canoe launching area.

Source: GoTL, 2011. *Timor-Leste Strategic Development Plan 2011-2030*. Government of Timor-Leste.

8.2.4 Alternative technologies or methods

Area 5- Land based at Tibar Bay was suggested by Ecostrategic as a possible alternative to development immediately adjacent to the coast. This option incorporated a land-based development with a narrow corridor through mangroves and seagrasses to a trestle jetty. The impacts to mangroves and seagrasses would be less by area cleared and there would be minimal requirement for dredging and reclamation.

8.2.5 No project alternatives

Not developing an alternative port site to Dili Port will result a constraint in economic growth and development in Timor-Leste, which is in direct opposition to the Strategic Development Plan developed and being implemented by the GoTL. In order to improve infrastructure and economic participation and increase development and investment in Timor-Leste to reduce the country's reliance on subsistence agriculture, it is recognised that increasing the cargo capacity of Timor-Leste is a strategic development requirement (SDP, 2011).

8.3 Comparison of impacts

In order to determine the suitability of each site relative to the other, the impacts on environmental and social factors were considered. These aspects are aligned to the Impact Assessment aspects elsewhere in this document.

In Summary, it is apparent that:

- The Dili Port Onshore and Offshore options have constraints in land development area and traffic with limited area for expansion in the future. This makes these options less optimal than options which have more land available
- The Hera option has the lowest overall Environmental and Social footprint, but there is a restriction in place by government decree limiting development in that area
- The Tasi Tolu option is the least suitable based on the combined factors of Environment and Social owing to its status as a protected area
- Tibar Bay is a suitable option based on its available land area for development, however the potential impact on communities and livelihood is moderate, taking into account the likely impacts on livelihood and traffic.
- The No Project option has the lowest impact footprint, however the positive impacts from economic development and improvement in infrastructure for the whole of Timor-Leste are not insignificant.

8.4 Rationale for selection of chosen project site

The port site at Tibar Bay was selected based on the higher positive social impacts compared to an expansion at Dili Port. Compared to a development west of Dili in the area of the North-west coast, the environmental and social impacts are higher here, than in Tibar due to the presence of key mangrove and coral habitat. The option at Tasi Tolu was not considered beyond the high level screening phase due to its international significance as a protected bird habitat, similarly the site at Metinaro is a location of critical mangrove habitat.

The site at Tibar Bay was selected in the overall screening as the most suitable.

8.5 Project components

The selection of the port layout within the Tibar Bay was considered in the context of:

- Reclamation and foundation suitability
- Hydrodynamics, wave and tidal aspects
- Flat land available for development for infrastructure
- Environmental and Social Impacts

The report by HPC (2013a) details the options assessment in regard to configuration of the port layout, including a generalised overview (Figure 8-6). Seven configuration options were proposed and each were assessed on the basis of their suitability against the factors listed above.

All the options had a major impact to the coral reefs within the bay from dredging; as well as hydrodynamics and coastal processes impacts.

8.6 Option selection

- Option 4 was discarded by HPC in 2013, based on its poor engineering suitability
- Option 3, 1A and 1B were discounted in 2013, based on the direct permanent impacts on the community, the salt and fish farms, cultural heritage sites and mangrove and seagrass habitat
- Option 2A and 2B were evaluated further by the PPP in terms of land-side footprint and operations space requirements for laydown and wharf space, and Option 2B was selected by the PPP and included in the Concession Agreement.

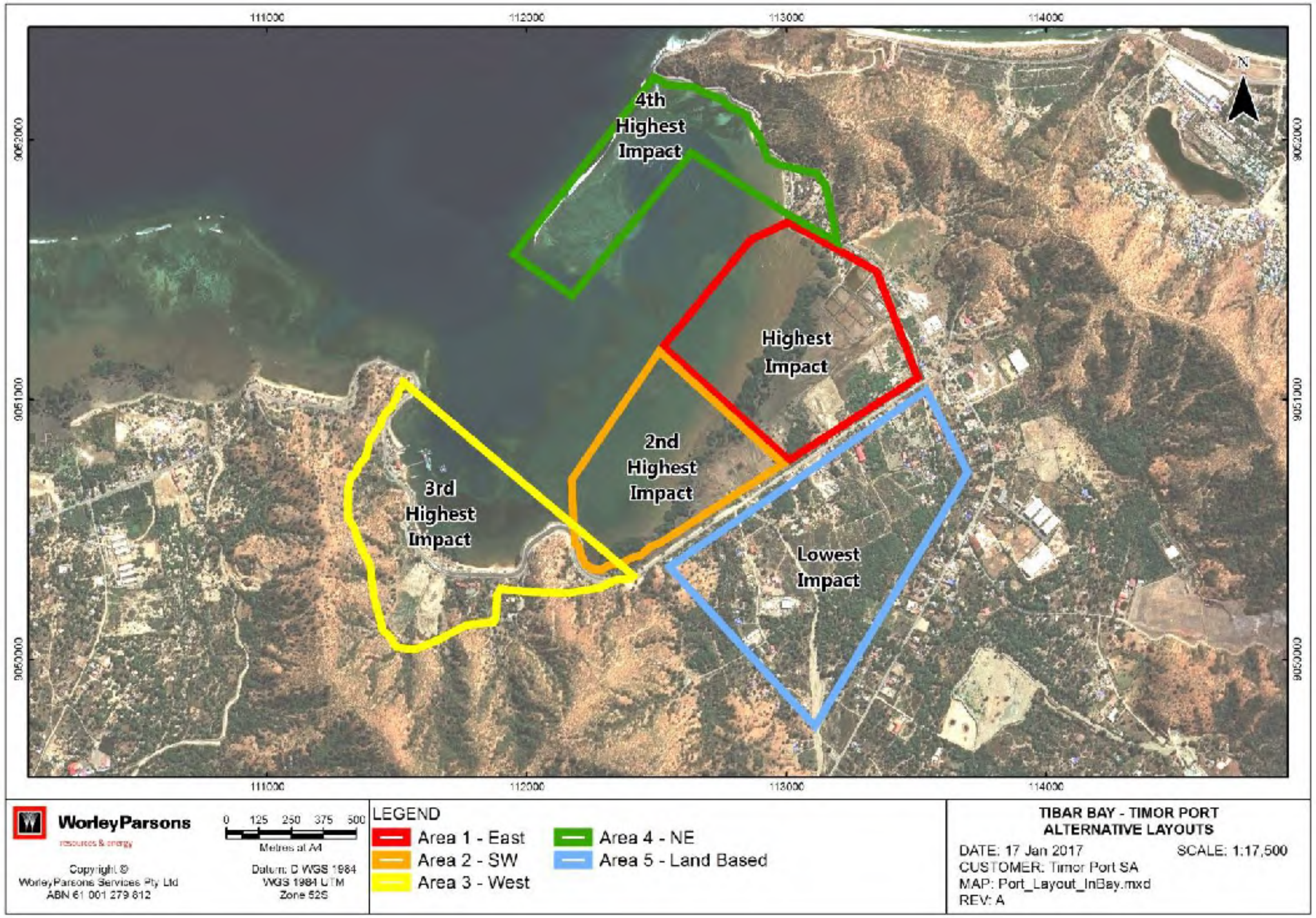
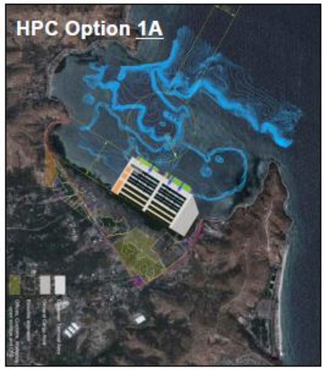


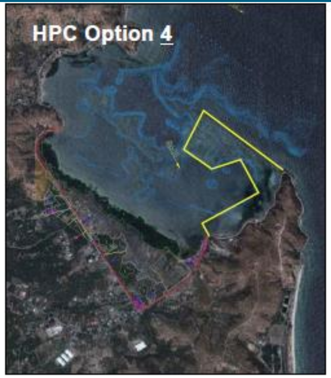
Figure 8-6: Port options within Tibar Bay (HPC, 2013a)

Table 8-6: The seven alternative port configurations in Tibar Bay (HPC, 2013a)

Option		Environmental	Social	Environmental and Social ranking
1A		Mangroves/Mudflat area – removal of over half the mangroves and mudflat area in Tibar Bay (by area) Destruction of coral on fringing reefs Acid Sulphate Soils impact Green Carbon impacts Surface and groundwater impacts from changes to drainage	Resettlement of 10 houses Cultural Heritage Sites permanent destruction Loss of water supply from spring Loss of fish ponds/salt farms / crustacean collecting Loss of fishing habitat Blocking access to coast for fishermen	7th
1B		As per 1A but less mangrove and mudflat area impact Mangrove habitat fragmentation with uncertain prospect for survival / retention	As per 1A with less impact on salt farms / fish ponds / crustacean collecting	4th

Option		Environmental	Social	Environmental and Social ranking
1C		As per 1A but less mangrove and mudflat area impact Mangrove habitat is more diverse in this area	As per 1A with less impact on salt farms / fish ponds / crustacean collecting	6th
2A		Mangroves – removal of less area than options 1A to 1C. Corals – direct impact of less area than 1A to 1C Seagrass – total area of impact is highest Acid Sulphate Soils impact Green Carbon impacts	Loss of the Oil Terminal (Economic) Resettlement of 4 houses Retreat – loss of amenity Loss of crustacean collecting and fishing areas	2nd

Option		Environmental	Social	Environmental and Social ranking
2B		As per 2A with additional mangroves and mudflat area impact Acid Sulphate Soils impact Green Carbon impacts	As per 2A with additional traditional fishing access impact Less cultural heritage site impact compared to 1A	3rd
3		Least overall direct impact to Mangroves, Coral, Seagrass and Mudflats Drainage (rivers) impact with main drainage (Rihui River) adjacent to footprint Secondary impact from port operations expected to be high, due to greater impact zone and location of shipping entrance Significant dredging requirements for turning basin and vessel access Terrestrial vegetation clearing	Resettlement of 10 houses Impact on salt farms / fish ponds / crustacean collecting Limited impacts to cultural heritage sites or existing economic activities Fishing in a larger area of the bay is restricted in this option	5th

Option		Environmental	Social	Environmental and Social ranking
4		Least overall direct impact to Mangroves, Coral, Seagrass and Mudflats Secondary impact from port operations expected to be low	Resettlement - 5 houses Loss of fishing boat access to the outer coastline area No impacts on cultural heritage sites	1st

8.7 Engineering design phase

The project design is currently at a Front End Engineering Design level of completion. This level of detail is sufficient that the request for quotations can be sent to the market to obtain data regarding the number and type of plant and equipment to be used in construction. The engineering design included in the project description is broad enough that the impacts can be assessed and the necessary standards for compliance identified.

The basis of selection of each of the components is based on the design criteria which are detailed in the Concession Agreement. The port has been designed to take over the container traffic from Dili Port, servicing container vessels between 400 and 7000 TEU capacity. The design vessel particulars are:

- The Largest Vessel, a 7000 TEU capacity with a length overall of 280m with a length between perpendiculars of 270m; and a maximum loaded draft of 14.2m 5m and a displacement of 110 -120 000t.
- Typical 3500 TEU vessel has an overall length of 230m with a length between perpendiculars of 220m; and a maximum loaded draft of 12m and a displacement of 60 000t.
- The smallest vessel, a 400 TEU capacity with a length overall of 110m with a length between perpendiculars of 100m; and a maximum loaded draft of 6.5m and a displacement of 7500t.

These ranges in vessel size and shape were selected as the basis of design based on the specifications for the future port capacity and traffic which is contained in the Concession Agreement.

The following areas for optimisations were considered during the FEED study, and are discussed further below.

8.7.1 Quay Wall

The quay is to be constructed using a concrete suspended deck on piles, due to seismic consideration, with an earth retaining type structural interface at the rear between the quay and land reclamation area. The suspended concrete deck structure is proposed to be an orthogonal beam grillage supporting the quay deck.

Various quay concepts were studied. This focused on the rear of the quay, being the interface with the reclamation area in the form of an earth retaining structure and the quay structure being a suspended concrete deck on piles. The different concepts of this earth retaining structure allow the Contractor to choose their preferred design and construction methodology and subsequently possible quay optimisations. Three different concepts were addressed with regards to the earth retaining type structure only, being:

- Concept 1: Stand-alone precast concrete counterfort type earth retaining wall.
- Concept 2: Stand-alone anchored steel sheet pile earth retaining wall.
- Concept 3: Stand-alone or structural integrated steel combi wall type earth retaining structure.

Concept 3 was selected as the preferred option to carry forward in the FEED Study as it has the highest potential to decrease the overall quay deck area, number of quay piles, better seismic performance and shorter construction duration.
A tugboat and service vessel pontoon berth is located at the south-east of the quay in a dredged pocket. The service berth is to accommodate two harbour tugs and one pilot tug.

8.7.2 Quay / Berth Pocket Position

The position of the quay wall / berth pocket in relation to its proximity to the existing coastal road at the north-west corner of the quay was optimised. The dredge batter slope from the toe of original concession agreement boundary would have cut beyond the existing road with assume dredge batters of 1V:3:H or 1V:5H, refer to
Figure 8-7. A 50 and 40m offset of the quay deck south-east of the original concession agreement position was considered; refer to Figure 8-8 and Figure 8-9. With a 40m shift, the 1V:3H dredge slope would not undermine the existing road. The 1V:3H dredge slope provides adequate stability under static loading conditions. The 40m offset was selected for the FEED Study.

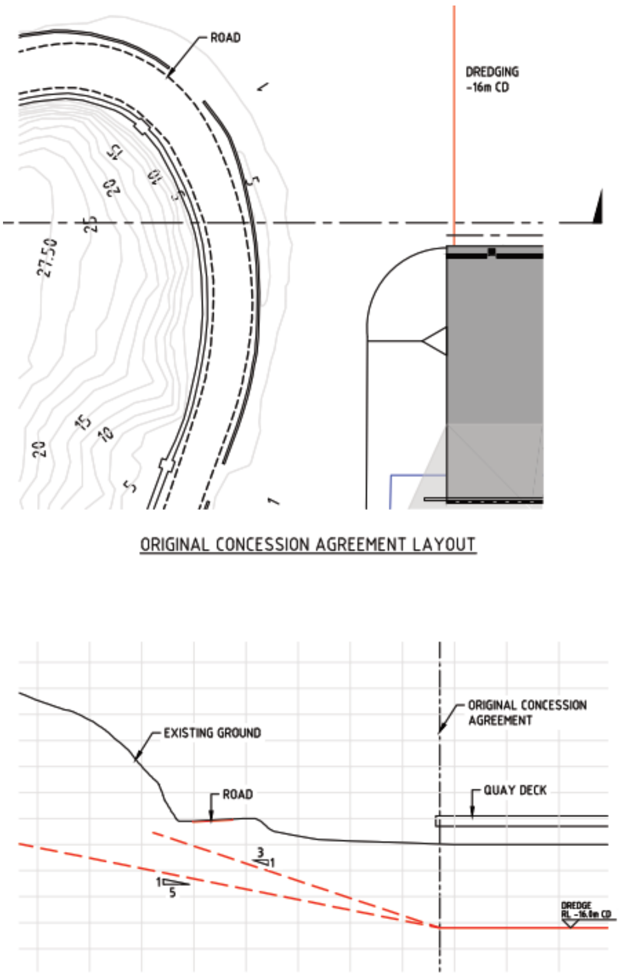
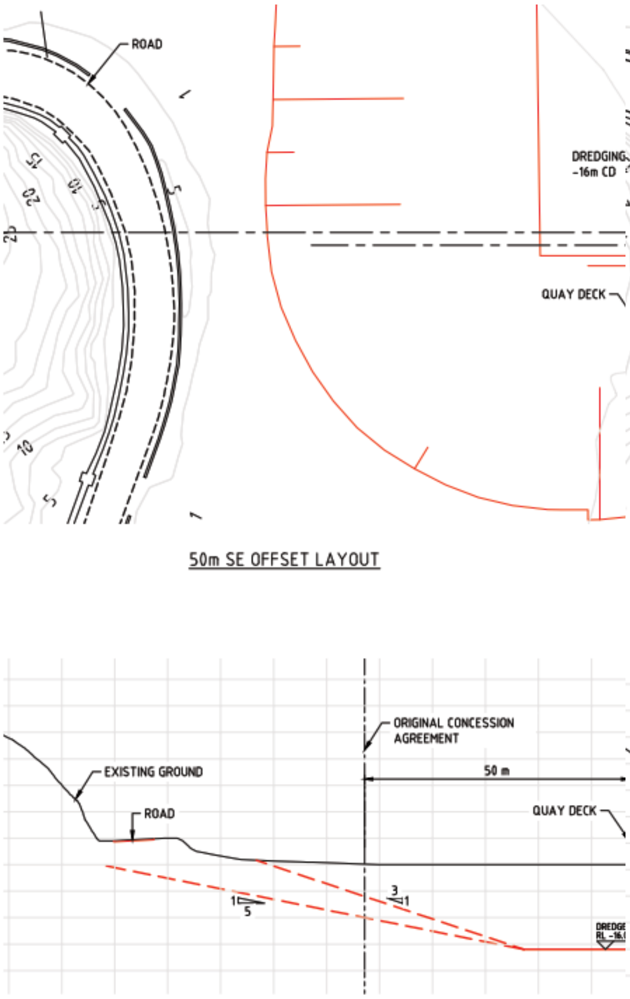


Figure 8-7 – Original Concession Agreement Layout



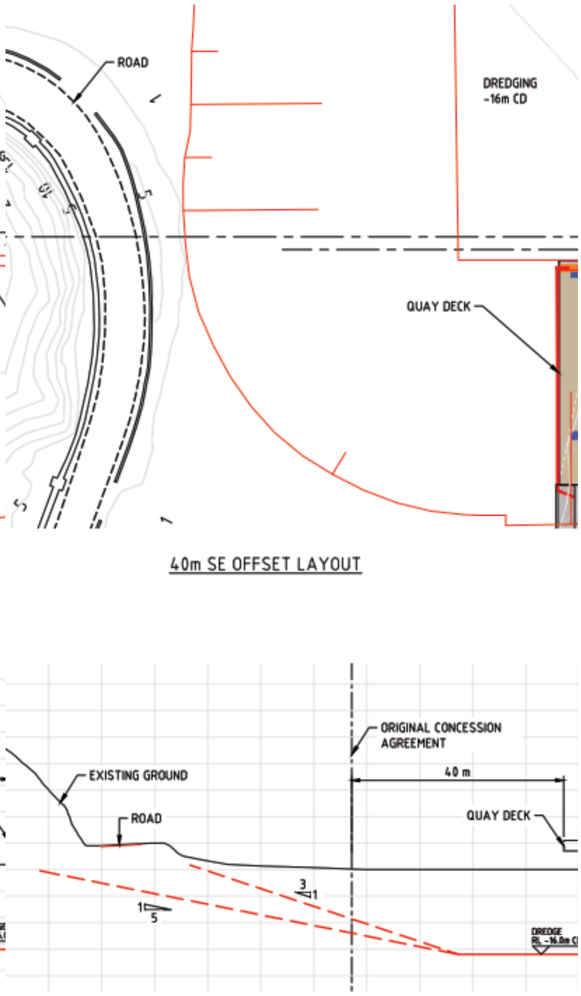


Figure 8-8 – 50m SE Offset Layout

Figure 8-9 – 40m SE Offset Layout

8.7.3 Turning Basin and Channel

As part of the FEED study a vessel manoeuvring study has been completed. The turning basing plan dimensions were based on a turning circle diameter of 600m (2 times 7000 TEU vessel LOA), located 70m from the berth line. The vessel manoeuvring study indicated that further optimisation of the turning basin could be considered as shown in Figure 8-10. The FEED study has not carried this optimisation forward the following reason:

- The manoeuvring study was at a FEED level, and has not considered the whole range of vessels, metocean conditions, and emergency manoeuvres.
- This would have been lead only to a minor decrease of dredging works (seabed deeper than –16 m CD in this area)

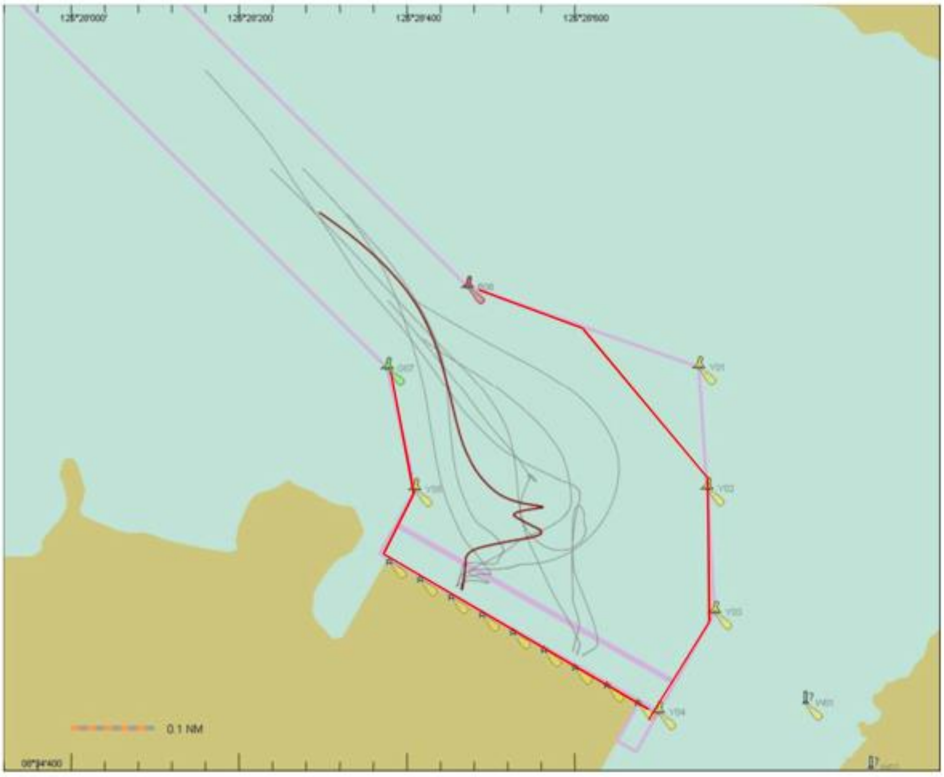


Figure 8-10 – Turning Basin Optimisation (Red Line)

The shipping channel width has been determined based on the International Design Guideline PIANC Report No 121-2014. The seabed topography in the vicinity of the shipping channel is currently -16m CD depth and the channel is therefore naturally 337m wide.

8.7.4 Navigational Aids

The initial concept of the navigational aids considered channel and turning basin markers that consisted of floating / spar buoys. The following optimisations have been considered, (refer to Figure 8-11):

- Changing the floating / spar buoys to single vertical piled structures. These would have reduced ongoing maintenance costs, no spare buoys required, and the contractor would already have the equipment available to install the piled markers.
- Reduce the number of turning basin markers by converting it to a lead marker.

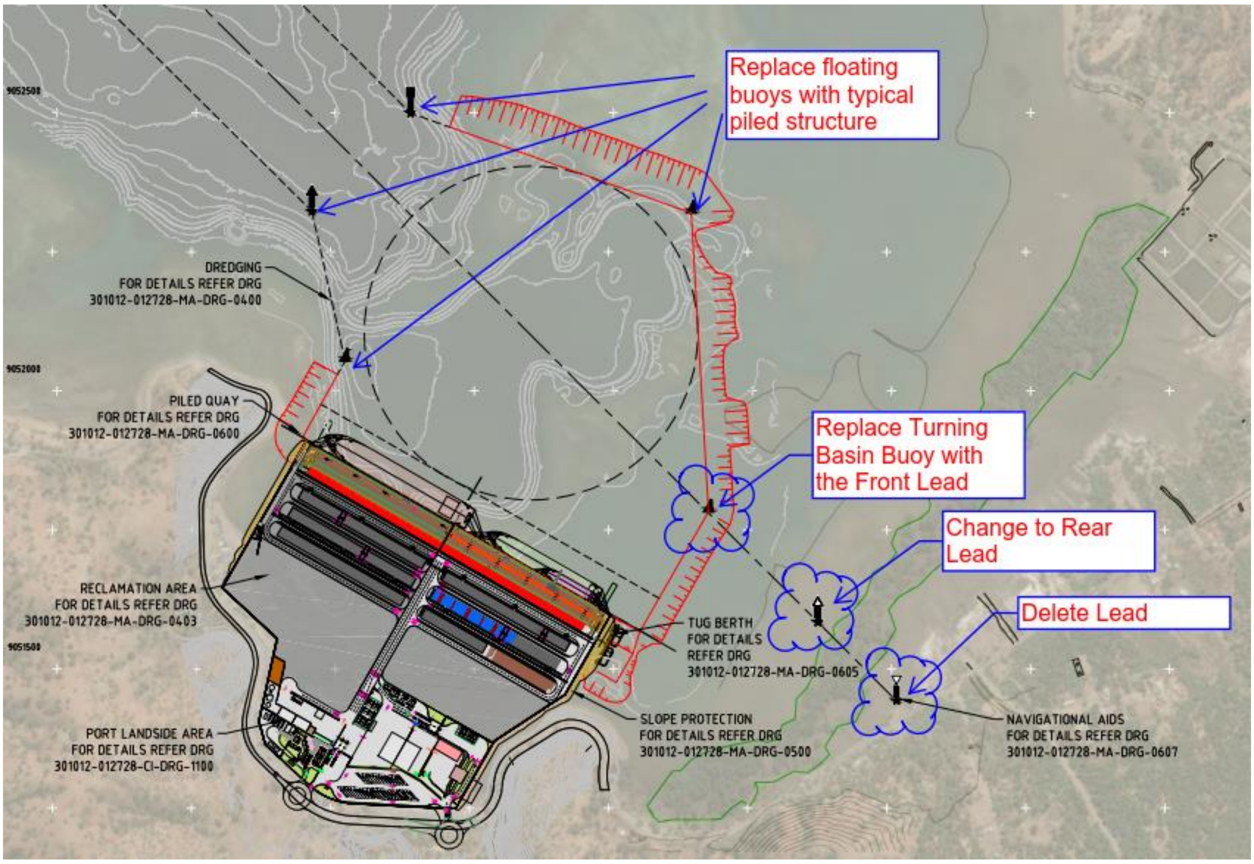


Figure 8-11 – Navigational Aid Optimisation

8.7.5 Breakwater and Berth Orientation

As part of the FEED study the requirement for a breakwater at the NW corner of the berth and/or re-alignment of the quay was assessed. Based on the studies completed during the FEED study, the following conclusions can be made:

- A wave study concluded that the waves in the turning basin and at the quay wall are relatively minimal. A cyclonic assessment was also made, and indicated that cyclones will have a minimal impact on the wave climate (beyond what has already been considered in the wave modelling).
- Direction of the critical wave is aligned with the bearing of the entrance channel, FEED study looked at potentially realign the quay wall orientation. It is however, aligning the quay wall orientation to the critical wave direction does not provide significant saving on waves forces, and realignment will result in larger dredge volume, hence reorientation of berth is considered no advantages to the project.
- The vessel manoeuvring study determined that the metocean conditions in the turning basin were acceptable.

- As part of the dynamic mooring analysis concluded that the estimated yearly operational downtime was within acceptable levels. Therefore, a breakwater and/or re-alignment of the quay structure is not required.
- The existing bathymetry at the NW corner of the site is very steep and deep. The installation of a breakwater would be cost prohibitive, and based on the studies conducted above, would not be required to provide additional benefit to the facility.

8.7.6 Deck and Reclamation Level

The Pre-FEED concept design had a deck and reclamation level of +6mCD, based on limited information and assumptions of wave climate. As part of the FEED study a wave climate and wave agitation study was conducted (including an assessment of cyclones on the site). The level of the deck and reclamation level was re-assed and determined that the deck level could be lowered to +5.5mCD while still achieving the overtopping requirements.

8.7.7 Pavement material optimization

The type of final pavement layer for the container yard was evaluated.

Several pavement options were assessed, and are listed in the table below with their comparative advantages and disadvantages:

Pavement type	Advantages	Disadvantages
1. Reinforced concrete slab	▪ Long life and durable pavement ▪ Resistant to rutting ▪ Low maintenance ▪ Provides good surface water runoff	▪ Have to import the required cement ▪ Longer construction period than flexible or unsealed pavement ▪ Slab may crack if there is a differential settlement in the underlying soils
2. Block pavers	▪ Reasonably durable pavement ▪ Provides adequate surface water runoff ▪ Less costly than the concrete slabs	▪ Availability of suitable jointing sand is not known ▪ Longer construction period than flexible or unsealed pavement ▪ Uneven surface presents a risk to operations and equipment if the subsurface settles ▪ Paver laying skills may not be readily available
3. Asphalt	▪ This surface provides good surface water runoff ▪ Less costly than reinforced concrete slab or block pavers	▪ Availability of raw material is questionable ▪ Susceptible to damage from container corner castings and forklift axle load (static purreturing) ▪ Requires regular maintenance ▪ Weaker resistance at temperatures over 25° C

For platforms supporting heavy loads a block paver type system was selected based on a net present cost calculation, as well as consideration of the relative advantages and disadvantages mentioned above.

For car parks and access roads reserved for trucks and light vehicles, asphalt pavements were selected bases on a net present cost calculation, as well consideration of the relative advantages and disadvantages mentioned in table above.

8.7.8 Water Management practices

The rainwater collection devices were designed according to the following objectives:

- Limiting the use of buried pipes,
- Limit removable concrete covers (U-channel cover in particular) on the traffic and container storage areas,
- Design concrete structures that can be cast in place or precast on site,
- Simple design and easy maintenance
- The main technical solutions chosen are therefore as follows:
- Concrete slot channels on the container stacking area connected to two large lateral open U-channels on each side of the yard,
- Concrete slot channels on large traffic zones (Gate in, Gate out & truck parks),
- Catchment grids connected to a buried pipe network in buildings areas,
- Concrete open channels collecting water coming from coastal road and upstream watersheds.

The onshore facility will be designed to include efficient stormwater drainage including waste separators in areas where fuels, liquids and detergents are handled. A wastewater treatment system is included in the infrastructure and will be designed to collect, process and treat all grey and black water produced from the port and terminal facility.

The specifications of the water and waste management processes on the container terminal have been derived from a review of environmental best practice to eliminate all potentially contaminated discharges through design.

8.7.9 Dredge disposal

The Dredge Disposal ground was initially proposed to be immediately to the west of the channel at Tibar Bay (Spoil Option 1). During the planning for the Environmental Surveys in September 2016 and the completion of the Literature Review by Advisian, the engineering team were advised by our scientists regarding the presence of sensitive coral and seagrass habitat in that location, together with its position at the mouth of the Tibar Bay would mean a far larger area of impact from dredge material disposal than necessary.

This site was initially proposed because it was close to the dredge location reducing carbon emissions (greenhouse gases) from the project and piped dredge spoil disposal method could be used, at lower cost and increase convenience for the dredge.

When this was discarded, a second proposed location was identified at the -60m AHD shoreline contour (Spoil Option 2). This area contains minimal coral cover and is largely comprised of bare sea floor.
Dredge spoil disposal simulations done by Artelia confirmed suitability of this spoil option 2 located at 1.2 km from the entrance of the channel.

In a precautionary approach, we will consider to move dredging disposal area further out to sea (around 200 meters).

8.7.10 Dredge depth

The Dredge depth was reviewed during the FEED phase and in the Concession Agreement, it was proposed at -15mCD for initial stage. Upon review, it was considered to have a better engineering, environmental and society outcome to undertake dredging to final design level -16mCD.
The benefits of doing so are:

- Single event of impact to the environment from dredging and dredge disposal;
- Single round of monitoring and mitigation measures reducing cost and personnel effort for the project;
- Single event of personnel and equipment mobilisation, at reduced cost to the project delivery and reduced personnel demand at later development stages in the project;
- A large portion of the channel and turning basin was already at greater than -16mCD depth and the additional 1m of dredging supplies the required material for reclamation, reducing the environmental impacts from sourcing fill and construction material from land-based sources; and
- Reduced carbon emissions (greenhouse gases) from the project due to a single mobilisation and demobilisation event for dredge plant and equipment.

8.7.11 Reclamation area

The Container Terminal and Reclamation area is to be a total of 27 ha (Phase 2). The container terminal size was studied extensively in a design optimization report compiled by HPC.

During the construction of the reclamation area, a staged approach is proposed to minimise the potential for acid sulphate soils to be exposed to the air developing acidic water in situ. This is done through keeping the sediment submerged under water for as much of the construction process as possible. The construction approach includes stages of reclamation with the use of basins within the reclamation footprint, overflowing into the adjacent basin before a final basin prior to discharge of overflow dewater to the Bay.

Consideration has been made for addition of lime during dewatering in each basin and testing of the dewater quality before discharge to the Bay.

8.7.12 Fill material alternatives

At FEED stage, no additional dredging is expected according to geotechnical information available.

In case additional material would be needed, this would be less impactful to dredge a little bit more without extending area of impact (that means natural seabed have already been removed due to – 16 m requirement and no additional area is dredged) than increasing pressure on existing quarries by requesting them to produce reclamation materials.

An assessment has been undertaken to determine the availability of fill material, and concludes there is no existing quarry able to provide enough materials for this project. Indeed, the demand (without reclamation materials) already requires a significant increase the production for concrete sand, concrete aggregates, land works materials and revetment materials.

8.7.13 Equipment selection

The specifications for equipment to be selected based on their lowest practical noise rating have been included in the design criteria.

9 Impact Assessment and Mitigation Measures

9.1 Overview

The following impact assessment section has been developed in accordance with the regulations and guidelines set by NDPCEI. The Timor-Leste environmental regulations do not currently establish criteria or indicators for assessing the significance of environmental impacts. The Annexes to the General Regulations, The Regulation on the Detailed Requirements for Screening, Scoping and Terms of Reference, Environmental Impact Statements and Environmental Management Plans for Environmental Assessment (Draft 5, 2012) states:

9. Impact assessment and mitigation measures
The proponent shall identify the impacts of the project for each phase of the project, as relevant (design/pre-construction, construction, operation, deactivation/ decommissioning), and assess the significance of the impacts using appropriate methodologies and criteria. This section must include direct and indirect impacts, cumulative impacts, climate change impacts, short, medium and long term impacts, temporary and permanent impacts, positive and negative impacts. This section should include:
   a. methodology and approach
   b. scope of the assessment
   c. identification of impacts
   d. determination of significance of those impacts
   e. mitigation measures
   f. incorporation of mitigation measures into project design
   g. determination of any residual impacts

The key statement which requires the proponent to assess the significance of the impacts using appropriate methodologies has resulted in the development of a modified risk-based assessment of project environmental and social impacts. This approach is discussed further in the next section.
Impact Assessment Framework

Environmental and social impacts of the Project have been assessed based on the level of impact the activity has on each factor, e.g. water, vegetation, heritage. The baseline condition of the factors has been determined from the specialist investigations on site, which are detailed in Section 6 – Description of the Environment. In the Impact Assessment (this Section), the impacts are assessed based on which phase the impact occurs in, i.e. pre-construction, construction, operation and decommissioning. The significance of the impact is considered in relation to the baseline condition.

An impact is quantified based on:

1. Duration of the impact, i.e. permanent (beyond the life of the Project) or short term (<10% of the Project life);
2. Environmental cost, i.e. cost of restoring to baseline condition or relative loss of habitat; and
3. Location of the impact, i.e. localized or regional relative to the Project location and size.

Mitigation measures are then developed for those impacts which are deemed significant or readily mitigated. The post-mitigation impact assessment is undertaken based on the likely success of the mitigation measures. This is termed the 'residual impact'.

9.2 Significance-based impact assessment framework

Quantifying the impact of the development of the Tibar Port Project has been undertaken using a modified 'Significance Assessment Framework' similar to that used in Western Australia (EAG9, 2010). In order to quantify the environmental and social impact of activities associated with the Tibar Port Project; it is necessary to describe what would constitute acceptable and unacceptable risks. When compared to a traditional risk assessment model (e.g. AS/NZS 4360-1999), it is clear that this approach has omitted the "likelihood" or statistical chance of the impact occurring. This approach has been taken because it was necessary only to consider the base case that the Project proceeds as it is currently planned to and it will have an impact on the aspects involved. This results in an assessment of the degree or extent of the impact, categorized from low-extreme over 4 gradations.

The significance of the impact has been considered in the context of its:

1. Duration: long or short term, permanent or non-permanent;
2. Extent: area of influence limited to the impact site only, its immediate vicinity or local or the wider regional area;
3. Qualitative criteria: The measurement of the factor in the field and compared against internationally acceptable criteria and standards for that factor; and
4. Environmental cost: Ease of remediation following impact.

The results from the assessment of significance classifies the potential impacts from 'Low' to 'Extreme' (Table 9-2). The Projects' environmental and social impacts can then be evaluated, from the perspectives required by GoTL legislation, including:

- Distinguish between significant positive and negative impacts;
- Direct and indirect impacts;
- Cumulative impacts;
- Cross-border impacts;
- Global impacts including climate change impacts;
- Long-term, medium-term and short term impacts;
- Describe impacts in quantitative terms; and
- Describe impacts terms of environmental cost and benefits.

Table 9-1: Definitions

Term	**Definition**
Aspect	Land clearing, spills, dredging, emissions, discharge, construction works, concrete pouring Used interchangeably with "Activity" in other texts
Factor	Flora, Fauna, wetlands, groundwater, surface water, heritage
Policy / Regulatory Framework	Regulatory requirements, stakeholder expectations
Environmental impact	Loss of flora and fauna, damage to mangroves, contamination of water, effect on heritage areas or artefacts
Effect	Water quality decline, reduction in coral cover%, reduction in new annual mangrove growth, dust fallout greater than safe environmental levels, noise levels cause health issues in local community
Consequence	Magnitude of the loss of flora and fauna, damage to mangroves, contamination of water, effect on heritage areas or artefacts.
Direct impact	Impact which is caused by the project activity within the Project site or its impact envelope e.g. increased vehicle activity resulting in congestion of access roads in a community
Indirect impact	Impact which is a consequence of a primary impact e.g. Loss of access to a footpath as a secondary impact of increased vehicle activity from construction.
Risk	Chance of the loss/impact occurring on the project during its lifetime
Mitigation	Rehabilitation, fauna relocation, spill response, waste treatment
Residual environmental risk level	Chance of the loss of flora and fauna, damage to mangroves, contamination of water, effect on heritage areas or artefacts *AFTER management/mitigation measures have been implemented*
Uncertainty	The level of confidence in the determined environmental risk level Linked to the level of data collection and its quality
Long term	Greater than the project life or duration Irreversible
Short term	Less than 10% of the project life or duration
Significant	Result which is large enough to matter or be noticed such that the stakeholders may object Has a large effect on which is noticeable when compared to the baseline or before case. Environmental cost is high
Insignificant	Result which is small and one that most rational stakeholders should not object to Has minor effect which is barely noticeable when compared to the baseline or before case. Environmental cost is low
Environmental cost	The cost associated with restoring baseline conditions via rehabilitation The cost to the economy (per capita GDP) e.g. destruction of the habitat used for tourism, removal of fishing grounds for subsistence fishing etc. Quantity of loss of natural resources as% of whole natural resource availability
Environmental benefit	The net improvement to the environment as a result of project action or actions e.g. installation of wastewater treatment plant (WWTP) reduces reliance on pit sanitation systems

Term	Definition
Periodic	Definitive period occurring sporadically during the project life or duration
Regional	The area within 200 km of the project boundary Cross border impact zone Global impact
Sensitive receptors	The settlement of Tibar The settlements located along the coastline at the Port site
TL	Timor-Leste
Localised / Local	The Project site and the area within 20 km from the Project boundary
Long term	Permanent in duration Indefinite duration More than double the project life duration i.e. 100 years
Unique	Endemic Locally significant population of a protected species/habitat type In a conservation reserve Afforded special protection under local laws and regulations
Landform	Naturally formed area having characteristic features
Habitat	Natural, undisturbed area supporting native vegetation and fauna

Factor Significance	Extreme	High	Medium	Low
Physical components				
Climate	Regional long term change in climate as a result of project activities through GHG emissions > **e.g. Kyoto pre-1990 levels of CO2 emissions in TL**	Some change to the CO_2 contribution from TL as a result of this project	Negligible change to the CO_2 contribution from TL as a result of this project	No change to the CO_2 contribution from TL as a result of this project
Topography, Geology, and Soils	Regional Soil Contamination that cannot be readily remediated Long term impact on landforms and soils regionally which require ongoing, comprehensive remediation	Local contamination of soil which requires local long term or regional short term remediation Extensive erosion of landforms leading to local loss of unique habitat	Local soil contamination which can be readily remediated Minor erosion effects	Localised and short term disturbance of soils and landforms which are readily remediated
Air quality & Dust(excl. GHG)	Regional long term change in air quality Continuous & frequent exceedance of ambient air quality standards	Ground level concentrations significantly higher than baseline at sensitive receptors Exceedance of the dust levels in 1 day = 150 µg/m3 at any of the sensitive receptors >10% of the time	Localised, short term exceedance of NEPM standards Exceedance of the dust levels in 1 day = 150 µg/m3 at any of the sensitive receptors <10% of the time	No measurable air quality impacts
Noise & Vibration	Regional long term change in noise levels Continuous & frequent emission of noise beyond permissible levels (38 dB(A) at the sensitive receptors during daylight hours)	Ambient noise levels are significantly higher than baseline at sensitive receptors Noise levels greater than 38dB (A) at the sensitive receptors during all hours	Localised, short term exceedance of Noise Regulation Ambient noise levels exceed Noise levels greater than 38dB (A) at the sensitive receptors during daylight hours	No measurable noise impacts

Factor Significance	Extreme	High	Medium	Low
Surface water	Permanent/ long term changes to water quality of local resources in excess of applicable guidelines (e.g. drinking, agriculture, WWTP discharge) Major changes to surface water hydrology and flow regimes which affect ecological integrity and can be remediated in the long term	Localised, short term changes to water quality exceeding applicable guidelines Long term, local and major changes to catchment surface hydrology i.e. baseflow	Minor changes to local water resources resulting in local short term reduction in water quality but not exceeding guidelines Local and minor changes to sub catchment surface hydrology	Local short term impact on quality and surface water flows which can be easily remediated
Groundwater	Long term effects on groundwater supply, groundwater quality in a the regional area requiring extensive remediation or cannot be readily remediated	Long term, local and major changes to groundwater supply, groundwater recharge i.e. Ecological Water Requirements (EWR)	Minor changes to local groundwater resources resulting in local short term reduction in water quality but not exceeding guidelines Local and minor changes to recharge	Local short term impact on quality and groundwater recharge which can be easily remediated
Coastal and Marine Waters	Regional short term and long term exceedance of background water quality standards (e.g. ANZECC) Regional long term change not easily remediated	Localised long term exceedance of background water quality standards (e.g. ANZECC) Localised short t term change readily remediated	Localised short term exceedance of background water quality standards (e.g. ANZECC) Localised long term change not easily remediated	No detectible impact to water quality from the aspect
Flora (Terrestrial)	Local and regional extinction of a species. Local and regional extinction of a IUCN species Local long term reduction in abundance of an IUCN or regionally significant species Long term perimeter impact	Local short term reduction in the abundance of a significant species Introduction of non-native species e.g. weeds Short term perimeter impacts	Local short term reduction of flora species Local loss of a species or vegetation community	Local short term reduction in the abundance of a species or vegetation community

Factor Significance	Extreme	High	Medium	Low
Wetlands	Clearing, Drainage, dewater or water quality impacts on wetland ecosystem which cannot be rehabilitated to pre-impact condition or better.	Clearing, Drainage, dewater or water quality impacts on wetland ecosystem which through extensive effort and management, can be rehabilitated to pre-impact condition	Short term, localized clearing, Drainage, dewater or water quality impacts on wetland ecosystem which can readily be rehabilitated and managed by the project.	No impact on any Wetland habitat through clearing, drainage or water quality impacts
Mangroves	Clearing, Drainage, dewater or water quality impacts on mangrove ecosystem which cannot be rehabilitated to pre-impact condition or better.	Clearing, Drainage, dewater or water quality impacts on mangrove ecosystem which through extensive effort and management, can be rehabilitated to pre-impact condition	Short term, localized clearing, Drainage, dewater or water quality impacts on mangrove ecosystem which can readily be rehabilitated and managed by the project.	No impact on any mangrove habitat through clearing, drainage or water quality impacts
Fauna (Terrestrial)	Local and / or regional extinction of a species Local and / or regional extinction of a IUCN species Local long term reduction in abundance of an IUCN or regionally significant species Long term perimeter impact Long term Impact on a specific protected fauna species	Local short term reduction in the abundance of a significant species Introduction of non-native species e.g. feral animals Short term perimeter impacts Short term, regional Impact on a specific protected fauna species	Local short term reduction of fauna species Local loss of a species or habitat / community Short term, short range localized impact on a specific protected fauna species	Local short term reduction in the abundance of a species or habitat
Marine fauna, including fisheries	Extinction of one or more species As consequence of this project, the species meet criteria for listing as threatened (IUCN) Regional, long term and irreversible impact to communities and populations Species of marine fauna become regionally extinct	Local short term impact to communities and populations	Local periodic impact to communities and populations	No detectible impact to communities and populations

Factor Significance	Extreme	High	Medium	Low
Marine habitats, including corals	Long and short term loss to benthic habitat Damage to local unique landform habitat	Reversible, short term loss (5 years since initial impact) of benthic habitat	Localised seasonal reduction in benthic habitat growth Does not threaten the viability of the community and population	No detectible impact to communities and populations
Economic components				
Traffic and Transport	Long and short term negative impact on community mobility and livelihood	Periodic negative impact on community mobility and livelihood	Limited negative impact on community mobility and livelihood	No negative or only positive impact on community mobility and livelihood
Employment	Long and short term negative impact on community livelihood	Periodic negative impact on community livelihood	Limited negative impact on community livelihood	No negative or only positive impact on community livelihood
Infrastructure	Long and short term negative impact on existing local infrastructure Long term reduction in the availability of water supply infrastructure and building materials.	Periodic negative impact on existing local infrastructure Short term reduction in the availability of water supply infrastructure and building materials.	Limited negative impact on infrastructure incl. water supply infrastructure and building material	No negative or only positive impact on infrastructure in the project area
Economic Use of Forests and Other Natural Resources	Long and short term negative impact on community livelihood	Periodic negative impact on community livelihood	Limited negative impact on community livelihood	No negative or only positive impact on community livelihood
Fishing	Permanent loss to more than 20% of fishing areas in the local area Significant threat to subsistence and commercial fishing in the local area	Commercial and subsistence decline of species for two seasons or medium term in the local area	Commercial and subsistence loss due to short term, localized change in species abundance Readily rectified by pursuing alternative areas within reasonable distance	No measureable impact on commercial or subsistence fishing Positive impact on fishing due to provision of alternative and assistance/training
Socio Economic Agriculture	Long term impact on subsistence crops / grazing (Not re-established, access eliminated altogether)	Short term impact on subsistence crop / grazing (Re-established elsewhere, access maintained, area not broadly suitable, no assistance provided)	Local, periodic impact on subsistence crop / grazing (Alternative planting location provided, assistance provided to re-establish, water and soil broadly suitable)	No impact on subsistence crop / grazing Positive impact on agriculture due to provision of alternative and assistance/training

Factor Significance	Extreme	High	Medium	Low
Tourism	Permanent loss to more than 20% of tourism areas in the local area Significant threat to independent and commercial tourism in the local area	Decline of Commercial and independent tourism activity for two seasons or medium term in the local area	Commercial and independent operators loss due to short term, localized change in tourism performance Readily rectified by pursuing alternative tourism areas within reasonable distance	No measureable impact on commercial or independent tourism Positive impact on tourism due to provision of alternative and assistance/training
Social components				
Population and Community	Regional, long and/or short term changes to population numbers and composition which cannot be addressed by administrative mechanisms	Local short term changes to population numbers and composition which can be addressed by administrative mechanisms	Local periodic changes to population numbers and composition which can be addressed by administrative mechanisms	No discernible local or regional impact of the project on the population and community from the status quo
Community Health	Regional, long and short term permanent negative changes to community health which cannot be addressed by administrative mechanisms Infrastructure temporarily negatively impacted by the activity such that it cannot function to maintain community health without significant investment	Local short term changes to community health which can be addressed by administrative mechanisms Infrastructure temporarily negatively impacted by the activity which is manageable with limited additional investment	Local periodic changes to community health which can be addressed by administrative mechanisms Existing infrastructure adequate to manage community health	No discernible local or regional impact of the project on the community health from the status quo
Institutions, Schools, and Health Facilities	Regional, long and short term, permanent changes to access to schools, institutions and health facilities cannot be addressed by administrative mechanisms	Local short term changes to access to schools, institutions and health facilities which can be addressed by administrative mechanisms with extensive support and investment	Local periodic changes to access to schools, institutions and health facilities which can be addressed by administrative mechanisms with extensive support and investment	No discernible local or regional impact of the project on the access to schools, institutions and health facilities from the status quo

Factor Significance	Extreme	High	Medium	Low
Community and Family Structures	Regional long and short term changes to community and family structures composition which can be addressed by administrative mechanisms	Local short term changes to community and family structures composition which can be addressed by administrative mechanisms	Local periodic changes to community and family structures composition which can be addressed by administrative mechanisms	No discernible local or regional impact of the project on the community and family structures from the status quo
Land Ownership and Land Rights	Permanent removal of land rights for local peoples which cannot be addressed by administrative mechanisms and requires a change in law	Short term, local changes to land ownership and land rights which can be addressed by administrative mechanisms	Short term, local changes to land ownership and land rights which can be readily addressed by administrative mechanisms	No impact on Land Ownership and Land Rights for local peoples
Natural Resource Rights	Permanent removal of natural resources rights for local peoples which cannot be addressed by administrative mechanisms and requires a change in law	Short term, local changes to natural resources rights which can be addressed by administrative mechanisms	Short term, local changes to natural resources rights which can be readily addressed by administrative mechanisms	No impact on Natural Resources Rights for local peoples
Cultural heritage, archaeological sites, sacred sites	Short term or long term regional or local impact on heritage and cultural values	Short term local impact on heritage and cultural values and artefacts Information and data insufficient for the area or site; to adequately assess the impact of the activities	Localised, single point impact on heritage values with some destruction or relocation of cultural artefacts required	No impact on heritage values, cultural artefact or significance in the project area
Unique Landscapes	Long or Short term reduction in amenity for stakeholders	Long term, insignificant reduction in amenity Short term, significant reduction in amenity for stakeholders	Insignificant reduction in amenity for stakeholders	No reduction in amenity for stakeholders

Table 9-2: Significance based assessment of impact category

Low	Medium	High	Extreme

Table 9-3: Impact assessment result table

	Impact status	Acceptability	Duration
Extreme	Modifications to the project plan may be required for the impact to be acceptable to stakeholders	Impact not acceptable	Impact is permanent and regional
High	Detailed management strategy with mitigation measures required to implement the project with this level of impact	Impact may be partially acceptable	Impact is permanent and local
Medium	Basic management measures required for project implementation	Impact generally acceptable	Impact is short term and local
Low	Brief mention in the EMP document, adequate data for assessment and management	Impact acceptable	Impact is short term and local

The environmental impacts and factors of interest associated with the project were identified during the scoping process, with the Project Document and ToR approved by the NDPCEI. Consulting key stakeholders and the wider community was an integral part of identifying the key issues and concerns regarding the Project.

9.3 Characterising impacts

Environmental and social impacts may vary in magnitude from no change or only a slight discernible change, to a significant change in the status of the environment or social setting. The significance of an impact is determined as a function of the importance or sensitivity of the receiving environment and the magnitude of the impact.

To assess environmental and social impacts for the Project, the following measures were undertaken:

- Relevant legislation, standards and guidelines for each of the environmental and social factors were identified and applied to the assessment of impacts where applicable;
- The receiving environment (baseline conditions) was described in detail and potential impacts to the environment were identified, and based on the specialist environmental and social investigations undertaken by experienced and qualified personnel;
- The Significance based framework (this section) was applied and resulting classification from 'Low' to 'Extreme' was determined;
- Feedback received during community consultation was used to identify areas of concern for the local community and key stakeholders, and suitable management and mitigation measures were identified;
- Mitigation and management solutions were identified to minimise environmental and social impacts to "As Low As Reasonably Practical" and to aim for "Best Practice"; and

- The residual impacts were determined in consideration of the likely effectiveness of the mitigation measures.

Where possible, environmental control measures have been integrated into the design development of the Project, with a particular focus on avoiding or minimising impacts to as low as reasonably practical, e.g. minimising emissions through using clean technology at the processing plant and power plant, reducing dust impacts etc.

Residual impacts associated with the construction and operation of the Project will be addressed through the implementation of an Environmental Management Plan for construction and operations.

This section provides a detailed impact assessment of each of the factors described in Section 6 (existing environment) and includes a discussion of:

- Methodology and approach (including criteria and indicators and data sources);
- Scope of the Assessment;
- Identification of Impacts;
- Determination of significance of those impacts and residual impacts;
- Proposed mitigation measures to be implemented; and
- Monitoring and reporting requirements, if applicable.

As directed by NDPCEI, the potential impacts from the Project have been assessed based on the following phases:

Preconstruction	Construction	Operation	Decommissioning
No onsite activities Engineering design and procurement activities	Dredging and spoil dumping Reclamation area development Clearing of the site/area – excavation, piling, pouring of concrete foundations and permanent establishment of laydown area, offices and workshops Building structures in concrete and steel Establishment of bunds, drainage areas Haulage of building materials and supplies by truck Piling and construction of jetty Construction of internal access roads	Port operation 24 hours a day, 7 days a week Truck hauling Operating port and Maintenance clearing (e.g. tree lopping for power lines)	Not applicable

9.4 Impact assessment summary

The impacts have been assessed for the construction and operations phase before mitigation measures are applied; and in accordance with the Significance-based impact assessment framework as detailed in section 9.2.

There is no decommissioning phase of this project.

Risk ranking	Pre-Construction Impacts	Construction Impacts	Operations Impacts
Extreme	N/A	N/A	N/A
High	▪ Land Ownership and Land Rights ▪ Natural Resources Rights ▪ Cultural Heritage	▪ Noise ▪ Terrestrial Fauna (birds) ▪ Megafauna - Underwater noise ▪ Benthic Habitat ▪ Fishing and marine Habitat use ▪ Land Ownership and Land Rights ▪ Natural Resources Rights ▪ Cultural Heritage	▪ Noise ▪ Megafauna - Underwater noise ▪ Land Ownership and Land Rights ▪ Natural Resources Rights
Medium	▪ Community health ▪ Family Structure	▪ Contamination (PASS) ▪ Coastal Marine water quality ▪ Megafauna - Vessel collision ▪ Population and Community ▪ Community health ▪ Institutions Schools and Health Facilities ▪ Family Structure	▪ Contamination (Anthropogenic) ▪ Surface and groundwater ▪ Terrestrial Fauna (birds) ▪ Megafauna - Vessel collision ▪ Traffic ▪ Fishing and marine Habitat use ▪ Population and Community ▪ Community health ▪ Institutions Schools and Health Facilities ▪ Family Structure ▪ Cultural Heritage

Risk ranking	Pre-Construction Impacts	Construction Impacts	Operations Impacts
Low	▪ Employment ▪ Infrastructure ▪ Institutions Schools and Health Facilities	▪ Greenhouse Gases (Climate) ▪ Topography, geology and soils ▪ Air Quality ▪ Surface and groundwater ▪ Terrestrial Flora ▪ Megafauna – light ▪ Megafauna – oil spills ▪ Traffic ▪ Employment ▪ Infrastructure ▪ Economic use of forest and other natural resources	▪ Greenhouse Gases (Climate) ▪ Topography, geology and soils ▪ Air Quality ▪ Coastal Marine water quality ▪ Terrestrial Flora ▪ Megafauna – light ▪ Megafauna – oil spills ▪ Benthic Habitat ▪ Employment ▪ Infrastructure ▪ Economic use of forest and other natural resources

9.5 Climate

9.5.1 Management objectives

The following international standards may be applicable in relation to climate and greenhouse gas emissions:

- To ensure the atmospheric emissions (i.e. carbon monoxide) are minimized as much as practicable; and
- To ensure design of project components accommodate climate change, including sea level rise and severe weather events etc.).

9.5.2 Applicable standards and legislation

The following international standards may be applicable in relation to climate and greenhouse gas emissions:

- UNFCC (1992) and the Kyoto Protocol; and
- Australian National Greenhouse and Energy Reporting Act (2007);
- IPCC; and
- Australia Clean Energy Act, 2011 detailing similar industry emissions in the Liable Entities Public Information Database.

9.5.3 Impact assessment

Pre-construction

There are no activities on the ground occurring during the pre-construction phase and therefore there is no impact.

Construction

During construction, vehicles are to be used to move material and personnel. These vehicles have been included as trucks, excavators, grader, water carts, buses and scooters. The vehicles fuel consumption has been based on 8 hour working day and all vehicles consuming diesel fuel. The total diesel consumed by vehicles per year of construction is 670 kL.

Construction vessels include the dredge and support vessels including tugs and barges including crane barges. These vessels will use up to 4,491 kL diesel fuel during the dredging campaign and drop off to 490 kL fuel when dredging is complete.

Construction power is to be sourced from generators and the national electricity grid, with mobile light spots in use where construction is required during the night. It is anticipated that up to 47kL of diesel is required for power supply for each year of construction.

The contribution of the Tibar Port Project to the Timor-Leste national greenhouse gas emissions is less than 1% overall. The major contributors are the dredge in the construction phase, where 12,169 t CO_2 e- comes from the dredge. In the Operational phase, the majority of the contribution is from vehicles moving freight from the port to Dili.

The project impacts during construction on Greenhouse Gases (Climate) are '**Low**'

Operations

During operations, vehicles are to be used to move material and personnel. These vehicles have been included as trucks, mobile harbor cranes, reach stacker, empty handlers, excavators, grader, water carts, buses and scooters. The vehicles fuel consumption has been based on 8 hour working day and all vehicles consuming diesel fuel. The total diesel consumed by vehicles per year of operation is between 14,000 kL and 28,000 kL in 2030 and 2045 respectively.

Operations vessels include tugs and the vessels which enter the port area. The vessels fuel consumption is 89 kL per year, based on two tug trips per day and 2 hours of vessel transit in port.

Operations power is to be sourced from the national electricity grid, with mobile light spots in use in case of emergency. It is anticipated that up to 20 kL of diesel is required for emergency power supply for each year of operations. The emissions from the supply of power by the national grid are not considered as direct emissions sources by the NGERS, however the calculated energy content is 567 GJ per annum for 160,000 kWh based on a 18 MVA power source and a power factor of 0.6.

The forecast tons CO2 e- is 2,000,000 for the whole of East Timor for the year 2020 according to the Timor-Leste Initial National Communication report. For this project, the operations phase in 2020 represents 2.12% of Timor-Leste's forecast total tons CO2 e- . In 2045, the emissions total from the project increases to 4% of Timor-Leste's forecast CO2 e- total.

The project impacts during operations on Greenhouse Gases are '**Low**'

9.5.4 Mitigation measures

Pre-construction

The Detailed Design should consider optimum Greenhouse Gas performance for all vehicles, plant and equipment, vessels and dredge machines.

Construction

- All on-site vehicle traffic shall be limited to a speed of 15 mph on unpaved roads;
- All areas with vehicle traffic shall be watered or have dust palliative applied and all material transported off-site shall be sufficiently watered
- No vehicles, equipment or plant will be left idling unnecessarily;
- Non Road Mobile Machinery (vehicles and plant) should be well maintained.
- Use a good quality fuel (e.g. with low sulphur content); and
- Engines and exhaust systems should be regularly serviced according to manufacturer recommendations and maintained to meet statutory limits/opacity tests.

Operations

- Equipment will be turned off when not used for extended periods;
- Optimising tug boats working time.
- Fuel substitution: using fuel with lower sulphur content, or using a cleaner fuel
- Provide the need-based safety measures by providing PPE to the workers based on the nature of the work;
- Safety with staff training and the organisation of annual awareness campaigns; and
- Controlled access to the site with warnings around the perimeter.

9.6 Topography, geology and soils

9.6.1 Management objectives

The key objectives for the management of landforms, geology and soils for the Project are to:

- Maintain the integrity, ecological functions and environmental values of landforms, geology and soil;
- Minimize permanent landform alterations; and
- Ensure that the modifications to landforms are physically and environmentally stable and sustainable.

9.6.2 Applicable standards and legislation

The general requirements contained in the convention below applies:

- United Nations Convention to Combat Desertification to combat desertification and mitigate drought in affected countries through international cooperation and partnerships.

9.6.3 Impact assessment

Pre-construction

There are no activities on the ground occurring during the pre-construction phase and therefore there is no impact.

Construction

The design and layout of the Tibar Port project has maximised the use of dredge material as fill and has limited the amount

of any ground adjacent to the port footprint. This is a positive environmental impact of rock and sand required from quarries on terrestrial Timor-Leste. This is a positive environmental impact of the project.

The reclamation area is located where an extension of the existing landform is created and does not require the excavation or levelling to topography and landforms on the project.

Sedimentation which may occur during heavy rains is mitigated by the oversized culverts located adjacent to the port area.

Potential impact from contamination from spills and waste are assessed in the section which follows.

The impact on topography, geology and soils during construction is expected to be '**Low**'.

Operations

The operations activities of shipping and truck movements are not expected to impact topography or geology because once construction is complete, no further earthworks are planned.

Operations may be impacted by sedimentation from the drainage adjacent to the port footprint, however management of the culverts and regular maintenance of drains is included in the operations plan for the port.

Potential impact from contamination from spills and waste are assessed in the section which follows.

The impact on topography, geology and soils during operations is expected to be '**Low**'.

9.6.4 Mitigation measures

Pre-construction

There are no ground works occurring in the pre-construction phase and no mitigation measures apply.

Construction

Management of culverts and regular maintenance of drains to be included in the construction plan for the port to mitigate impacts from sedimentation and land use changes.

Operation

Management of culverts and regular maintenance of drains to be included in the operations plan for the port to mitigate impacts from sedimentation and land use changes.

Regular bathymetry to monitor sedimentation during Operations

Decommissioning

This phase is not applicable to this project

9.7 Contamination

9.7.1 Management objectives

The key objectives for the management of contamination for the Project are to:

- Maintain the integrity, ecological functions and environmental values of the soil, sediment and water quality in the marine and terrestrial environment;
- Minimize impact from contamination and spills; and
- Minimize impact from acid sulphate soils.

9.7.2 Applicable standards and legislation

The standard which is used to assess the extent of impact on soil quality is contained in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Interim Sediment Quality Guidelines) (ANZECC and ARMCANZ 2000).

For this EIS, the standard used to assess the extent of contamination of soil and water by hydrocarbons, metals and biological contaminants is contained in the Contaminated sites guidelines: Assessment and management of contaminated sites (Department of Environment and Regulation, 2014).

The standard used to assess ground and surface water quality is contained in the Water Decree Law 2004/04 Quality of drinking water which is based on the WHO standards Drinking water quality guidelines.

Contamination of the soil and geology may likely be identified through monitoring of water resources around the site. Sampling and assessment methodology is contained in the Contaminated sites guidelines: Assessment and management of contaminated sites (Department of Environment and Regulation, 2014).

Other relevant standards for determining the thresholds for measured contaminant values are contained in Australia's National Environment Protection (Assessment of Site Contamination) Measure, 2013.

Contamination resulting from wreck and infrastructure removal is likely and guidelines pertaining to Nairobi International Convention on the Removal of Wrecks (IMO, 2015) and Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (MARPOL)

9.7.3 Impact assessment

Pre-construction

There are no ground works occurring in the pre-construction phase and no impact assessment apply.

Construction

During construction, removal of existing infrastructure and wrecks will occur. The potential impact from oil spills and other chemical spills as a result of the salvage works are considered to be possible. During the assessment, samples were analysed for a range of contaminants which may enter the environment as a result of leaks from these old vessels and infrastructure, however they were detected at levels below the Ecological Screening Levels (ESLs).

Dredging and reclamation is likely to aerate and stir the sediments within Tibar Bay and all the samples taken and analysed during the survey were found to contain PASS in excess of the guideline value.

The potential impact from litter and anthropogenic sources has been identified, however this is readily mitigated through litter control measures.

The potential impact of contamination during construction is '**Medium**'.

Operations

There is the potential for impact from contamination during operations. This impact may be from oil spills, surface oil and grease spills and solid waste litter.

The potential impact of contamination during operations is '**Medium**'.

Decommissioning

This phase is not applicable to this project.

9.7.4 Mitigation measures

Construction

When onshore disposal is to be conducted of the dredge material, due to the PASS exceeding the guideline in most samples, liming should be undertaken. The mass of liming required was also calculated during the laboratory analysis, known as the liming rate. In order to ensure sufficient liming, the maximum liming rate of 14 kg $CaCO_3$/t is recommended to be used to ensure adequate amelioration of generated acid when the dredge spoil is exposed to the atmosphere.

Mitigation Measures for contamination pertaining to contamination from vessels and oil spills are detailed in the Environmental Management Plan and the Port Marine Spill Contingency Plan.

Operations

Mitigation Measures for contamination pertaining to contamination from vessels and oil spills are detailed in the Environmental Management Plan and the Marine Oil Spill Contingency Plan.

The mitigation measures for litter and waste management includes:

- Good housekeeping practices
- Provision of solid waste removal services to the project site
- Education of employees around the safety and environment impacts from litter

9.8 Air quality

The project construction and operations phase includes vegetation clearing, earthworks and dredging; and civil construction activities. These require the movement and operation of manpower and equipment. In this engineering design phase, schematics for engineering construction and plant procurement are developed, however the exact equipment specifications are not developed until a subsequent phase, the Detailed Design.

The primary sources of dust emissions have been detailed through the equipment register. Since the equipment selection has not been confirmed, assumptions have been made around the plant selection and maximum potential sound levels have been used for each type of plant.

9.8.1 Management objectives

The key objectives for the management of air quality impacts are to:

- To ensure that atmospheric emissions do not impact on the health, welfare and amenity of the population and land uses and the environment.
- To use all reasonable and practicable measures to minimize airborne dust.

9.8.2 Applicable standards and legislations

In order to determine whether the modelled air quality for the project is in compliance with legislation, a search of relevant local and international standards was undertaken. RDTL do not have published Air Quality Standards, or targets and international best practice standards were used instead.

Parameter	International best practice standard	Proposed interim target limit
Particles as PM_{10}	International Ambient Air Quality Standards (IAAQS), WHO (2009) interim target for developing countries	1 day = 150 μg/m^3
Particles as $PM_{2.5}$	International Ambient Air Quality Standards (IAAQS)	24 hour = 75 μg/m^3 Annual = 70 μg/m^3
Dust fallout	DEC (2005) Approved Methods & Guidance for the Modelling and Assessment of Air Pollutants in NSW'	Annual = 4g/m2/month

9.8.3 Impact assessment

The air quality impact assessment of the construction and operation of the Project used modelling tools which looked at the Projects emission inventory and predicted future ambient air quality. ISC AERMOD View, a steady state plume model was used to predict the ambient concentration surrounding the Project site during the construction and operation phase. The results of the models prediction are presented in the form isopleth maps to describe the dispersion of potential air pollutants over the Project surrounding areas and sensitive receptors.

Pre-construction

There are no physical earthworks occurring in the pre-construction phase and therefore no impacts on air quality.

Construction

The potential impacts to air quality are from:

- dredge and vessel movements;
- earth moving and vegetation clearing activities;
- use of construction equipment mobilizing particulate emissions from paved and unpaved roads and material storage; and
- direct emissions from vehicles and plant in the form of fuel combustion (i.e. exhaust fumes) and brake wear.

The air quality model indicates that all calculated 1st high 1 hour/24 hour/annual concentrations for CO, SO2, $PM_{2.5}$ and PM_{10} were below the standards.

The project impacts during construction on Air Quality are '**Low'**

Operations

- indirect emissions from vehicles and plant via the mobilization of particulate emissions from paved and unpaved roads and material stock piling;
- direct emissions from vehicles and plant in the form of fuel combustion (i.e. exhaust fumes) and brake wear; and
- shipping/vessel movements.

The air quality model indicates that higher ambient concentrations were predicted to occur during the operation phase due to an increased contribution of emissions from vehicle fuel combustions on roadways moving to and from the Port,

The projected increase in the dust ($PM_{2.5}$) levels at the Tibar Primary School as a result of the project operations is directly linked to the projected traffic increase. The peak increase in dust levels at the Primary School has been modelled to be 18 µg /m3, which is below the allowable limits.

The project impacts during operations on Air Quality are '**Low**'

Decommissioning

There is no decommissioning phase for this project.

9.8.4 Mitigation measures

Pre-construction

The Detailed Design should consider Greenhouse Gas performance for all:

- Vehicles;
- Plant and Equipment;
- Vessels; and
- Dredge machines.

Construction

- All on-site vehicle traffic shall be limited to a speed of 15 mph on unpaved roads;
- All areas with vehicle traffic shall be watered or have dust palliative applied and all material transported off-site shall be sufficiently watered
- No vehicles, equipment or plant will be left idling unnecessarily;
- Non Road Mobile Machinery (vehicles and plant) should be well maintained.
- Use a good quality fuel (e.g. with low sulphur content); and
- Engines and exhaust systems should be regularly serviced according to manufacturer recommendations and maintained to meet statutory limits/opacity tests

Operation

- Equipment will be turned off when not used for extended periods;
- Optimising tug boats working time.
- Fuel substitution: using fuel with lower sulphur content, or using a cleaner fuel
- Provide the need-based safety measures by providing PPE to the workers based on the nature of the work;
- Safety with staff training and the organisation of annual awareness campaigns; and
- Controlled access to the site with warnings around the perimeter.

Decommissioning

There is no decommissioning phase for this project.

9.9 Noise and vibration

9.9.1 Management objectives

The key objectives for the management of noise and vibration impacts are to:

- To ensure that noise and vibration emissions do not impact on the health, welfare and amenity of the population, land uses and environmental values.
- To ensure that noise and vibration emissions, both individually and cumulatively, comply with the appropriate statutory requirements.
- To ensure design and procurement activities incorporate measures for minimising noise and vibration emissions during all phases of the Project; and
- To ensure that all reasonable and practicable measures are undertaken during construction and operations to minimise noise and vibration emissions.

9.9.2 Applicable standards and legislation

The standards referenced in the assessment are:

- UNTEAT (2001) No. 8 Guideline on Ambient Noise
- Australian Standard AS 2436-2010 Guide to Noise and Vibration control on construction, demolition and maintenance sites
- Department of Environmental Protection (1997) Environmental Protection (Noise) Regulations. Government of Western Australia

Table 9-4 below outlines the sound levels applicable for the durations of noise emission.

The influencing factor is applied to account for noises which include tonality, modulation and impulsiveness. This relates to sounds which produce an additional impact as a result of their characteristics.

Table 9-4: Noise standards (maximum) from UNTEAT (2001)

Sensitive Receptor Type	Noise Exposure Value (dBA)
Tibar Port Project Maximum Permissible Noise Level (daytime) – Calculated (DEP Noise Regulations,1997)	**68 dB(A)**
Residential, Institutional and Educational Receptors	50 – 55 dB(A)
Commercial Receptors	70 dB(A)
Industrial Receptors	7 dB(A)

9.9.3 Impact assessment

Pre-construction

There is no ground activity during this phase and therefore no impacts to the environment are expected.

Construction

The modelled results show that using 100% of the amount of equipment, the noise level at the sensitive receptors exceeds noise limit of 68 dB(A). In the scenario where 70% of the equipment is used, the noise level at the sensitive receptors is 66 dB(A), which is slightly below the limit of 68 dB(A).

The impact on Noise from the project construction is therefore '**High**'

Operations

The modelled results show that using 100% of the amount of equipment, the noise level at the sensitive receptors is 69 dB(A), which exceeds the noise limit of 68 dB(A). In the scenario where 70% of the equipment is used, the noise level at the sensitive receptors is 67 dB(A), which is below the limit of 68 dB(A).

The impact on Noise from the project operation is therefore '**High**'

Decommissioning

There is no decommissioning phase for this project.

9.9.4 Mitigation measures

Pre-construction

The greatest influence on the project noise impacts is the selection of equipment to be used on site. The specifications as follows should be included in design and procurement documents:

- Where practicable, all equipment, plant, machinery and vessel noise emissions shall be rated at maximum 85 dB(A) at 1 metre distance

This is a significant reduction to the noise emissions modelled during the specialist study and is likely to result in a significant reduction in predicted noise exposure levels at the sensitive receptors. In accordance with the equations provided in AS 2436-2010 (AS 2436, 2010) the predicted noise levels from a single 85 dB at 1m emission source, is 45 dB(A) 100 m away from the source.

This falls below the noise standard of the project at 100m from source and therefore would be below the project noise standard at the nearest sensitive receptor. Currently the equipment has been modelled at between 80 dB(A) and 140 dB(A) ratings.

Construction

- Use selected equipment with the lowest possible noise specifications. If a noise complaint is recorded through the grievance framework and monitoring confirms it is above the guideline level a retrofit mitigation measure will be implemented.
- Storage areas should be located away from sensitive receptors.

Operation

- Use selected equipment with the lowest possible noise specifications. If a noise complaint is recorded through the grievance framework and monitoring confirms it is above the guideline level a retrofit mitigation measure will be implemented.

Decommissioning

There is no decommissioning phase for this project.

9.10 Surface water

Addressed in Groundwater and Surface Water

9.11 Groundwater and surface water

9.11.1 Management objectives

The key objectives for the management of groundwater impacts are to:

- Maintain the integrity, ecological functions and environmental values of groundwater;
- Minimise the impact on the flow and quality of springs; and
- Ensure that mine dewatering impacts (drawdown) are limited in geographic extent and are quantified.

9.11.2 Applicable standards and legislation

The following standards and legislation is applicable to groundwater:

- Timor Water Supply Guidelines (undated, Ministerio das Infra-Estruturas);
- Water Decree Law 2004/04; and
- Guidelines for Drinking -Water Quality WHO, 2008.

9.11.3 Impact assessment

Pre-construction

There is no ground activity during this phase and therefore no impacts to the environment are expected.

Construction

- Clearing of terrestrial vegetation potentially resulting in increased run-off and sedimentation. This is not expected to be an impact because there will be no clearing of terrestrial vegetation for the project. (Note: Mangroves are considered marine habitat under this assessment)
- Increase in people using the project site resulting in pollution of water sources and litter in drainages. The nearest spring used for drinking is 850 m east of the project site and is located in a separate aquifer. Activities on the project site are not expected to impact water quality in the springs or boreholes identified.
- Impact on the water quality used by the Tibar Retreat is not expected as a result of this project because the Retreat uses water brought in from Dili by truck.
- Construction of infrastructure causing changes to flooding regime is not expected to have an impact. The road is not part of the project. Increasing the landside area during port construction will cause localised changes to the drainage and run-off behaviour. (Note: Changes to sedimentation in the marine environment are considered separately.)
- Increase in people using the project site resulting in pollution of water sources and litter in drainages is expected to cause a low level of impact due to the relatively short term nature of the construction.
- Construction of infrastructure in the area changes the surficial aquifer's groundwater flow regime in the local sub-catchment and potentially in the adjacent catchment down-stream of the project site. This has the potential to indirectly impact the spring flows in the Rihui catchment.

The impact on surface and groundwater during construction is '**Low**'.

Operations

- Permanent changes to flooding regime and periodic impacts during extreme rainfall events are expected to have an impact during operations. This is because the port landside increases the drainage area of the catchment and the length of discharge pathways to the ocean.
- Waste water treatment plant discharges into local rivers and drainage causing pollution of local water sources is not expected to be an impact. Wastewater is to be treated on site and clean water discharged into the ocean.
- Permanent siting of infrastructure in the area changes the surficial aquifer's groundwater flow regime in the local sub-catchment and potentially in the adjacent catchment down-stream of the project site. This has the potential to indirectly impact the spring flows in the Rihui catchment.

The impact on surface and groundwater during operations is '**Medium**'.

Decommissioning

There is no decommissioning phase for this project.

9.11.4 Mitigation measures

Pre-construction

There is no ground activity during this phase and therefore mitigation measures are recommended.

Construction

- Cleaning of all oil, fuel and waste spills immediately
- Waste management procedure to control litter
- Correct operation and maintenance of waste water treatment unit
- Mitigation of sedimentation of the culverts and on site drainage by means of an active drainage maintenance programme.
- Mitigation of flooding during extreme runoff events through the use of berms and diversion drains to limit flooding of the construction site.

Operations

- Cleaning of all oil, fuel and waste spills immediately
- Waste management procedure to control litter
- Correct operation and maintenance of waste water treatment unit
- Mitigation of sedimentation of the culverts and on site drainage by means of an active drainage maintenance programme.
- Mitigation of flooding during extreme runoff events through the use of berms and diversion drains to limit flooding of the construction site.
- Regular bathymetry to monitor sedimentation during Operations

Decommissioning

There is no decommissioning phase for this project.

9.12 Coastal and marine water quality

Construction and operation of the wharf may potentially impact the beaches, bathymetry and sediment transport. The wharf is likely to be impacted by the natural events associated with tides, sea level change, storm surge, coastal wind and waves and ocean currents.

9.12.1 Management objectives

The key objectives for the management of potential impacts to coastal and marine water are to:

- Maintain the integrity, ecological functions and environmental values of the marine environment;
- Minimise the impact on bathymetry and sediment transport from the wharf; and
- Minimise the impact on coastal zone including beaches.

9.12.2 Applicable standards and legislation

The following Timor-Leste legislation and international standards may be applicable in relation to coastal and marine waters:

- Law No. 5, 1990 on Conservation of Biological Resources and their Ecosystems.
- Law No. 5, 1994 Concerning Biodiversity.
- Government Regulation No. 51, 1993 on Environmental Impact Analysis.
- UNTAET Regulation No. 2000/17.
- UNTAET Regulation No. 2000/19.
- UNTAET Regulation No. 2000/19 on protected places (30 June 2000) was established for the purpose of protecting designated areas, endangered species, wetlands, mangrove areas, historic, cultural and artistic sites, conservation of biodiversity and protection of the biological resources of East Timor. Fifteen natural areas were protected under this regulation and have been designated as PNAs. The majority comprise primary forest areas, coral reefs, mangroves, wetland habitat and mountain summits above 2,000 m.
- ANZECC/ARMCANZ guidelines (2000) for marine environments (Tropical Australia).

9.12.3 Impact assessment

Pre-construction

There is no ground or in water activity during this phase and therefore no impacts to the environment are expected.

Construction

Coastal processes were modelled over a 30 day simulation period, for a representative period each of the seasons, the monsoon (February) and the dry season (October). The results of the modelling indicate that:

- There are no significant changes to sedimentation rates, either from the Comoro River and local rivers or from coastal processes changes as a result of landform modifications due to port construction.
- There are no significant changes to flushing in and out of Tibar Bay as a result of the construction of the port infrastructure and diversion of the drainage line at the reclamation area.
- The currents in the deep water straits off the coast of Tibar Bay are predominantly from the south-west to the north-east in the wet season (Monsoon) and reverse in the dry season.

The impact of sedimentation as a result of dredging has been interpreted from the hydrodynamic modelling as being negligible. Sedimentation should not exceed the current rates of 50 mm/month during dredging. This is unlikely to have an impact on the mangrove health in Tibar Bay.

The impact of sedimentation with regards to reducing light availability in the port (i.e. turbidity is expected to be medium because there are some changes to the current behaviour within the Bay. Flushing is not expected to change from the current environmental conditions, in either the Monsoon or dry season conditions.

In the absence of a detailed sediment balance model, the impact on coral and seagrass from reduced light as a result of sedimentation is deemed to be '**High**' for construction.

The creation of a shipping channel and turning circle within the bay has been subject to a hydrodynamic model to determine if there are any changes to the wave and current behaviour within the bay as a result of the port infrastructure being located there. The hydrodynamic model highlights stronger hydrodynamics in the current configuration, especially over the northern reef and the tidal flats.
Under such condition, the expected impact of the project on the wave and current is deemed to be '**Low'** for construction.

Discharge of saline and turbid water from the reclamation area bunds is expected to occur during the dredging and construction period. This is expected to last at least 12 months. The discharge location has not been selected, however it is expected to be as close to the mouth of Tibar Bay as possible, to take advantage of the natural flushing behaviour within the shipping channel.

The potential impact on the water quality within the bay from reclamation water discharge is expected to be '**Medium**'.

Operations

The impact of sedimentation with regards to reducing light availability in the port (i.e. turbidity is expected to be medium because there are some changes to the current behaviour within the Bay. Flushing is not expected to change significantly from the current environmental conditions, in either the Monsoon or dry season conditions.

There are no additional activities which occur in operations which may increase the sedimentation in Tibar Bay. The impact of sedimentation during operations is expected to be '**Low**'.

There are no additional activities which occur in operations which may increase the wave and current in Tibar Bay. The impact on wave and current during operations is expected to be '**Low**'.

The potential impact on the water quality within the bay from treated waste water discharge is expected to be '**Low**'. The treated waste water is subject to end-of-pipe discharge water quality criteria in accordance with the applicable standards and guidelines.

Decommissioning

There is no decommissioning phase for this project.

9.12.4 Mitigation measures

Pre-construction

N/A

Construction

Implement the Dredge Management Plan to mitigate the impacts on sedimentation impacts on coral and seagrass within Tibar Bay and the impact area

Operations

Implement the Environmental Management Plan and best practice port operating procedures to mitigate the potential impacts on water quality and contamination on coral and seagrass within Tibar Bay and the impact area

Decommissioning

There is no decommissioning phase for this project.

9.13 Fauna and vegetation (birds)

9.13.1 Management objective

The key objectives for the management of terrestrial vegetation and fauna are to:

- Maintain the abundance, diversity, geographic distribution and productivity of flora and fauna at the species and ecosystem levels through the avoidance or management of adverse impacts.

9.13.2 Applicable standards and legislation

There has been no national mapping of vegetation communities in Timor-Leste and relatively few published botanical surveys making it difficult to place survey results into a regional or national context. Therefore, the IUCN has been used as the local standard for assessing the impact on flora.

The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on plants, fungi and animals that have been globally evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those plants and animals that are facing a higher risk of global extinction.

The following legislation and regulations are applicable to the environmental protection and biodiversity conservation in Timor-Leste:

- Law No. 5, 1990 on Conservation of Biological Resources and their Ecosystems;
- Law No. 5, 1994 Concerning Biodiversity;
- Government Regulation No. 28, 1985 on Forest Protection;
- Government Regulation No. 51, 1993 on Environmental Impact Analysis;
- UNTAET Regulation No. 2000/17; and
- UNTAET Regulation Regulation No. 2000/19.

9.13.3 Impact assessment

Pre-construction

There is no ground activity during this phase and therefore no impacts to the environment are expected.

Construction

There will be no direct impact on terrestrial flora as a result of the project development. The impact is deemed to be "**Low**". Clearing / disturbance activities associated with the proposed port will be restricted to shoreline and marine areas.

There will be no direct impact on terrestrial fauna as a result of the project development. The impact is deemed to be "**Low**". Clearing / disturbance activities associated with the proposed port will be restricted to shoreline and marine areas.

The removal of rock outcrops located on the intertidal areas from the project footprint is likely to reduce the available roosting sites for the Endangered Great Knot. The destruction of mudflat, seagrass and mangrove habitat in the project footprint is likely to reduce the available foraging area for the Endangered Far Eastern Curlew. The increase in vessel and vehicle activity within the Tibar Bay is likely to impact the birds' ability to forage and roost and negatively impact the links with Lake Tasi Tolu as a regional wetland linkage and foraging and roosting extent.

The direct impact resulting from the clearing of habitat in the project footprint is deemed to be '**High**'.

Operations

Ongoing impacts to vegetation and fauna during port operations are deemed to be "**Low**". All clearing / disturbance activities will occur during the construction phase only.

The increase in vessel and vehicle activity within the Tibar Bay is likely to impact the birds' ability to forage and roost and negatively impact the links with Lake Tasi Tolu as a regional wetland linkage and foraging and roosting extent.

The direct impact resulting from the ongoing activity during operations is deemed to be '**Medium**'.

Decommissioning

There is no decommissioning phase for this project.

9.13.4 Mitigation measures

Pre-construction

A project-wide commitment to limiting the direct and indirect impacts to terrestrial vegetation and fauna include mitigation measures such as:

- Reclamation of land through alternative use of dredge spoil material if possible, thereby reducing the need to clear terrestrial vegetation for infrastructure.
- Selection of the site to limit impact on habitat with the site selected having the lowest possible clearing footprint of all the configuration options.

Construction

A project-wide commitment to limiting the direct and indirect impacts to terrestrial vegetation and fauna include mitigation measures such as:

- Reduction in dust generated through the implementation of a Dust Management Plan including wetting of unsealed roads, limiting dust generating activities when it is windy and monitoring of dust levels in the project area.

The approach proposed for the mitigation and management of impacts on Avifauna (birds) are further detailed in the project's Biodiversity Action Plan.

Operations

A project-wide commitment to limiting the direct and indirect impacts to terrestrial vegetation and fauna include mitigation measures such as:

- Reduction in dust generated through the implementation of a Dust Management Plan including wetting of unsealed roads, limiting dust generating activities when it is windy and monitoring of dust levels in the project area.

The approach proposed for the mitigation and management of impacts on Avifauna (birds) are further detailed in the project's Biodiversity Action Plan.

Decommissioning

There is no decommissioning phase for this project.

9.14 Marine fauna

9.14.1 Management objectives

The key objectives for the management of marine fauna (including fisheries) are to:

- Maintain the integrity, ecological functions and environmental values of the marine environment; and
- Minimise the impact on marine fauna, fisheries and habitats from the shipping channel, wharf and turning basin.
- Minimise impacts to marine fauna from underwater noise generated from construction and operations activities;
- Avoid collisions with marine fauna

9.14.2 Applicable standards and legislation

The following Timor-Leste legislation and international standards may be applicable in relation to marine fauna:

- Law No. 5, 1990 on Conservation of Biological Resources and their Ecosystems.
- Law No. 5, 1994 Concerning Biodiversity.
- Government Regulation No. 28, 1985 on Forest Protection.
- Government Regulation No. 51, 1993 on Environmental Impact Analysis.
- UNTAET Regulation No. 2000/17.
- UNTAET Regulation No. 2000/19.

- UNTAET Regulation No. 2000/19 on protected places (30 June 2000) was established for the purpose of protecting designated areas, endangered species, wetlands, mangrove areas, historic, cultural and artistic sites, conservation of biodiversity and protection of the biological resources of East Timor. Fifteen natural areas were protected under this regulation and have been designated as PNAs. The majority comprise primary forest areas, coral reefs, mangroves, wetland habitat and mountain summits above 2000 m.
- ANZECC/ARMCANZ guidelines (2000) for marine environments (Tropical Australia).
- The International Convention for the Control and Management of Ships' Ballast Water and Sediments (IMO 2004) provides standards and requirements for the control of marine pest translocation in ships ballast.
- At present there is no international convention for the management of biofouling, however the Australian government has developed a National System for the Prevention and Management of Marine Pest Incursions (NSPMMPI, 2009).

9.14.3 Impact assessment

Impacts on cetaceans and marine megafauna have been assessed for the following aspects:

- Noise (underwater noise)
- Vessel strikes
- Lighting
- Oil and chemical spills

Pre-construction
There is no ground / in water activity during this phase and therefore no impacts to the environment are expected.

Construction
During construction activities **underwater noise** will be generated from the following sources:

- Operation of support vessels and the use of bow thrusters to maintain position;
- Dredger;
- Tug vessels;
- Crane barge; and
- Sheet piling

Typical source noise levels from natural sources and proposed construction activities are outlined in Table: 9-5 below.

Table: 9-5 Typical noise characteristics from natural and anthropogenic sources

Source	Source Sound Intensity (dB re 1 μPa sound pressure level)	Dominant Frequency (Hz)
Natural Noise		
Ambient sea sound	80- 120	Varied
Undersea earthquake	272	50
Lightning strike on sea surface	250	Varied
Breaching whale	200	10- 100
Bottlenose dolphin click	<229	Up to 120,000
Humpback whale (fluke and flipper slaps)	192	30-1,200
Humpback whale vocalisation	179	50-10,000
Sperm whale clicks	<235	100- 30,000
Blue whale vocalisation	190	12-400
Marine turtles		100-800
Anthropogenic Noise		
Vessels-small to medium (<100 m in length)	160-180	100-1,000
Vessels greater than 100 m	180	10-1,000
Vessels-holding station in strong currents using dynamic positioning (DP)	137	Broadband
Piling operations	207-209 at 1m	100-2,000
Dredge vessel	118-185 at 1m	Not available

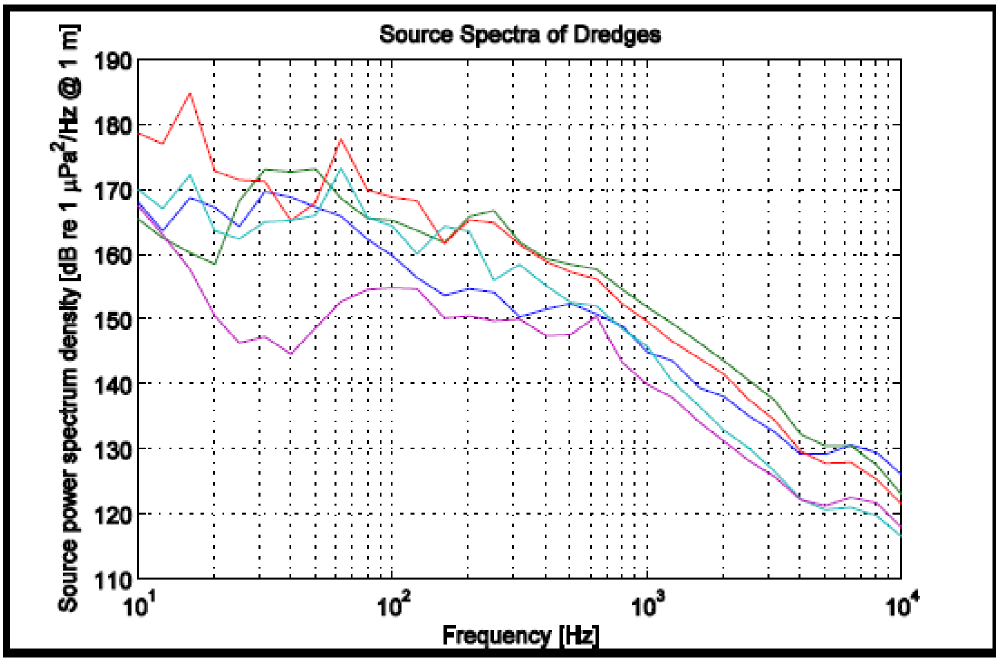


Figure 9-1: Source spectra of various types of dredges recorded by JASCO (2011)

Piling, dredging and other anthropogenic sound sources have a hierarchy of effects on marine fauna which depend critically on the distance from the sound source, the sound frequency and intensity and on hearing, vocalisation and other biological characteristics of the organisms. For a given source, the effects diminish with range depending on sound attenuations and the organism's sensitivity. The effects of pile driving with increasing distance from the source are outlined in Figure 9-2.

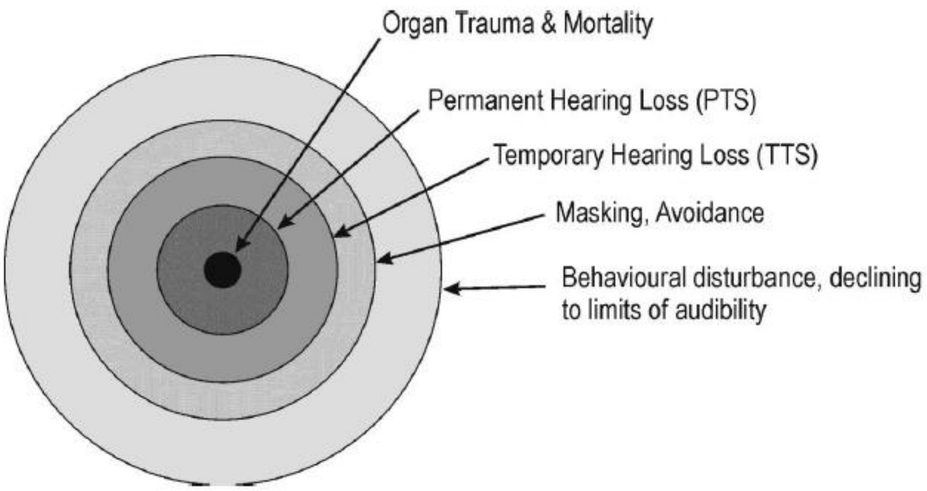


Figure 9-2: Potential effect of pile driving and other subsea sound source with increasing distance from the source

Sound exposure criteria used in this impact assessment are summarised in Table 9-6.

Table 9-6: Sound exposure criteria

Species	Response	Sound Intensity (dB re 1 μPa sound pressure level)	Source
Cetaceans, dugongs and turtles	Onset of PTS and organ trauma	230 dB re 1 μPa	Southall *et al.*, 2007
Cetaceans and dugongs	Onset of TTS and behavioural disturbance	183 dB re 1 μPa	Southall *et al.*, 2007
Turtles	Behavioural response in turtles	166 dB re 1 μPa	McCauley *et al.*,2000
Turtles	Avoidance behaviours in turtles	175 dB re 1 μPa	McCauley *et al.*,2000

Impacts to cetaceans and dugongs as a result of the operation of support vessels are unlikely as the sounds levels generated by support vessels are below the proposed criteria for behavioural disturbance (183 dB re 1 μPa) (Southall *et al.*, 2007). The operation of dredge vessels may result in behavioural disturbance to cetaceans and dugongs in the vicinity of the bay as sound level ranges generated by dredge vessels are within proposed criteria for behavioural disturbance.

The main source of underwater noise will be piling activities. As the source noise levels as a result of piling are 207-209 dB re 1 μPa (Figure 9-2) behavioural disturbance to dugongs in the vicinity of Tibar Bay is likely. As the whales migration path along the 200 m bathymetry contour is 3 km from the project area behavioural disturbance to whale during migration activities is unlikely.

Although little is known about potential impacts on turtles from increased noise exposure, (McCauley *et al.* 2000) suggested that marine turtles may begin to show behavioural responses at 166 dB re 1 μPa but will not show actual avoidance behaviours until 175 dB re 1 μPa. Cumulative exposure is likely to cause a gradual desensitisations to the noise with individuals becoming less likely to be startled or impacted. There were several turtle sightings during previous mega fauna surveys undertaken in Tibar bay (Tourism and Fisheries Department, 2012 and Charles Darwin University 2014. Fishermen have also observed the Green turtle nesting on the beaches of the Tibar bay region-Tasi Tolu to the east and Kaitehu to the west (Charles Darwin University, 2014). As the typical noise levels generated from vessel movements and piling activities are above the behavioural response threshold for turtles, behavioural responses to underwater noise are likely from turtles that reside in the bay.

A cumulative assessment of the 2014 surveys and fisherman interviews, together with the results of the opportunistic observations undertaken in 2016 and 2017, indicates that Tibar Bay can be considered Tier 2 critical habitat for green, loggerhead, olive ridley and hawksbill turtles.

While sandy habitat is present in the bay it is unlikely that marine turtles nest successfully in the bay given the lack of supratidal habitat, the lack of suitably deep sand to construct nests in and the presence of predators (dogs, pigs).

The construction of the port development Tibar Bay is expected to reduce the area of seagrass meadow and coral habitat in the south end of the bay. Seagrass beds, coral reef and soft bottom habitat in the north of the bay is not expected to be impacted and any effects will be short lived and end with the constructions phase. The foraging habitat present within Tibar Bay is well represented regionally and so is not critical to the population level survival of the four species found in the region.

It is possible females using Tibar Bay to internest between clutches will be exposed to disturbance caused by dredging and construction activity. The biggest risk to internesting females will be from a dredge and it is recommended that some form of dredge management be included to reduce this risk (this will be dependent on the type of dredging program planned). The small footprint of the project and the short time frame for construction will limit this impact to 1 – 2 breeding seasons and will have no significant or detectable impact at the population level.

Operation of the port will result in an increase the size and numbers of ships using the bay. There is a chance of an increase in turtles being hit by vessels as they surface to breathe, or during mating, however the slower speeds of vessels moving into and out of the port will reduce this risk.

Fahi Obuk, a confirmed turtle nest beach adjacent to Tibar Bay, may be impacted from light emissions from the operational port however the topographical variation between Tibar Bay and the beach is expected to shield these emissions significantly (Pendoley and Kamrowksi, 2016)

The impacts of underwater noise on marine megafauna during construction are **High**.

There is an increased likelihood of **vessel strikes** during construction activities in comparison to operations activities due to an increased number of vessels operating in the Project Area. Vessel collision with marine fauna may result in injury or death of marine fauna. Marine fauna that are present in surface waters such as marine turtles and cetaceans are most susceptible to vessel strikes due to their proximity to the vessel (hull, propeller or equipment).

Marine turtles on the sea surface or in shallow coastal waters have been observed avoiding approaching vessels by typically moving away from the vessels track (Hazel *et al*. 2007).

Cetaceans including whales demonstrate a variety of behaviours in response to approaching vessels (attributed to vessel noise), including longer dive times and moving away from the vessel's path with increased speed (Baker & Herman, 1989; Meike *et al.,* 2004). These behaviours may contribute to reducing the likelihood of a vessel strike.

The Project area is 3 km away from northern migration route for whales (the 200 m bathymetry contour.

Given that cetaceans, marine turtles and other marine fauna exhibit avoidance behaviour, the likelihood of vessel collision with marine fauna during vessel activity is **Medium**.

Artificial **lighting** can cause a change in the behaviour of fauna, particularly nesting turtles. The main implication of artificial lighting from offshore vessels for marine turtles is the disruption of hatchling sea-finding behaviour, as hatchlings can be disoriented if lights or atmospheric glow occur away from the sea. Adult turtles are more inclined to avoid brightly lit facilities (Witherington & Martin, 1996). Fishermen have observed the Green turtle nesting on the beaches of the Tibar bay region-Tasi Tolu to the east and Kaitehu to the west (Charles Darwin University, 2014). As the light from construction activities will be generated in the inshore bay area, turtles sea finding behaviour is unlikely to be effected by light from construction activities.

Cetaceans are not expected to be affected by light generated by construction activities. Impacts from light are expected to be **Low.**

Operations

During operations noise will be generated from vessel operations and the use of bow thrusters to maintain positions. Typical sound levels generated by vessel operations and dynamic positions vessels are outlined in Table: 9-5.

Impacts to cetaceans and dugongs as a result of the operation of support vessels is unlikely as the sounds levels generated by support vessels are below the proposed criteria for behavioural disturbance (183 dB re 1 μPa) (Southall *et al.*, 2007).

Although little is known about potential impacts on turtles from increased noise exposure, McCauley *et al.* (2000) suggested that marine turtles may begin to show behavioural responses at 166 dB re 1 μPa but will not show actual avoidance behaviours until 175 dB re 1 μPa.

The results of previous megafauna surveys indicate that the presence of turtles in the vicinity of the bay is likely (Tourism and Fisheries Department, 2012 and Charles Darwin University 2014.)

As the typical noise levels generated from vessel movements and piling activities are above the behavioural response threshold for turtles, behavioural responses to underwater noise are likely from turtles that reside in the bay.

The impacts of underwater noise on marine megafauna during operations are **High**.

The impact of vessel collision is outlined in the section above. As vessel movement in the vicinity of Tibar Bay will increase gradually from smaller to greater amounts during operations the likelihood of vessel collision during operations will be '**Low**' to '**Medium**'.

The impact of lighting on marine fauna is described in Section 9.14.3. Impacts to turtles as a result of lighting from operations activities are unlikely as vessels will spend the majority of time in the vicinity of the bay and will only be offshore in the sight of hatchling turtles for very short periods of time.
Cetaceans are not expected to be affected by light generated by operations activities. Impacts from light are expected to be **Low.**

Oil spill risk

The following are the main risks of a hydrocarbon spill from port construction and operations:
- Collision between vessels;
- Grounding; and
- Spill during bunkering activities.

These risks have the potential to release the following hydrocarbons to the marine environment:
- Heavy Fuel Oil (HFO);
- Intermediate Fuel Oils (IFO);
- Marine Grade Oil / Diesel (MGO); and
- Hydraulic Oils

The maximum credible spill volume as a result of a vessel collision is the volume of the largest fuel tank (AMSA, 2015), indicative volumes are provided in Table 9-7.

The likely spill volumes are outlined in Table 9-8. This assumes that the collision is non-major due to the slow speeds at which the vessels will be operating in the vicinity of the construction site and assumes that vessels may be single hulled.

Table 9-7: Indicative worst case credible scenario

Source	Incident	Location	Fuel Type	Volume
Dredging Vessel	Vessel Collision or Grounding	Tibar Bay	HFO/MGO	150 m^3 (estimated from AMSA 2015 and PPA 2016 using bulk ore carrier)
Tug/Pilot Vessel/Ancillary Dredging Support Vessels	Vessel Collision or Grounding	Tibar Bay	HFO/MGO	30 m^3 (estimated from AMSA 2015 and PPA 2016 using tug/pilot vessel)

Table 9-8: Most likely scenario

Source	Incident	Location	Fuel Type	Volume
Dredging Vessel	Hydraulic Leak	Tibar Bay	Hydraulic Oil	10 m^3 (Estimated)
Dredging Vessel	Bunkering fuel leak	Tibar Bay	HFO/MGO	50 m^3 (Estimated)
Tug/Pilot Vessel	Bunkering fuel leak	Tibar Bay	HFO/MGO	30 m^3 (Estimated)

Marine fauna	Hydrocarbon Impact
Cetaceans (including dugongs)	Whales and dolphins could potentially ingest dissolved oil when feeding in open water or become coated with diesel while surfacing to breathe. Ingestion of oil at the quantities required to induce direct toxic effects is considered unlikely in a spill scenario (Geraci, 1998). Diesel has a low stickiness and would likely quickly wash-off the dorsal surfaces of cetaceans as they dive into deeper waters. Exposure of eyes and mucous membranes may result in irritation. The highest potential risks for dugongs are related to direct ingestion of seagrass or macro-algae exposed to acute or chronic toxicity and or drastic reduction on seagrass coverage due to hydrocarbon spills (Heinsohn *et al*. 1977). Significant impacts to dugongs are unlikely diesel is not predicted to contact any seagrass habitat and under goes rapid dispersion and evaporation. Impact is expected to be **Low** for construction and operations.
Turtles	Harmful effects to turtles may occur through ingestion of oil, inhalation of toxic vapours (e.g. close to the spill source) or irritation to the head, neck and flippers due to oil contact with the skin. Diesel is unlikely to stick to turtles in large amounts since it has a low stickiness and would likely wash off skin surfaces. In the unlikely event that diesel did accumulate at a turtle nesting area, there is potential for adult turtles and/or hatchlings to be impacted. Potential impacts include smothering of adults and hatchling and/ or avoidance behaviour of adult turtles. This could result in failed or aborted nesting attempts or a reduction in survival rates of hatchlings. Impact is expected to be **Low** for construction and operations.
Whale sharks and rays	As whale sharks and rays dwell in the water column, impacts are most likely from the water and food (WAF), through the pathways of ingestion or the coating of gill structures. This could lead to respiratory problems or accumulation of hydrocarbons in tissues. In the worst instance this could lead to mortality, or sub-lethal stress. Impact is expected to be **Low** for construction and operations.
Crocodiles	Studies have shown that crocodiles exhibit avoidance behaviour to petroleum (Donald et al., 2010). Impact is expected to be Low for construction and operations.

Decommissioning

There is no decommissioning phase for this project.

9.14.4 Mitigation measures

Construction

As no legislation/guidelines are currently available for regulating the impacts of underwater noise from piling activities on marine fauna, the measures outlined in the EPBC Act 1999 Policy Statement 2.1 was used in the development of the management measures for piling activities.

- Where practicable, limiting of piling activities to day light hours.
- Marine mammal observers will be on board vessels undertaking piling activities.

- A vessel will not travel greater than 6 knots within 300 m of a whale (caution zone) and not approach closer than 100 m from a whale; and
- A vessel will not approach closer than 50 m or a dolphin and/or 100 m for a whale (with the exception of animals bow riding).

Operations

- A vessel will not travel greater than 6 knots within 300 m of a whale (caution zone) and not approach closer than 100 m from a whale; and
- A vessel will not approach closer than 50 m or a dolphin and/or 100 m for a whale (with the exception of animals bow riding).

9.15 Marine habitat incl. coral

9.15.1 Management objectives

The key objectives for the management of marine habitats (including corals) are to:

- Maintain the integrity, ecological functions and environmental values of the marine environment
- Minimize the impact on marine habitats including corals from the wharf, turning basin and shipping channel.

9.15.2 Applicable standards and legislation

The following Timor-Leste legislation and international standards may be applicable in relation to climate and greenhouse gas emissions:

- Law No. 5, 1990 on Conservation of Biological Resources and their Ecosystems.
- Law No. 5, 1994 Concerning Biodiversity.
- Government Regulation No. 28, 1985 on Forest Protection.
- Government Regulation No. 51, 1993 on Environmental Impact Analysis.
- UNTAET Regulation No. 2000/17.
- UNTAET Regulation No. 2000/19.
- UNTAET Regulation No. 2000/19 on protected places (30 June 2000) was established for the purpose of protecting designated areas, endangered species, wetlands, mangrove areas, historic, cultural and artistic sites, conservation of biodiversity and protection of the biological resources of East Timor. Fifteen natural areas were protected under this regulation and have been designated as PNAs. The majority comprise primary forest areas, coral reefs, mangroves, wetland habitat and mountain summits above 2000 m.
- ANZECC/ARMCANZ guidelines (2000) for marine environments (Tropical Australia).
- The International Convention for the Control and Management of Ships' Ballast Water and Sediments (IMO 2004) provides standards and requirements for the control of marine pest translocation in ships ballast.
- At present there is no international convention for the management of biofouling, however the Australian government has developed a NSPMMPI (2009).

9.15.3 Impact assessment

Pre-construction

There is no ground activity during this phase and therefore no impacts to the environment are expected. During this stage it will be critical to develop the approach for implementing the Biodiversity Action Plan.

Construction

Coral habitat

The area of coral estimated to be directly lost as a result of the dredging and land reclamation for the Tibar Bay project is 11.1 ha of reef flat with up to 20% live coral, and 8.9 ha of up to 100% live coral. The bulk of the direct loss is attributable to the dredging of the turning basin and channel.

Mangroves

An estimated 1.4 ha of mangroves will be permanently removed as part of reclamation of the port, which represents 7.8% of the total mangrove habitat within Tibar Bay.

Alongi (2014) estimates that 1,300 ha of mangrove forest remain in the country, which is a significant decline from 9,000 ha estimated in 1940. This represents an estimated loss of between 80-85% in the last 64 years. The loss from the Tibar Bay project represents an additional 0.1% to the total cumulative loss of mangroves within East Timor.

Seagrass

The area of seagrass estimated to be directly lost as a result of the dredging and land reclamation is estimated at 9.6 ha of which the highest proportion is associated with reclamation.

Table 9-9: Summary of habitat loss due to dredging and reclamation in Tibar Bay

Benthic Habitat Type	Coverage in Tibar Bay (ha)	Percent Cover (%)	Coverage on Coast of Timor-Leste (ha)	Within Reclamation Area (ha)	% of Total Within Tibar Bay	Within Turning Basin and Channel (ha)	% of Total Within Tibar Bay	Total% Loss of North Coast Habitats
Seagrass	17.3	7.2	2,200	8.8	51.0	0.8	4.4	0.004
Sand-Silt	99	41	N/A	4.5	4.6	31.2	31.5	N/A
Coral ≤100% Live	31.2	12.9	458*	1.7	5.3	7.2	23.0	0.019
Sparse Sponges-Gorgonians	4	1.6	N/A	0.0	0.0	2.3	57.8	N/A
Mangroves	17.8	7.4	754	1.4	7.8	0.0	0.0	0.002
Silt-Mud	35.7	14.8	N/A	6.1	17.2	0.3	1.0	N/A
Coral <20% Live	36.7	15.2	N/A	4.6	12.4	6.5	17.8	N/A
TOTAL	241.8	100	3,412	27.1	11.2	48.3	20.0	0.025

^ Source: Boggs *et al.* (2009) Most comparable to Tibar Bay shallow reef system, this is total 'coral dominated reef flat' >5% live coral cover and depth recorded between a minimum of 1.1 m and 1.6 m (Boggs *et al.* 2009).

Dredging and spoil disposal

The dredging program is estimated to run for nine months and involve the removal of 3.2 million m^3 of material from within the bay.

It is estimated that about 15% of the total volume of dredged sediments will be unsuitable for reclamation works, due to a high percentage of fines. This represents approximately 500,000 m^3 of dredged material that shall consequently have to be dumped offshore. Offshore disposal of fines is estimated to take less than three months to complete.

Once the dredge removes the hard and unsuitable material, it is envisaged that a dredger (utilizing pump and piping arrangement) will be used to discharge to landside for reclamation.

Potential impacts to marine ecological communities from sediments and changes to sediment and/or water quality in the vicinity of dredge footprint include:

- Direct removal of benthic organisms from the dredge footprint
- Dredge-induced turbid plumes generally results from the resuspension of existing fine sedimentary material from the seabed during dredging and mobilisation during disposal
- Sedimentation (burial) of benthic species adjacent to the dredge footprint
- Smothering of seagrass and corals in areas adjacent to the dredge area and where high levels of sedimentation occur, potentially impacting on food resources and nursery grounds for other species
- Decreased growth or reproduction of marine organisms (e.g. corals, seagrass) caused by excessive turbidity and/or reduced availability of light to maintain photosynthesis.

Potential impacts from dredging and spoil disposal induced turbidity were assessed using modelling undertaken by Artelia (2017). The modelling was based on the most likely dredging scenario using a typical dredging and dumping cycle for the Project.

This included:

- dredging of "unsuitable" material by a dredger, 24 h/day and 7 days/week. The dredger would fill a barge of typically 3,700 m^3 of capacity. Once filled, the barge would sail to the disposal site (located approx. 1.2 km offshore) to dump the material by opening the doors.
- Use of two barges to ensure continuous operations of the dredger. It is assumed that the 3,700 m^3 capacity barge would be filled in 6 hours. The dumping pace is 4 dumps in 24 h, during 7 days per week (after a one day-period of initialization of the model). Considering this dredging and dumping protocol, at the end of each 15 days simulation, 92,000 tons of fines are dumped offshore and 16,200 tons released at the dredging site.
- A dumping duration of 5 minutes. It is assumed that 50% of the dumped fines remain in the water column and that the other 50% fall directly on the seabed.

The sediment quality assessment of the dredged material confirmed that sediments contained very low concentrations of metals and organic contaminants that were less than recommended screening levels). As such, mobilisation of sediments into the water column during dredging is not anticipated to introduce elevated levels of contaminants into the surrounding environment.

An assessment of potential impacts from turbidity and sedimentation generated by dredging and spoil disposal was developed using the preliminary model of sediment plume dispersion and overlaying the plumes onto the marine habitat maps to assess the plume intensity and spatial extent of the turbidity.

Impacts of construction on benthic habitat in Tibar Bay is **High**.

Operations

During operations, coral impacts are likely to be negligible except in the case of an oil spill, illegal anchoring in demarcated coral protection areas and poor management of ballast water by ships in port.

During operations, the impacts on seagrass and mangroves is restricted to pollution events which are potentially catastrophic, but are unlikely with the implementation of the Marine Oil Spill Response Plan.

During operations, impacts from waste water treatment plant discharge is likely to be negligible if the WWTP is managed appropriately and discharge is within the discharge criteria at the edge of the mixing zone.

Impacts of operations on benthic habitat in Tibar Bay is **Low**.

Decommissioning
There is no decommissioning phase for this project.

9.15.4 Mitigation measures

Pre-construction
- Implementation of the Biodiversity Action Plan

Construction
- Implementation of the Dredge Management Plan
- Implementation of the project Environmental Management Plan
- Implementation of the Biodiversity Action Plan
- Implementation of the Port Marine Spill Contingency Plan

Operations
- Implementation of the operators' Port Marine Oil Spill Response Plan
- Implementation of the project Environmental Management Plan
- Implementation of the Biodiversity Action Plan

Decommissioning
There is no decommissioning phase for this project.

9.16 Traffic and transport

9.16.1 Management objectives

The key objectives for the management of traffic and transport impacts are to:

- To protect the amenity and safety of nearby residents from potential impacts resulting from increased traffic and transport activities associated with the development of the Project; and
- Minimise disturbance to local traffic and ensure road safety is not compromised by the development of the Project.

9.16.2 Applicable standards and legislation

There are no relevant standards or legislation currently in Timor-Leste applicable for traffic and transport.

9.16.3 Impact assessment

The Traffic Baseline and Impact Assessment (Appendix I) indicates that the existing traffic flows are below the road capacity and there is no significant generated traffic flow on the alignment Dili-Tibar-Liquiça. The road widths are 4-6 m, which is below the recommended minimum road width for heavy vehicles of 6.5 m.

Pre-construction
There is no ground activity during this phase and therefore no impacts on traffic are expected.

Construction
During construction, traffic generated does not create significant problems for the road capability. The road pavement, however will be subject to failure if it is travelled by a heavy vehicle and the road will likely require an upgrade. The traffic along the route Dili-Tibar (one direction) will increase from 331 pcu to 442 pcu (25%) during the construction phase.

The impact from traffic during construction is anticipated to be '**Low**'

Operations
During operations, traffic generated creates some problems for the road capability as the road is too narrow for the large numbers of vehicles anticipated to travel the route Tibar-Dili. The traffic along the route Dili-Tibar (one direction) will increase from 331 pcu to 755 pcu (56%) during the operations phase.

The impact from traffic during operations is anticipated to be '**Low**' to '**Medium**' depending on the anticipated road upgrades by the GoTL.

Decommissioning
There is no decommissioning phase for this project.

9.16.4 Mitigation measures

Pre-construction

There is no ground activity during this phase and therefore mitigation measures for traffic are proposed.

Construction

- Transport infrastructure upgrades to support container trucks travelling the local road transport network
- Minimising vehicle movement – good planning and scheduling can limit the number of vehicle movements required which will reduce the likely impacts to the condition of the roads and public safety.
- Implementation of one-way systems, ensuring reversing sensor/alarms are installed on all vehicles and mobile equipment and signage in reversing areas can reduce the risk of reversing accidents.
- Traffic signage – all traffic signage will be clearly and prominently displayed in well-lit areas. Signage will be posted to indicate speed limits, restricted access, visitor parking, headroom, and other route hazards.
- Speed limits will be implemented and enforced.
- Road widening may be required as a minimum road width of 6.5 meters is recommended for heavy vehicles (Appendix I).

Operations

- Transport infrastructure upgrades to support container trucks travelling the local road transport network
- Minimising vehicle movement – good planning and scheduling can limit the number of vehicle movements required which will reduce the likely impacts to the condition of the roads and public safety.
- Implementation of one-way systems, ensuring reversing sensor/alarms are installed on all vehicles and mobile equipment and signage in reversing areas can reduce the risk of reversing accidents.
- Traffic signage – all traffic signage will be clearly and prominently displayed in well-lit areas. Signage will be posted to indicate speed limits, restricted access, visitor parking, headroom, and other route hazards.
- Speed limits will be implemented and enforced.
- Road widening may be required as a minimum road width of 6.5 meters is recommended for heavy vehicles (Appendix I).

Decommissioning

There is no decommissioning phase for this project.

9.17 Employment

The project is likely to have a positive impact due to an increase in employment opportunities in the country during port construction and operation phase over the concession period. Training should be made especially accessible to PAPs and residents of Tibar and Ulmera Sucos or Liquiça in cooperation with the Secretary of State for Vocational Training and Employment (SEPFOPE). This aligns with the goal to employ 75% of Timor-Leste citizens and permanent residents during construction phase[11].

9.17.1 Management objectives

The key objectives for the management of employment are to ensure:

- To maximise local employment opportunities throughout all phases of the Project
- Prospective employees are provided with the necessary and appropriate skills training for employment opportunities during all phases of the Project;
- The expectation of employment is not over inflated and clearly outlined to the locals, thereby minimising any potential conflicts/discourse amongst the local populace; and
- Existing employment sectors/source of livelihood are not adversely impacted.

9.17.2 Applicable standards and legislation

The following standards and legislation are applicable to employment:

- Law 4/2012 Labor Code.

9.17.3 Impact assessment

Pre-construction

The plan for the development of the Project will raised great expectations amongst the local residents. The greatest expectation being the creation of new employment opportunities and the recruitment of a large number of workers for a relatively long-term period

It is likely the employment opportunities for the pre-construction activities will be significantly less than those for the construction and operational phases. The period of employment is also expected to be for a short-term period. It is likely that any potential impacts will be positive for the community and their livelihoods, as the Project will provide the opportunity for skill development and training. Therefore, the risk assessment determines the potential impacts associated with employment during the pre-construction phase is considered to be low

[11] *A Local Development Plan was part of the Technical Bid of the preferred bidder and will be inserted as part of the Concession Agreement to ensure actual implementation. In the Plan, the preferred bidder has clearly stated that it targets to employ 75% of Timor-Leste citizens and permanent residents during the construction period.*

Construction

The primary positive impact of the Project is the opportunity of employment and training / skill development. The employment opportunities associated with the construction of the Project are expected to be in the order of 200 persons. Local businesses are also likely to benefit during the construction phase, as a result of increased trade.

While the development of the Project will predominately result in positive impacts for the employment sector, there is also the potential for some negative impacts, namely:

- Potential conflicts associated with allocation / distribution of employment opportunities amongst local villages and administrative sub-units.
- Potential conflicts associated with expectations and reality of pay scales and employment terms.
- Loss of monetary income with termination of employment at the end of the construction, stage and subsequent adjustment of lifestyle with the loss of income

Operations

The Concessionaire should adhere to their targets of approximately 50% of Management and Finance-Administration, 80% of O&M and HSE officers and 95% of equipment driver be filled by Timor-Leste as noted in the Local Development Plan. This relatively high representation of national workforce should be promoted through targeted training and support programmes that can be coordinated with relevant agency such as SEPFOPE. Training and employing local is a priority. This includes directly and indirectly affected PAPs/PAHs. The operator will also need to address employment for vulnerable groups / people and the traditional gender roles including adherence to these roles or recourse for greater employment inclusion.

Decommissioning

There is no decommissioning phase for this project.

Indirect impacts

The public staffing levels within the existing Dili Port APORTIL will be affected by the relocation of the container facility to the new port at Tibar Bay. Approximately 300 people currently work at the existing port, most of whom are employed by private companies whose operation at the port will be impacted by the Dilli port closure.

As a result, some workers may become unemployed or need to relocate to the Tibar Port.

9.17.4 Mitigation measures

- The Concessionaire and the Grantor will communicate with SEPFOPE to ensure existing programs of SEPFOPE be especially accessible to the residents of host Suco/District/Country prior to and during the construction period.

- The concession plan should state that it targets to employ 75% of Timor-Leste citizens and permanent residents during the construction period for positions where skills are available in Timor-Leste.
- Training for positions available at the Port during Operation should be made available to local community
- The Concessionaire should provide continuous training to newly hired port staff
- The Concessionaire should adhere to their targets of approximately 50% of Management and Finance-Administration, 80% of O&M and HSE officers and 95% of equipment driver be filled by Timor-Leste as noted in their Local Development Plan.
- The Concessionaire will give priority were possible to residents of host Suco/District/Country during the hiring of port personnel
- Maintenance of the Grievance Mechanism
- The Concessionaire will provide additional training to newly hired port staff.

9.18 Infrastructure

9.18.1 Management objectives

The key objectives for infrastructure are to ensure:

- Upgrades to existing or construction of new infrastructure for the Project are designed and built fit for purpose; and
- Existing infrastructure are not adversely impacted by the development and operation of the Project.

9.18.2 Applicable standards and legislation

There are currently no relevant standards or legislation application to infrastructure in Timor-Leste.

9.18.3 Impact assessment

It is considered that the development of the Project will have a long term beneficial impact on the local communities and economy in terms of social infrastructure development. Infrastructure such as roads, seaport, water and electricity are expected to enhance socio-economic development in the area, through job creation and increase in commercial activities.

Pre-construction

There will be some limited impact to infrastructure as people are resettled as a component of this project. Houses and infrastructure will be required as a component of this resettlement.

Resettlement impacts are assessed separately and the impact on infrastructure during pre-construction is **Low**.

Construction

During the construction phase it is likely there will be an increased pressure on existing infrastructure due to Project-related influx. However, the Project personnel will travel to site from Dili each day and local people will be employed as far as possible.

Therefore, the risk assessment classifies the potential impacts to infrastructure during the pre-construction and construction phase to be '**Low**', as the primary impact will be positive with the development of new and improvement of existing infrastructure.

Operations

The potential impacts to infrastructure during the operational phase will be associated with deterioration and depreciation through usage.

Therefore, the risk assessment classifies the potential impacts to infrastructure during the operation phase to be '**Low**'.

Decommissioning

There is no decommissioning phase for this project.

9.18.4 Mitigation measures

- Maintenance of the Grievance Redress Mechanism

9.19 Economic use of forest and other natural resources

The use of natural resources is documented in section under Fishing and marine habitat use because the key natural resource in use by the local community is Fisheries and mudflat habitat.

The project impact on economic use of forestry and natural resources is considered to be **'Low'** during construction and operation because the project is not impacting any terrestrial forests or vegetation.

9.20 Fishing and marine habitat use

9.20.1 Management objectives

The key objectives for the management of socio-economic impacts to fisheries are to ensure:
- ensure the local communities access to other natural resources for economic usage are not adversely affected with the development of the Project; and
- Maintain the abundance, diversity, geographic distribution and productivity of flora and fauna at the species and ecosystem levels through the avoidance or management of adverse impacts.
- The Concessionaire should regularly maintain access to fishing ground including maintaining proper navigational aid to avoid collision between fishermen and vessels.

9.20.2 Applicable standards and legislation

The following standards and legislation may be applicable in relation to the management of fishing resources:

- Draft Decree Law on Biodiversity, dated March 2012;
- United Nations Convention for Biodiversity (1992);
- Decree Law 6/2004 On General Bases of the Legal Regime for Fisheries and Aquaculture Management and Regulation (amended by Decree Law 4/2005)

9.20.3 Impact assessment

Pre-construction
There is no ground activity during this phase and therefore no impacts on traffic are expected.

Construction
Port construction will require dredging works on the establishment of an approach channel and turning circle within the bay. Dredging activities will require some restriction on access to deeper fishing grounds on the wider coast affecting 15 fishermen utilizing motor boats and three fish vendors that depend on supply from these fishermen for their trade. It will also affect the fishermen in the Project area of influence outside of the direct impact zone. While water turbidity will also increase due to dredging, volume of fish catch will likely be reduced. This will cause impacts to small scale fishermen fishing exclusively inside the bay and gatherers. Fish culturists will likely be impacted on its operation as access to fresh sea water will be limited on the peak of dredging works. Fishing livelihoods will be difficult to restore and PAPs will need to be re-trained and with fundamental numeracy and literacy skills before they can be reskilled and acquire jobs at the new port.

The impacts on fishing and marine habitat use during construction are expected to be **High**.

Operations
Upon the start of the operation of the Port facility, local economic linkages will be naturally formed with surrounding areas through further changes in land use in surrounding locations as well as the presence of more workers that will likely be in need of food supplies and accommodation. These economic linkages may provide a natural off-set to potential negative impacts to fishing stock from the Bay area provided local fisherman are able to transition across industries.

Port operation, maintenance activities, ship traffic and potential pollution are expected to reduce volume of fish catch and available marine resources in the bay. Impacts will likely persist among fish vendors, small scale fishermen, gatherer and fish culturists. Access to the deeper fishing ground by those fishermen utilizing motorized boats will likely be uninterrupted during the operational phase.

The impacts on fishing and marine habitat use during operations are expected to be **Medium**.

Decommissioning
There is no decommissioning phase for this project.

9.20.4 Mitigation measures

- Mitigation measures to minimize pollution impacts on fishing ground and sources of on PAP and adjacent communities will be determined during the preparation of the EIS. The EMP should be strictly implemented by the Concessionaire.
- The Livelihood Restoration Plan will be incorporated into the Resettlement Action Plan to be prepared by the Government. This should be discussed, re-updated and implemented with the concessionaire's support as the impact is likely to occur and extend during the operation phase of the port. Training for positions available at the Port during Operation should be made.
- The Concessionaire should clearly delineate work areas, secure the area to avoid or minimize impacts on adjacent fishing ground and other marine resources. An alternative route for fishermen should be provided which should be provided with proper navigational aids. This will be monitored on a regular basis as part of the scope of work under the EMP for the port.
- A RAP has been prepared to include the provision of allowances for temporary loss of income from fishing for PAH's and allowance for temporary loss of income from employment
- The LRPs will be prepared and implemented by the Government. Accessibility for training and preference for hiring of PAPs and residents at the new port will be considered. This will be discussed, re-updated and implemented with the concessionaire's support as the impact is likely to occur and extend during port construction and operation.
- The LRP should include plans and redress mechanisms for loss of access to fishing areas and alternative means to address this loss of provisioning ecosystem services.
- Maintenance of the Grievance Redress Mechanism
- Mitigation measures applicable to increased turbidity will be determined in detail during the preparation of the Dredge Management Plan.

9.21 Socio-economic agriculture

No impact on agriculture has been identified in the project area.

9.22 Tourism

The Project location is not considered to be a popular destination for tourism. Therefore, it is not considered that the Project will impact to Tibar Tourism popularity.

9.23 Population and community

The following section provides a brief overview of the potential impacts and mitigation measures associated with population and community. Section 10 Social Impact and Economic Assessment provides greater detail on the potential impacts relating social and economic impacts.

9.23.1 Management objectives

The key objectives for population and community management are to:

- Ensure a smooth transitioning during relocation as well as during influx of people into Administrative Post of Tibar
- Minimize potential conflict among locals and between locals and newcomers.

9.23.2 Applicable standards and legislation

The following standards and legislation may be applicable in relation to the management of population and community:

- Parliamentary Law 3/2009, Community Leaderships and Their Election; and
- Parliamentary Law 11/2009, Territorial Administrative Division.

9.23.3 Impact assessment

Pre-construction

As with all developments it can be expected that there will be an influx of people into the area seeking employment or taking advantage of the economic growth during construction and operations. Currently, people living the Tibar bay study area live in close-knit homogenous community belonging to the same cultural group.

Construction

During the construction phase, the number of people living in and around Tibar Bay might increase and due to the lack of cross cultural interaction experienced in the community some community members maybe vulnerable to the changes. This may create conflict over jobs, access to resources, increased pressures on housing and social facilities, overcrowding and associated health impacts.

Operations

Below are the potential impacts of the operational activities associated with the Port on population and community:

- The local area may experience an influx of people, as they seek employment opportunities associated with the operational phase of the Project.
- Increased chances of the spread of communicable diseases such as HIV/AIDS and STDs linked to influx of predominantly male job-seekers and workers.
- Potential conflict of interest between sucos within and/or those near the Project area in both Tibar and Ulmera Post Administrative.

Decommissioning

There is no decommissioning phase for this project.

9.23.4 Mitigation measures

- Maintenance of the Grievance Redress Mechanism established pre-construction and expansion to include construction impacted stakeholders

9.24 Community health

The following section provides a brief overview of the potential impacts and mitigation measures associated with community health. Section [Social Impact and Economic Assessment] provides greater detail on the potential impacts relating social and economic impacts.

9.24.1 Management objectives

The key objectives for community health are to ensure:

- There are no adverse impacts to community health associated with the development and operation of the Project.

9.24.2 Applicable standards and legislation

There is no formal Timor legislation addressing community health. However, in 2008, the Ministry of Health (MoH) introduced Servisu Integrado du Saude Comunidade - Integrated Community Health Services - (SISCa) in its bid to improve access to basic health services and preventative services at the village level. SISCa has six components, including; family registration; nutrition assistance and child health promotion; maternal health and family spacing; hygiene, sanitation and malaria prevention; ambulatory primary care; and health promotion activities. (Human Resources for Health Country Profile Timor-Leste.Ministry of Health. 2012; SISCA Guidelines, Dr. Nelson Martins PhD).

The Ministry of Health then launched the Comprehensive Primary Health Care Package in 2015. One of the components of this package is household registration conducted by a doctor at the suco and aldeia level.

9.24.3 Impact assessment

Pre-construction, construction and operations

The following adverse health impacts, without management or mitigation measures, could arise during the pre-construction, construction and operational phase of the Project:

- Increase in the number of respiratory ailments due to an influx of people into the area, overcrowding in settlements and poorly ventilated accommodation;
- Increase in the level of respiratory ailments due to increased dust caused by construction activities and to a lesser extent operation phase activities;
- Increase in vector-related ailments such as malaria due to increase in population density;
- Increase in sexually transmitted infections such as the human immunodeficiency virus due to population influx;
- Increase in lifestyle risk such as alcoholism, drugs, gender and domestic violence due to increased disposable incomes;

- Increase in communicable disease such as cholera due to the rapid change in the social and physical environment; and
- Increased pressure on health services infrastructure.
- The development of the Project may also see a positive impact to community health as the Project Proponent will commit to a number of health care initiatives and programmes, as outline in the Mitigation section below.

The impacts of the project on community health are deemed to be **Medium.**

9.24.4 Mitigation measures

- Maintenance of the Grievance Redress Mechanism established pre-construction and expansion to include construction impacted stakeholders
- Facilitate education and awareness programs throughout the lifespan of the port
- Establish access controls to the site activities posing health and safety risks to the community.
- Develop strict protocols for increased traffic safety.

9.25 Institutions, schools and health facilities

The following section provides a brief overview of the potential impacts and mitigation measures associated with institutions, schools and health facilities.

9.25.1 Management objectives

The key objectives for the management of institutions, schools and health facilities are to:

- Minimise potential impact and disturbances to facilities especially during their scheduled operation hours.

9.25.2 Applicable standards and legislation

The following legislation and international standards may be applicable in relation to institutions, schools and health facilities:

- Decree Law 9/2011, National Institute of Health;
- Decree Law 7/2010, Legal Regime for Administration and Management of the Basic Education System; and
- Decree Law 9/2009, Organic Law of Polícia Nacional de Timor-Leste or National Police of East Timor (PNTL).

9.25.3 Impact assessment

Pre-construction

The potential impacts of the pre-construction activities associated with the port on institutions, school and health facilities are:

- Constant movement of vehicles along Tibars main roads
- Increased pressure on healthcare and education infrastructure due to Project related influx.

The impact on to institutions, schools and health facilities during pre-construction is **Low**.

Construction

The potential impacts of the construction activities associated with the port on institutions, school and health facilities are:

- Constant movement of vehicle from Dili to Tibar will increase dust and noise level thus affecting activities taking place adjacent to the road.
- Increased of noise level due to movement of manpower, earth moving and vegetation clearing activities, use of construction equipment, and civil and mechanical construction
- Increased pressure on healthcare and education infrastructure due to Project related influx

The impact on to institutions, schools and health facilities during construction is **Medium**.

Operations

The potential impacts of the operational activities associated with the port on institutions, school and health facilities are:

- Increased noise level from the ships and barges operated in the Port may affect activities taking place during normal working hours.
- Increased pressure on healthcare and education infrastructure due to Project related influx

The impact on to institutions, schools and health facilities during operations is **Medium**.

9.25.4 Mitigation measures

- Regular water sprinkling on the roads and application of dust suppressants to sections of roads used routinely by vehicles that pass through and close to habitation and facilities including conducting routine air quality monitoring

- Haulage of goods and movement of vehicles / people and equipment can be scheduled and sequenced to reduce the number of noisy operations.
- Use selected equipment with the lowest possible noise specifications. If a noise complaint is recorded through the grievance framework and monitoring confirms it is above the guideline level a retrofit mitigation measure will be implemented.
- Alternative construction methods may also be available which may be more practicable and cost effective in dealing with potential noise impacts
- Consulting with NGOs in the area that may support operations at the nearby health centres, with special focus on refurbishment of key areas, equipment and building maintenance, as well as, improved health care management information systems as part of its Corporate Social Responsibility program.

9.26 Community and family structures

The following section provides a brief overview of the potential impacts and mitigation measures associated with community and family structures. Appendix J provides greater detail on the potential impacts from social and economic impacts.

9.26.1 Management objectives

The key objectives for the management of community and family structures are to:

- Maintain and protect the community and family structures near the Project site and/or within new site ; and
- Minimize potential conflict and/or tension within community and family members and ensure their kinship is not jeopardized by the development of the Project.

9.26.2 Applicable standards and legislation

The following standards and legislation may be applicable in relation to the community and family structure:

- Decree Law No. 5/2004 on Community Authority;
- Decree Law No. 29/2011, Fair Price;
- Law 4/2012, Labour Code;
- Parliamentary Law 3/2009, Community Leaderships and Their Election; and
- Parliamentary Law 11/2009, Territorial Administrative Division.

9.26.3 Impact assessment

Pre-construction, construction and operations

The acquisition of land for the port may potentially cause impacts on the community and family structure in the form of

- Conflicts over the status of land (i.e. private owned or state owned);
- Conflicts over land acquisition systems and process/values;
- Impacts to household subsistence and ability to generate income;
- Conflicts over the dismantling of graves and customary/traditional ritual houses; and
- Community resettlement.

The impact to family structure is expected to be **Medium**.

9.26.4 Mitigation measures

- Implementation of the Resettlement Plan by the GoTL;
- Continuous and ongoing consultation with stakeholders throughout the project life;

9.27 Land ownership and land rights

The following section provides a brief overview of the potential impacts and mitigation measures associated with land ownership and land rights. Appendix J provides greater detail on the potential impacts relating social and economic impacts.

Eight of the 12 households to be physically relocated depend largely on fishing and they access the fishing ground from their current location, parking and launching their boats from the coastal strip. Fishermen located on the Northern Eastern side of the bay will also have their fishing access impacted by the project though they are not being resettled.

The livelihood impact is assessed as '**High'** because it will result in complete changes of patterns and social processes for those affected, both directly and indirectly.

It should be noted that this EIS does not address the issue of resettlement. The GoTL have developed and implement a separate RAP.

9.27.1 Management objectives

The key objectives for land ownership and land rights are to:

- Monitor the GoTL's implementation of resettlement to encourage accordance with international best practice, including an approach based on IFC PS 5;
- Ensure entitlement for compensation where people do not have proof of landownership; and
- Ensure security of tenure at resettlement sites.

9.27.2 Applicable standards and legislation

According to the IFC Dili airport Preliminary Legal Due Diligence Review (2013), "The current land ownership legal regime in Timor-Leste is complex and uncertain". The Constitution only allows expropriation where the following conditions are met: 1) expropriation is in the public interest; 2) fair compensation is paid; and 3) resort to expropriation is allowed by law. There is no existing expropriation or compulsory land acquisition law in Timor-Leste. It is not clear whether Condition No. 3 requires an expropriation law to be passed by Parliament or whether a Government Decree Law would be sufficient.

The Preliminary Legal Reviee (2013) notes that, although not legally required to allowed, it is common practice for Government to pay compensation when evicting illegal occupants from State land. Compensation is negotiated between the Government and community on a case-by-case However, 'best practice' indicates that IFC PS 5 should be considered to produce a mutually-agreeable resettlement policy framework.

9.27.3 Impact assessment

Pre-construction, construction and operations

The potential impact of the project on Land Ownership and Land Rights is **High**, where resettlement is required in order for the project to go ahead. The impact is permanent and is applicable for all project phases.

9.27.4 Mitigation measures

- A RAP will be prepared which will include the provision of allowances for loss of income (for directly affected PAH's from fishing and allowances for temporary loss of income from employment on the site.
- Establish and implement a Grievance Redress Mechanism.
- The livelihood restoration component will be incorporated into the RAP to be prepared and implemented by the Government. Training should be made accessible for the affected population. Preference for hiring at the new port will be considered. This will be discussed, re-updated and implemented with the concessionaire's support as the impact is likely to occur and extend during port construction and operations

9.28 Natural resources rights

The following section provides a brief overview of the applicable Standards and Legislations, potential impacts and mitigation measures associated with natural resource rights.

9.28.1 Management objectives

The key objectives for the management of natural resource rights are to:

- Maintain and protect the natural resource rights near the Project site and/or within new site
- Minimize potential impacts on the surrounding environment

9.28.2 Applicable standards and legislation

The following standards and legislation may be applicable in relation to natural resource rights:

- Decree Law 26/2012 Environment Basic Law (EBL);
- Decree Law 5/2011 Environmental Licensing Law (ELL);
- UNTAET Regulation 2000/19 on Protected Places;
- UNTAET Regulation 2000/17 on the Prohibition of Logging Operations and the Export of Wood from East Timor;
- Draft Decree Law on Forest Management, draft 7, received August 2013;
- Draft Decree Law on Biodiversity, dated March 2012;
- United Nations Convention for Biodiversity (1992)
- Draft Expropriation Law;
- United Nations Convention to Combat Desertification;
- Decree Law 6/2004 On General Bases of the Legal Regime for Fisheries and Aquaculture Management and Regulation (amended by Decree Law 4/2005); and
- IFC's PS on Environment and Social Sustainability 2012.

9.28.3 Impact assessment

Pre-construction, construction
The main impacts on natural resources rights will be experienced in the pre-construction phase, as access and ownership of the land will need to be resolved prior to commencement of any works. Therefore, the risk assessment determines the potential impacts on land ownership and land rights during construction to be '**High**'.

The RAP specifies the detailed procedures to be followed by GoTL and the actions it will take to resettle and compensate affected PAPs in a way consistent with national legislation and IFC PS 5. While the national law does not define what should be considered humanitarian for compensation, IFC PS 5 provides the reference in the preparation of this RAP, which states that: " When displacement cannot be avoided, displaced communities and persons will be compensated for loss of assets at full replacement cost and other assistance to help them improve or restore their standards of living or livelihoods".

Operations
Included in the RAP are the livelihood restoration components that provide the entitlements of those economically affected. The mitigation of economic displacement will be considered complete when – (i) affected persons have received compensation and other assistance according to the requirements of the IFC PS 5, and (ii) affected persons are deemed to have been provided with adequate opportunities to re-establish their livelihoods.

Therefore, the risk assessment determines the potential impacts on land ownership and land rights during operation to be '**High**'.

9.28.4 Mitigation measures

- A RAP has been prepared which will include the provision of allowances for loss of income (for directly affected PAHs from fishing and allowances for temporary loss of income from employment on the site
- Establish and implement a Grievance Redress Mechanism
- The livelihood restoration component will be incorporated into the RAP to be prepared and implemented by the Government. Training should be made accessible for the affected population. Preference for hiring at the new port will be considered. This will be discussed, re-updated and implemented with the concessionaire's support as the impact is likely to occur and extend during port construction and operations

9.29 Cultural heritage, archaeological and sacred sites

9.29.1 Management objectives

The key objectives for cultural heritage, archaeological and sacred sites are to:

- Minimise the number of recorded heritage sites which are directly impacted by the Project;
- Ensure that the management of the relocation of known sites is undertaken in accordance with best practice standards; and
- Ensure transparency and consultation occurs in relation to the required impacts on known heritage sites in the Project site.

9.29.2 Applicable legislation

There is no local standard for the identification, management, relocation and protection of cultural heritage sites, places, artefacts or expressions in Timor-Leste. The following standards are relevant globally:

- International Council on Monuments and Sites – Charter;
- UNESCO Conventions and recommendations relating to Cultural Heritage; and
- World Bank Operational Policy 4.11 Physical Cultural Resources.

9.29.3 Impact assessment

Only two sites (site no. 3 and site no. 4) are located in the project’s footprint and will be directly affected by construction. The remaining three sites (sites no. 1, 2 and 5) are located outside but very close to the project’s footprint. No additional archaeological or cultural heritage sites were detected in the area.

Pre-construction, construction

The impacts on cultural heritage for construction of this project is **High**.

Operations

The impacts on cultural heritage for operations of this project is **Medium**.

9.29.4 Mitigation measures

Mitigation measures to limit the impact to cultural heritage sites include:

- Where a site is to be permanently destroyed, appropriate community consultation is to be undertaken and documentation of this site to be collected or the site should be relocated where possible;
- Where a site is to be subject to access restrictions for the project life, community consultation is to be undertaken and access control measures implemented for when the site is required by the community;

9.30 Unique landscapes

Unique landscapes are those geological, landform or natural artefacts which have been considered in the context of natural heritage and visual amenity.

There are no unique landscapes in the project footprint.

10 Social Impact Assessment

The SIA is a study of direct and indirect social effects of infrastructure projects or other planned developmental interventions on the socio-economic environment. The primary objective of the SIA is the identification of potential social impacts and the design of measures to avoid or minimize, mitigate and/or compensate the adverse impacts and enhance the positive impacts.

This SIA is prepared in the framework of the planned Tibar Port development ("the Project"), located within the sucos or villages of Tibar and Ulmera in the District of Liquiça, Timor-Leste.

For the purpose of the SIA, the project area is defined as two overlapping areas, shown in Figure 1:

- The area of impact and/or disturbance of the project components and/or activities on PAPs likely to be affected by involuntary resettlement (physical dislocation) and/or economic disturbance either through business relocation or temporary restriction to access to the natural resources and;

- The Project Area of Influence (PAoI), which includes the area of impact and/or disturbance, as well as the area wider Tibar Suco and Ulmera Suco community (refer to Figure 10-1).

The area of impact is then divided into: (i) the directly affected area (the red area shown in Figure 10-1); and, (ii) the indirectly affected area (The green area shown in Figure 10-1. The directly affected area is the area to the western side of the Bay which hosted several temporary and permanent structures owned by fishermen and business owners. This area will be affected by the port's footprint and those using the area will have to be physically relocated through involuntary resettlement. The indirectly affected area is the area on the eastern side of the Bay to the western side of the Bay that will not be affected by the project footprint, however, hosted those fishermen, coastal resource gatherers, pond owners and fish vendors that could potentially be economically impacted by the development.

Affected parties were categorized as follows: Group A composed of 12 informal PAHs residing at the Directly Affected Area and engaged in fishing and other livelihood activities which will be affected by involuntary resettlement (potential physical and economic displacement); Group B composed of 29 PAHs likely to be impacted in their livelihood by restriction on access to fishing ground (potential economic displacement), and; Group C, composed of 13 businesses engaged in fuel transport operation and 1 in fishing activities in the small port terminal facility located on the west side of the bay (potential economic displacement).

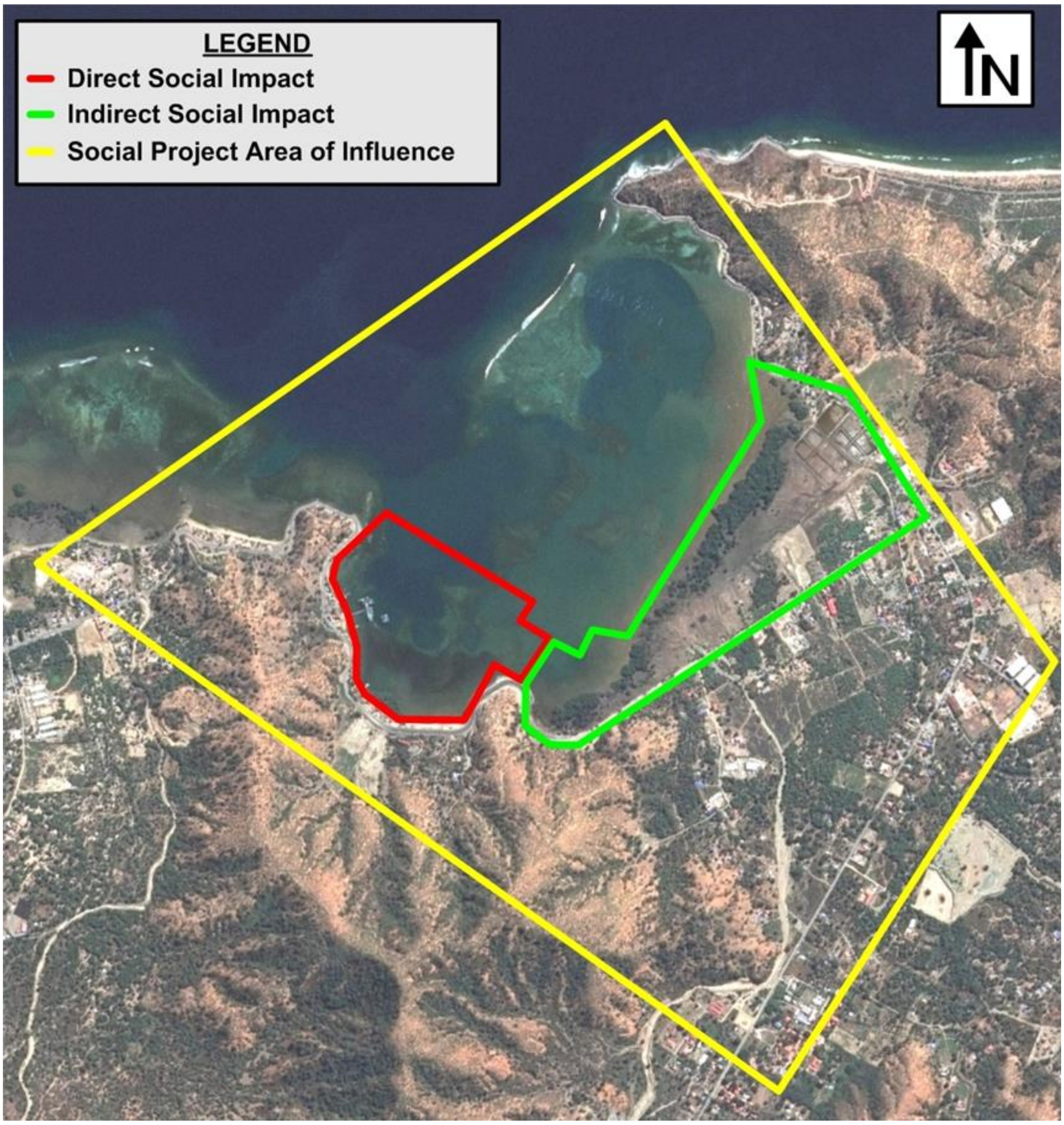


Figure 10-1: Project Area of Influence including the directly and indirectly affected area

The SIA will become the basis for the development of appropriate impact avoidance, mitigation and/or off-set measures in accordance with national legislation and regulations, IFC PSs and other relevant national and international good practices (GPs). Highest amongst the relevant national legislations is the Constitution of the Democratic Republic of Timor-Leste that determines that ownership, use and development of land as one of the factors for economic production should be regulated by law.

Government data collection

The GoTL developed the PPP Working Group between September 2013 and December 2013, they facilitated the organization of a Special Panel through which the Technical Team was formed in January 2014. From that period until September 2014, data gathering occurred in parallel to the cadastral mapping for the RAP.

Advisian data Collection

The GoTL SIA and RAP focused on the PAPs and PAHs, in the area of influence. Advisian was awarded the scope to develop a SIA that incorporates findings of the GoTL SIA and RAP for the area of influence, and additionally to investigate the PAoI.

Survey findings

The GoTL socio-economic census that was conducted from December 14 -16, 2015 to further collect in-depth socio-economic information more suited for the preparation of SIA and RAP. This detailed census identified a total of 217 affected people consisting of 68 PAPs in Group A and 149 PAP in Group B. Approximately 50% of the PAP in Group A and Group B are considered minors or under 18 years old. Figure 10-2 shows the population pyramid for the Suco of Tibar, where Group A and B are located.

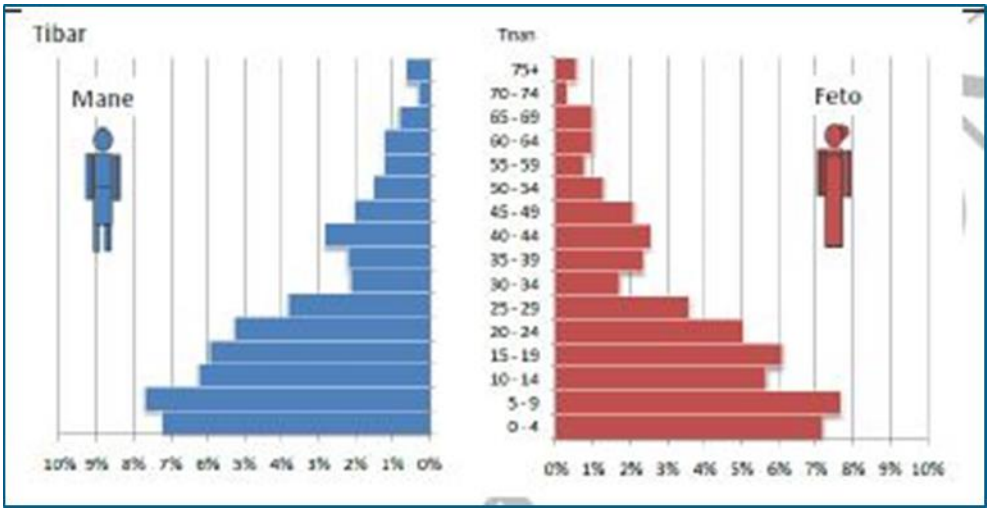


Figure 10-2: Population Pyramid of Suco Tibar (Census Fo Fila, 2013)

The majority of the PAPs have a lower educational attainment (Primary school or below), a profile that is consistent with the Timorese national average for rural areas.

A majority of the PAPs (more than 70%) identified Mambae as their mother tongue, suggesting consistent pattern of ethnicity with the Suco of Tibar and Ulmera. About 90% of the PAPs have noted that they are affiliated with the Catholic Church. Other religious groups include the Protestant Church (2.24%), Islam (0.33%), and Buddhist (0.07%).

In both Project Affected Household (PAH) Groups reported a range of livelihood strategies they depend on, mostly related to fishery or other coastal resource-based livelihood including clam gathering, salt making, fish culturing and others.

Incomes of the PAHs range widely from less than US$100 per month to more than US$1,000 per month. A total of 6 PAHs were identified as fall under the "Vulnerable Household[12]" category. Due to their economic disadvantage and live hood strategies in comparison to the other PAHs.

The majority of the PAHs are consistent with the nuclear family household definition, consisting of two parents and children. Households ranged in size from 10 to 1 family member's. PAHs in both Groups reported a range of livelihood strategies they depend on, mostly related to fishing or other coastal resource-based livelihoods including clam gathering, salt making, fish culturing and others. Fishing equipment was found to range from traditional non-motorized boats to motorized boats.

Between 10-14th October 2016, the Advisian Social Team conducted socio-economic surveys in the greater project area with indirectly affect community members. This refers to community member who will not be physical or economically displaced by the project however will still be impacted. The households mainly consisted of Tibar community members living on the other side of the road from the proposed port location, as well households in neighbouring Ulmera. The survey was undertaken for 25 households currently living near the proposed development. Two of the survey were conducted with fish Co-Ops (homesteads with only men living together to fish collectively) The survey questionnaire included the socio -economic status of PAPs, migration patterns, fishing activities and other sources of livelihood, and perceptions on impacts.

The households ranged in size from 4 to 10 individuals and had an average of 6.05 people in each household, with an average of 3 children under eighteen per household. All apart from two of the surveyed households included children under eighteen. The survey captured information about 126 individuals in total (67 males and 60 females) and the average age of individuals captured in the survey was 21.4.

Household incomes ranged between <US$100 per month and above $US2,000 per month. The breakdown of family incomes is shown in Figure 10-3. As can be seen in the figure, the significant majority of households have a monthly income of $US101 – 300. The most common main sources of income for households within this bracket are fishing and working in security. Income from fishing appears to vary widely across households, with the household earning over $US2000 a month also listing fishing as its main source of income, as well as households in the $US1001 – 2000 bracket, $US501 – 1000 bracket and $US301 – 500 brackets and the sources of income for individuals within the surveyed population included fishing, security work and farming. 45% of the families surveyed (10 households) responded that their main income source was sufficient, roughly one third of households stated that their current income does not meet the needs of their families, and a further 9% stated that their incomes were sometimes not sufficient. 15% of respondents did not answer the question.

[12] *Vulnerable People, especially those below the poverty line, the landless, the elderly, women and children, or other displaced persons who may not be protected through national land compensation legislation, who by virtue of gender, ethnicity, age, physical or mental disability, economic disadvantage, or social status may be more adversely affected by resettlement than others and who may be limited in their ability to claim or take advantage of resettlement assistance and related development benefits.*

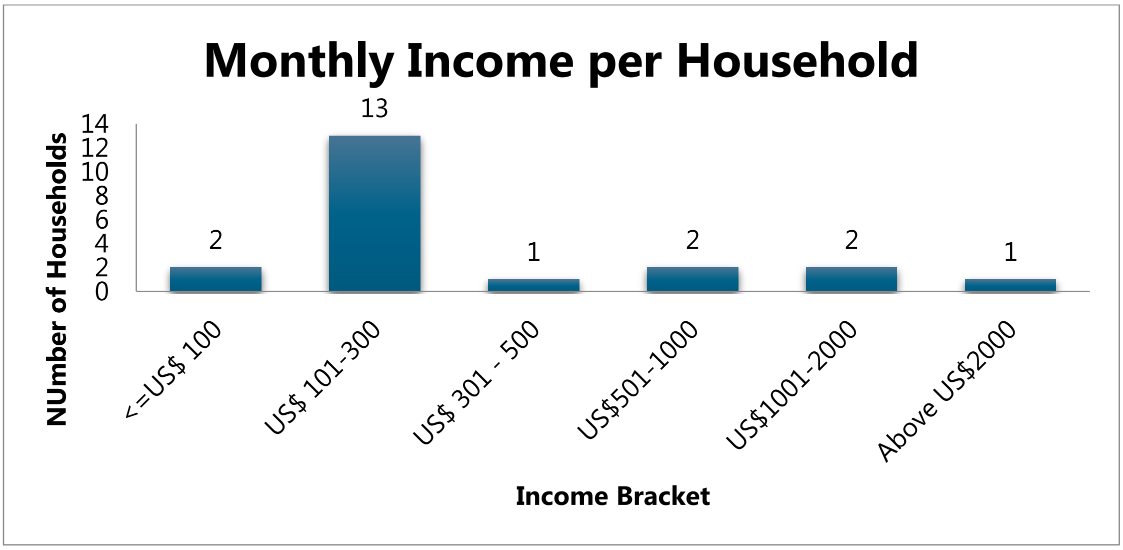


Figure 10-3: Monthly income per household (Advisian socio-economic survey)

Education levels varied widely across respondents, with four adults recorded as illiterate and seven having completed diplomas at University. Approximately 33% of respondents had completed high school though 44% had not completed education above primary school level.

Social impacts

This SIA documents outlines that the local community will face predicted impacts during the Pre-Construction, Construction and Operation phases of the development. Impacts consist of loss of structures and/or productive trees, loss of livelihoods, impact on employment at the existing port, reduced visual amenity and restricted access to the port area. Fuel importing businesses currently operating in the Bay will also need to relocate to other locations. Refer to Appendix J for the RAP document.

During the Construction Phase, dredging and other activities that will take place in the coastal water are likely to temporarily affect the current fishing and other marine resource gathering activities in the Bay as well as access to the deeper ocean needed by rompong fishermen. Increases in seawater turbidity, especially during dredging, is likely to affect fish culturing in the nearby aquaculture ponds.

To address the predicted impacts, a Social Management Plan/Mitigation Plan (SMP) is proposed combining mitigation and compensation measures to affected populations and those in the surrounding area. Please refer to Table 10.1. Mitigation measures provided in the plan should be carried out by the responsible entities in parallel with the Local Development Plan for implementation by the Concessionaire.

Aspect	Impacts	Social Management Action Plan	Responsibility	Timing
PRE- CONSTRUCTION PHASE				
1. Structures	Impact on structures in Directly Impacted Areas	1.1. A RAP/Compensation Plan including a livelihood restoration component that adheres to the national law and IFC PS 5 should be prepared and implemented. 1.2. Establish and implement Grievance mechanism in line with IFC PS 1 1.3. Set -up an Organization Structure and establish the Institutional Plan to ensure effective and efficient implementation of all plans (e.g. RAP/LRP, etc.) from pre-construction to operation phase of the project	Grantor	During the financial closing period (Pre-construction)
2. Crops/Productive Trees	Impacts on trees	2.1. A RAP/Compensation Plan including a livelihood restoration component that adheres to the national law and IFC PS 5 should be prepared and implemented 2.2. Establish and implement Grievance mechanism in line with IFC PS 1 2.3. Set -up an Organization Structure and establish the Institutional Plan to ensure effective and efficient implementation of all plans (e.g. RAP/LRP, etc.) from pre-construction to operation phase of the project	Grantor	During the financial closing period (Pre-construction)
3. Livelihoods	Impacts on PAH's	3.1. Livelihood Restoration Component will be incorporated together with the RAP and will include the provision of allowance for temporary loss of income from fishing, allowance for temporary loss of income from employment, accessibility to training provided for potential employment in the construction and operational phases of the project. This training and the associated employment opportunity as a result of increased skills will be discussed, re-updated and implemented with the concessionaire's support within the framework of the proposed Local Development Plan. 3.2. Establish and implement Grievance mechanism in line with IFC PS 1	Grantor	During the financial closing period (Pre-construction)

Aspect	Impacts	Social Management Action Plan	Responsibility	Timing
4. Incomes for businesses	Impacts on loss of income from business disturbance	4.1. The government will give due consideration to affected businesses on the approval of new relocation site proposed by them as well as granting them the license to operate with proper application documents filed to concerned entities. 4.2. Establish and implement Grievance mechanism in line with IFC PS 1 4.3. Businesses will be provided with sufficient time to transfer to other locations. 4.4. The Livelihood Restoration Component will be incorporated together with the RAP and will include the provision of allowance for temporary loss of income from fishing, allowance for temporary loss of income from employment, accessibility to training provided for potential employment in the construction and operational phases of the project.	Grantor	During the financial closing period (Pre-construction)
CONSTRUCTION PHASE				
1. Marine water, fishing ground, aquaculture sites, and tidal flat area	Impacts on access to the deeper ocean, fishing ground within the Bay, increased in turbidity and reduction in sources of livelihood	1.1. The Concessionaire will clearly delineate work areas, ensuring access to fishermen going to the deeper offshore and implement measures to minimize impacts on adjacent fishing ground as well as impacts from increased in turbidity. This will be monitored on a regular basis as part of the scope of work under the Environmental Management Plan for the port. 1.2. A RAP will be prepared which include the provision of allowance for temporary loss of income from fishing and allowance for temporary loss of income from employment at the site. 1.3. The Livelihood Restoration Plans will be incorporated into the RAP to be prepared and implemented by the Government. Training for jobs available during the construction period should be made accessible to the Suco/District residents. This will be discussed, re-updated and implemented with the concessionaire's support as the impact is likely to occur and extend during port construction and operation.	1.1 Concessionaire 1.2 Grantor 1.3 Grantor	During the financial closing period (Pre-construction)

Aspect	Impacts	Social Management Action Plan	Responsibility	Timing
2. Population	Population influx	2.1. The Concessionaire and the Grantor will communicate with SEPFOPE to ensure existing programs of SEPFOPE be especially accessible to the residents of host Suco/District/Country prior to and during the construction period. 2.2. Maintenance of the Grievance Redress Mechanism	2.1 Concessionaire and Grantor 2.2 Concessionaire / Grantor	During the financial closing period (Pre-construction)
3. Health and Safety	Community Health and Safety	3.1. Maintenance of the Grievance Redress Mechanism 3.2. Facilitate education and awareness programs throughout the lifespan of the port 3.3. Establish access controls to the site activities posing health and safety risks to the community. 3.4. Develop strict protocols for increased traffic safety.	Grantor	During the financial closing period (Pre-construction)
OPERATIONS PHASE				
1. Marine water, fishing ground, aquaculture sites, salt production area, and tidal flat.	Impacts on fishing ground and reduction in sources of livelihood.	1.1. The Concessionaire should regularly maintain access to offshore fishing ground. 1.2. Mitigation measures to minimize impacts on fishing ground within the Bay and impacts from higher turbidity of water 1.3. Training for jobs available during O&M phase should be made accessible to Suco/District residents. 1.4. Implement Grievance mechanism	1.1 Concessionaire 1.2 Concessionaire 1.3 Grantor 1.4 Grantor	▪ 30 year concessionaire period ▪ Grantor to continue the mitigation measures from the date the port operation and management is transferred to them by the concessionaire
2. Impact on existing port employment	APORTIL staff numbers will be reduced with the building of the new port	2.1. A Strategic Port Area Development Plan (APORTIL Development Plan) is being developed to encompass port operations in other districts. 2.2. A National Port Organisational structure should be developed to include position descriptions and demobilisation and or re skilling of staff. 2.3. Some staff will be transferred to the Tibar Bay Port.	2.1 Grantor 2.2 Grantor 2.3 Grantor 2.4 Grantor and Concessionaire	▪ 30 year concessionaire period ▪ Grantor to continue the mitigation measures from the date the port operation and management is transferred to them by the concessionaire
3. Visual amenity	Visual impact of the port on local tourist operator and community	3.1. Existing vegetation around the perimeter of the port should be retained, if possible to act as a visual screen 3.2. Where feasible the elements within the construction site should be located to minimise visual impact. 3.3. Preparation of Light Management Plan should be considered to mitigation night time lighting	Concessionaire	During the financial closing period (Pre-construction)

Aspect	Impacts	Social Management Action Plan	Responsibility	Timing
4. Restricted local access	Local fishermen and community members will have less access to the bay.	4.1. The Concessionaire should regularly maintain access to fishing grounds including maintaining proper navigational aids to avoid collisions between fishermen and vessels. 4.2. Consultation with local community members should be on-going	4.1 Concessionaire 4.2 Grantor and Concessionaire	During the financial closing period (Pre-construction)
5. Employment Creation	Generation of employment opportunities	5.1. Training for jobs available during Operations and Maintenance phase should be made accessible to Suco/District residents. 5.2. The Concessionaire and the Grantor will coordinate with Secretary of State for Professional Training and Employment Policy SEPFOPE to gear its training program at the local vocational training centre to jobs available at the port 5.3. The Concessionaire should provide additional training to newly hired port crew. 5.4. Concessionaire should adhere to their targets as noted in the Local Development Plan. 5.5. Implement Grievance mechanism in line with IFC PS 1	5.1 Concessionaire and Grantor 5.2 Grantor and Concessionaire 5.3 Concessionaire 5.4 Concessionaire 5.5 Grantor	▪ 30 year concessionaire period ▪ Grantor to continue the mitigation measures from the date the port operation and management is transferred to them by the concessionaire

Table 10-1: Social impact management plan

11 Economic Assessment

The amounts below are based on the information available at this stage, and constitute a preliminary estimate.

The economic values of environmental impacts of the Project are mitigated through the following best practice approaches:

1. Selection of plant and equipment which meets noise and air quality emissions standards;
2. Engineering and project design to limit the footprint area and thus impacts to vegetation from clearing and on heritage sites;
3. Site selection to limit the impacts of dust and noise on the communities and reduce the costs associated with noise attenuation and dust suppression measures;
4. Selection of the Project implementation approach to ensure access to employment opportunities for the local people; and
5. Selection of dredge and reclamation methodology to provide construction material and to limit the impact from sedimentation and contamination.

	Pre Construction & Construction	Operations
Environmental	$ 443 666	$ 221 833
Social	$ 254 524	$ 87 566
BAP	$ 419 440	$ 72 971

Economic positive impact generated by proposed project to the local community and to state of Timor-Leste is summarized below:

	Construction	Operations
Direct local employment	500 workers	200 workers (at the beginning) to 400 workers (based on traffic growth at year 30)
Amount to GoTL	20 millions USD of taxes	+ 165 million USD of Concession fee + 173 million USD of taxes

12 Summary of the Environmental Management Plan

An Environmental Management Framework (EMF) sets the structure for managing environmental risks and impacts during the Project life cycle. The EMF for the Tibar Port Project includes the following key approaches:

a. Select the Project option which has the lowest possible environmental footprint;
b. Reduce the environmental impact, as far as possible, through engineering and design approaches;
c. Mitigate environmental impact, as far as possible, through engineering and design approaches;
d. Manage the direct impacts and the risk of ongoing impact through management measures and monitoring; and
e. Continuously improve the environmental management and monitoring measures through the Project life cycle.

As required by the Environmental Licensing Law the EMP is a separate document from the EIS.

The EMP is an essential tool for ensuring that mitigation of the negative impacts and enhancement of the positive impacts is carried out effectively throughout the life of the Project. An EMP should be systematically improved on a regular basis to ensure that best available technologies (BAT) and best environmental management practices are implemented in a manner that is pragmatic, efficient and cost-effective.

The EMP for the Project addresses:

1. Environmental impacts which are identified as '**Medium**' or greater in EIS document;
2. Mitigation measures for all aspects which are required in accordance with industry best practice;
3. Monitoring measures and standards to be followed;
4. Trigger values or target values of measurement criteria;
5. Reporting requirements; and
6. Continuous improvement process.

The EMP will be reviewed at the following key Project milestones:

- Completion of the pre-construction phase and additional specialist studies;
- Completion of the construction phase;
- Award of the Operations contract to incorporate operator-specific information;
- Every 5 years at minimum during Operations phase.

The EMP will be reviewed following the events where:

- Equipment or procedural changes result in a positive or negative change to the Project environmental and social risks;
- Monitoring results indicate that a change to the mitigation and monitoring regime is required to manage the Project impacts;
- Legislative changes in country require update to the EMP; and
- There is a change to the responsibility matrix for EMP implementation.

The EMP is supported by three key documents:

- Dredge Management Plan
- Port Marine Spill Contingency Plan
- Biodiversity Action Plan

The economic values of environmental impacts of the Project below are based on the information available at this stage, and constitute a preliminary estimate.

Parameter	Pre Construction & Construction	Operations
Air Quality	$ 96,322	$ 64 215
Noise and vibration	$ 23,351	$ 35 026
Sedimentation	Included in D&C contract	$ 52 539
Water Quality	$ 14,594	$ 17 513
Benthic Habitat	$ 189,726	$ 43 783
Reclamation	$ 58,377	$ -
Invasive Marine Species	Included in D&C contract	$ -
Marine Megafauna	$ 14,594	$ -
Underwater noise	$ 14,594	$ -
Lighting	$ 8,757	$ 8 757
Offshore disposal	Included in D&C contract	$ -
Terrestrial fauna (incl. birds)	$ 23,351	$ -
Employment	$ 116,754	$ 58 377
Fishing	$ 53,123	$ -
Population and community	$ 72,971	$ 29 189
Cultural Heritage	$ 11,675	$ -
Mangroves and Mudflat/Seagrass	$ 396,090	$ 72 971
Birds and Turtles	$ 23,351	$ -

13 Public Consultation

Involving the public in preparation of the EIS is fundamental to increasing the public's understanding and acceptance of the Project (e.g., how the Project may affect or improve their living conditions). Public involvement also enables members of the public to identify and bring forward impacts and issues that are not immediately obvious to the EIS team. The earlier in the Project preparation process the public can be involved, the more likely that a trusting relationship can be built and useful recommendations made.

13.1 Purpose of public consultation

The public consultation process for the environmental assessment is carried out in accordance with the Draft Ministerial Diploma for the "Regulation on the Public Consultation Procedures and Requirements during the Environmental Assessment Process" dated 22 April 2014.

Considerable resources were invested into stakeholder engagement from the inception of this project by the GoTL. Stakeholder engagement has been institutionally anchored in the inter-ministerial PPP Working Group, which in October 2013 appointed a Special Panel for Stakeholder Engagement (Special Panel) chaired by the Vice Minister for Transport and Communication. The Special Panel delegated the work to a Technical Team representing 7 ministries and secretaries of state in January 2014.

The GoTL Stakeholder Engagement Team met regularly to develop the stakeholder engagement program and building mutual trust and ownership to the process among the members. The Stakeholder Engagement Team subsequently oversaw the conduct of public consultation and disclosure, conducted detailed measurement surveys as well as mapping of cultural heritage sites. The Timor Port team have continued the open and transparent consultation with all stakeholders. Table contains a summary of Stakeholder Engagement activities to date, all conducted during the Pre-Construction Phase for the purpose of general and specific information dissemination and discussion sessions. Refer to Table 13-1 and Table 13-2for a summary of the consultation to date.

13.2 Fieldwork

The GoTL socio-economic census that was conducted from December 14 -16, 2015 to further collect in-depth socio-economic information more suited for the preparation of SIA and RAP. This detailed census identified a total of 217 affected people consisting of 68 PAPs in Group A and 149 PAPs in Group B.

Then on the 10-14th October 2016, the Advisian Social Team conducted socio- economic surveys in the greater project area with indirectly affect community members. This refers to community member who will not be physical or economically displaced by the project however will still be impacted. The households mainly consisted of Tibar community members living on the other side of the road from the proposed port location, as well households in neighbouring Ulmera. The survey was undertaken for 25 households currently living near the proposed development. Two of the survey were conducted with fish Co-Ops (homesteads with only men living together to fish collectively) The survey questionnaire included the socio-economic status of PAPs, migration patterns, fishing activities and other sources of livelihood, and perceptions on impacts. Refer to Figure 13-1, Figure 13-2, Figure 13-3 and Figure 13-4 for pictures of community members being interviewed for the socio-economic surveys.

Figure 13-1: Members of fishing co-op being interviewed for socio-economic survey

Figure 13-2: Tibar community members being interviewed for socio-economic survey

Figure 13-3: Tibar community member being interviewed for socio-economic survey

Figure 13-4: Interview with the Tibar Primary School principal.

Table 13-1: Public consultation summary

Stakeholder Engagement	Type of Engagement	Date	Tools Used	Number of Attendees	Project information Presented	Comments raised
Local Community	Community meeting	June 11,2014	Presentation, discussion & leaflet	120, (Locally affected population; district and sub district administrators; representatives from the relevant agencies	Plans, rationale, potential social and environmental impacts of project	Compensation mechanism, Benefit sharing mechanism
Local Community	Community meeting	August 1, 2014	Presentation, discussion & leaflet	65, (Locally affected population; sub district, Administrator; *Chefi du Suco* of Tibar and Ulmera	Informing the community about data; cadastral mapping process in the area of the Tibar Port	Relocation sites to those physically affected. Exact are to be affected by the development. Mitigation plans to avoid affecting community water supply (Natural Spring). Timeline of relocation. Effect of development to livelihood activities (Salt making)
Business Owners	Community Meetings	Nov 18,2015	Presentation Discussion session	25 Representatives (from affected businesses, Stakeholder Engagement Team members)	Project timeline, status and clearance of the area.	The businesses noted that enough time should be provided for them to transfer to other locations. The best solution was not compensation but to provide them a place to move to.
Principal Of Tibar Primary school	One on one meeting	12 October, 2016	Background information document provided and discussion session	3, The Principal and two Advisian staff	Introduction to Advisian, EIS scope and timeframe	The Principal supports the project but was concerned about the increased traffic in the area due to the project.

Stakeholder Engagement	Type of Engagement	Date	Tools Used	Number of Attendees	Project information Presented	Comments raised
Doctor at Tibar Clinic	One on one meeting	12 October, 2016	Background information document provided and discussion session	3,The Doctor and two Advisian staff	Introduction to Advisian, EIS scope and timeframe	Dr Do Santos has heard about the Tibar Port project he received the information from community members.
Manager at Tibar Training Centre	One on once consultation	12 October 2016	Background information document provided and discussion session	3, Training Centre Manager and two Advisian staff	Introduction to Advisian, EIS scope and timeframe	The center also has external contracts with companies to design training course for specific company requirements. So this is something that can be explored if required for Tibar Port.
Manager at Tibar Bay resort		12 October 2016	Background information document provided and discussion session	2, Resort Manager and two Advisian staff	Introduction to Advisian, EIS scope and timeframe	The Resort Manager explained that she had consultation with the government for many years regarding the project.
Jesuit Religions Group	One on one discussion	16 January 2017	Project introduction and discussion session	3, Jesuit Priest and Advisian representatives	Introduction to Advisian, EIS scope and timeframe	The Jesuit church representatives have not be directly approached by the GoTL to inform them of the project. They have obtained information via the internet.

In addition to the local community and business owner consultations, The GoTL PPP Unit and Timor Port held separate consultation activities with relevant government agencies, as shown in Table 13-2. This is consultation to collection information related to the relocation of fuel importing businesses out of the area. A summary of the government agency consultation is provided below.

Table 13-2 GoTL and Timor Port business consultation

Agency Consulted	Type of Engagement	Date	Tools Used	Number of Attendees	Project information Presented	Comments raised
Police Maritime	Consultation meeting	6th August 2015	Interview site inspection	4 (3 PPPLU offers and one Police Maritime officer)	To collect information regarding all activities relative to the businesses that are currently operating at the Tibar Port	• Global Fuel, Laiara Fuel, Arjumar Fuel have business license and still active in loading and unloading the goods. The three companies are constructing their own jetty in Liquiça area. When the construction of TBP Port starts, they will move to their own Jetty. This information has also been verified by ANP see result of discussion with ANP. • Atauro Express: This company no longer imports fuel, but its ship are still anchored in the berth or using the existing port's Jetty. Atauro Express also invested to the existing port such as fencing the port area, installation of the pipe system, rehabilitation of the facilities and building its office inside the existing port. ETO and PUALAKA; These two companies previously operated at the existing Tibar Port. They still have their assets inside existing Tibar Port. According to the Maritime Police, these two companies informed them that they will clear or remove their assets soon. Note: As of May, 2016 these two companies have cleared their assets within the Port

Agency Consulted	Type of Engagement	Date	Tools Used	Number of Attendees	Project information Presented	Comments raised
ANP	Meeting	25th August 2015	Consultation meeting	ANP (2) PPPLU (3)	Discuss the existing business operators at Tibar Port.	Information gathered on businesses: • Equipment: there are 2 barges in Tibar Port; each barge has a capacity of 2,500 KL (kilo-liter) fuel (diesel). Owner of the barges is Star King Construction. Laiara knows the contact person. The barges receive and store diesel fuel for marketing to fuel refilling stations, power stations including Betano, Atauro and Oecusse and operators of heavy equipment. • Fuel for Hera Power Plant is directly transported to the power station which has an existing jetty. • Pertamina, on the other hand has its own jetty, however, they do not share this with other oil importers. • Tibar Port exists since 2002. ANP as the proper authority will no longer allow wooden vessels to transport fuel to Timor-Leste, due to non-compliance with the International Standard (Wooden Vessel is inappropriate to carry fuel).This does not mean that ANP will stop the businesses of these companies, but rather to require them meet the minimum Safety Standards. Follow-up discussions went through for 3 months already and some resistance have been encountered. • Regarding documentations, wooden-vessel operators have no papers to show. Based on information, the hauling of fuel which is not acceptable anywhere in the world occurred in

Agency Consulted	Type of Engagement	Date	Tools Used	Number of Attendees	Project information Presented	Comments raised
						East Timor somewhere in the middle of the sea being brought by a certain vessel. ANP, on the other hand, is obliged to check the quality of incoming fuel by taking and sending samples to Australia for analysis. • Ajumar has Fiber Glass vessel and is handling 300,000 to 1,000,000 liters. • Global and Lai Ara - Vessel used is owned by another company. • According to ANP, gasoline is not allowed to be transported through this port. • Regarding Mr. Lourenço, he is an operator and the facilities in Tibar Port are owned by the Government. • ANP received proposals to build jetty in Liquiça 7 kilometers away from Tibar Port. **Noted that a resolution for this issue (clearing of area for TBP) should be prepared and the Ministry of Public Works, Transport and Communications (MPWTC) shall present this to the Council of Ministers for approval.**
	Meeting	11 April 2016	Consultation meeting	ANP (1) PPPLU (3)	To get updates on businesses and other related information.	• Of the 13 businesses listed to have conducted fuel importing activities on Tibar Bay, only three have license from ANP to continue operating because they met the safety standards. These are Global Fuel and P. Trading Pty, Lda., Arjumar Unip. Lda, and Lai Ara Unip. Lda. • ANP updated PPPLU on the status of the development of Global, Arjumar and Lai Ara's

Agency Consulted	Type of Engagement	Date	Tools Used	Number of Attendees	Project information Presented	Comments raised
						plans to develop their own jetty facility. Global and Lai Ara has teamed up to develop their own facility also Arjumar is going to build their own facility. These sites are located in Liquiça. • To build their own facility, these businesses have to submit • Page 31 v.June 10, 2016 • Application to secure permit from ANP. Application to be submitted will be reviewed and should be completed in accordance with ANP requirements. As to potential impacts to availability of diesel fuel in Timor-Leste should the businesses stop activities, ANP highlighted that during the relocation phase, there could be impacts on the supply of diesel fuel but specific to construction works in the country (as Pertamina is supplying the bulk of consumer diesel demand).
Project Management Unit –Roads (PMU)	Presentation and one on one consultation	30 November 2016	Discussion session	11,Timor Port, Advisian and PMU Roads representatives	Infrastructure requirements around proposed port	The requirement for the PMU's assistance with Storm water channels and roundabouts close to the proposed port.
PPPLU	Presentation and one on one consultation	30 November 2016	Discussion session	18, Timor Port, Advisian and PPPLU representatives	Livelihood Restoration plans status, Independent Engineer appointment	Timor Ports noted that the delay in the appointment of the Independent Engineer could delay the project submissions.

Agency Consulted	Type of Engagement	Date	Tools Used	Number of Attendees	Project information Presented	Comments raised
Electricidade De Timor-Leste (EDTL)	Presentation one on one consultation	1 December 2016	Discussion session	11, , Timor Port, Advisian and EDTL representatives	Project Power requirements during construction and operations of the proposed project	The EDTL will work on existing network to ensure sufficient power to Timor Port.
(DNSA) Water and Sanitation Department	Presentation one on one consultation	1 December 2016	Discussion session	12, Timor Port, Advisian and DNSA representatives	Project water requirements.	DNSA indicated that they will perform new test (during 72 hours and monitoring surrounding bores) to check rate available and water quality.
National Procurement Commission (NPC)	One on one consultation	1 December 2016	Discussion session	11, PPPLU, NPC, Advisian and Timor Port representatives	The appointment of the Independent Engineer.	• The requirements of the Independent Engineer in concession agreement were discussed.
Customs	Presentation and one on one consultation	2 December 2016	Discussion session	9, Customs, Advisian and Timor Port representatives	Timor Port presented the customs operation of the port	• The general layout of the customs facility at the proposed port was presented. GoTL Customs to provide comments.

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13.3 Consultation for draft EIS

WorleyParsons and Timor Port have undertaken a process of consultation with the people who may be affected by the Project and the Project stakeholders. WorleyParsons and Timor Port have made efforts to ensure that the public, including affected people, women and vulnerable groups, have the opportunity to participate fully in the consultation process. Consultations have taken place on a continuous basis, starting as early as possible in the EIS process.

13.4 Approach

For the purpose of the development of the project Advisian mapped the project stakeholders with input from the GoTL PMU who conducted previous consultation. The list of identified stakeholders who were invited to the public meeting are summarized below:

Table 13-3: Summary table of project stakeholders invited to the meeting

Government Agencies
MPWTC
Ministry of Finance
Ministry of Justice - Land and Property
Ministry of Agriculture & Fisheries
Ministry of Tourism, Arts and Culture
Ministry Social Solidarity
Ministry of Housing Development, Spatial Planning and Environment
Local Government
Bazartete Subdistrict
Municipality of Liquica
Suco Tibar
Suco Ulmera
Chefe Aldeia
Tibar and Ulmera residents
Chief Ald
Local fishermen
Tibar Primary school
Tibar Police
Civil Society and NGO’s
La’o Hamutuk
Luta Hamutuk
Conservation International
Other Agencies
IFC

Newspaper readership is low in Tibar and thus other advertising methods are better suited to encourage broad public consultation. Community input received during the socio-economic surveys indicated that best way to engage the local community was through the Suco Administration (Therefore Timor Port representatives met with the Ulmera and Tibar Suco chiefs (Refer to Figure 13-5) and public notices to advertise the meeting were placed at the following venues:

- Liquica District Administrator office
- DNTPSC Liquica office
- Bazartete sub-district administrator office
- Forestry Office in Tibar
- Tibar clinic
- District Administrator office, the Sub-district Administrator office of Bazartete, and at the
- Suco office of Tibar and Ulmera.

Figure 13-5: Timor Port staff meeting with Tibar and Ulmera administration to discuss the public meeting

Figure 13-6: Timor Port staff putting up public notice posters in the community

Timor Port and Advisian organized a public meeting on the 23 February 2017 in the Tibar Retreat at Tibar Bay, to discuss the proposed project and the draft EIS and EMP. The date, time and venue of this public meeting was coordinated with the Tibar and Ulmera *Chefes do Suco*. The public meeting advertising was described in **13.4**. The presentation and group discussions were translated into Tetum. Over a 130 people attended the public meeting. This is confirmed by the attendance register.

Advisian and Timor Port presented a description of the Project, explained the EIS process, and provided a summary of the study findings to date. The PMU also presented an update. The presentation also included videos showing a 3D model of how Tibar Port will look once constructed. The PMU also presented an update on the Resettlement Action Plan progress. Following the presentation, three information tables were set up with maps, diagrams and pictures of a similar of port facilities.

The each information table was staffed with a representative from Advisian, Timor Port and the PMU, who provided more detailed explanations of Project details. The community members were invited to observe, ask questions and/or provide recommendations to the Project team. All questions and comments were recorded.

Figure 13-7: Public meeting to discuss the proposed project at Tibar Retreat

A record of the meeting has been included in the Appendix K, including attendance registers and all comments and opinions given by members of the public.

13.5 Summary of comments

Overall the community appeared to be supportive of the project. Table 13-4 is a summary of the key questions raised and addressed in the public meeting.

Table 13-4: Summary of key questions raised and addressed in the public meeting

Question raised at public meeting	Proponents response
Is there any way to avoid the impact the project will have on the mangroves?	The project cannot avoid clearing the 1.4 ha of mangroves in Tibar Bay. However the Biodiversity Action Plan that has been developed as part of the EIS recommends mangrove rehabilitation. The proponent aims to work with a local NGO to provide mangrove seedlings for rehabilitation as part of the company's social corporate responsibility. Advisian has also proposed a mangrove offset area. However these mitigations have not been finalized.
The community will be impacted by the vibration and noise from the piling activities. How will these be mitigated?	There are no health guidelines for vibration however mitigation measures recommended included reducing the hours that piling will occur. For example it will mainly happen during the day and will be for no more than a 6 month period. The noise will be monitored and will be kept at acceptable levels.

Question raised at public meeting	Proponents response
Dust from the local roads is a current problem how the project will manage this.	The EIS will include a dust management plan. An example of one of the measures to reduce dust would be to water the roads. However the new road development is not part of the project.
Will the removal of the mangroves and seagrass and sedimentation have an affect the sea level and cause flooding in the local community?	The reclamation activities will not have an impact on sea levels.
The new road project in Tibar will impact the mangrove. When the Government widens the road they will destroy the mangroves. The other concern is that the dredging will have an impact on the mangroves because of sedimentation.	The road extension is not part of this project however the comments will be noted. As PMU Tibar ports have weekly meetings with PMU road so they will discuss the concern about the roads and mangrove and sedimentation.
Most of the fishermen's rompongs are in the fishing channel. Because of the project they will not be allow to fish in this area. How will the project manage this?	The Government's responsibility is only for fishing ground near the project area but not outside location such as rompong area. During survey we are only identified 1 rompong. This is new information, will discuss with PMU. Fishermen can continue to use rompongs outside the shipping channel.
The local spring that has been identified to have high cases of E.coli. This is very concerning for the local community.	The contamination issues should be should be discussed with their local authority. The community should write letter to SAS, Government to request assistance from SAS department. The Spring water contamination has been caused by water disposal from the waste dump site (Tibar) and animals. The PMU will try to share this information to relevant authority.
Some of the fishermen's boats are unable to enter Ulmera beach (the place that has been identified by Government), due to distance issue and historical issues between Tibar and Ulmera Community	Before deciding to select the current location (Ulmera) the PMU had proposed 3 locations to the Secretary of State for Land Property (the 3 area including the beach) However, Secretary select the current area (Ulmera) to be utilized as the area is very close to the main road.
How will local community members with low levels of education access jobs and training from the project?	Bollore (TPSA) will have a two part recruitment process during construction and operation. There are other sub-contractors who will take responsibility for construction. But the sub-contractor will give first opportunity for Tibar

Question raised at public meeting	Proponents response
	or Ulmera community. Fisherman should continue to fish because people who work in port might want to buy their fish. We will select people to do training. We have two plans for training: • Training for workers. They can improve their capacity. • Training for local community and health education. But Timor can't promise to you how much training will be.
How can local businesses in Tibar work with Timor Port to provide services.	Timor Port has a local company register. If a company is interested in working on this project they should register their interest. Smaller Timorese companies may be able to support the main contractors. Timor Port have our commitment, look employ 100 Timorese workers and only 1 worker from France.. It is better we use local company and local community for work because Economical (cheap) and efficient.

The full meeting minutes from the public meeting has been included in Appendix K, including attendance registers.

13.6 Consultation for draft BAP

Timor Port has undertaken a process of consultation with the Chefes do Suco of local communities who may be affected by Conservation and Offset areas proposed in the Biodiversity Action Plan.

Timor Port organized a meeting with Ulmera and Tibar Chefes do Suco respectively on the 14 and 16 August 2017 in each Chefe office, to discuss the proposed project and the draft BAP. The presentation was translated into Tetum.

Timor Port presented a description of the Project, explained the BAP process and provided a summary of the Offset and Conservation areas. The PMU also assisted to this meeting. Following the presentation, a question and answer time was lead. All questions and comments were recorded.

Figure 13-8: Chefes de Suco meetings to discuss the proposed BAP

A record of the meeting has been included in the Appendix O, including attendance registers.

Chefe Sucos agreed in principle with the BAP and action plan and they look forward to the subsequent progress.

13.7 Recommendation for future consultation

Timor Port is committed to ensuring continued, open and transparent consultation with all Project stakeholders and interested and affected parties. Consultation will continue through the life cycle of the Project. There should be ongoing consultation relating to the following processes:

- The Resettlement Action Plan
- The Livelihood Restoration Plan
- The Grievance Redress Mechanism

14 Difficulties encountered in the preparation of the EIS

The key challenge in the development of this EIS were that the surveys and initial field works were undertaken with limited engineering inputs and no identified spoil disposal ground or details around staging of construction. This made it difficult to determine where to collect baseline environmental data.

The field survey timeframe was restricted and not optimal for collecting certain data including fauna and flora, whales and turtles.

The project is to be assessed by the GoTL regulator (NDCEPI). The **unofficial** involvement of the IFC and World Bank advisors has created challenges with respect to compiling a document which meets the local environmental standard and ToR which is the subject of the Concession Agreement; and managing the expectations of the IFC who are technical advisors to the PPPLU and not contractually reviewers of the project EIS.

15 Conclusions and Recommendations

The project will have unavoidable impacts on the marine and human environment; however the site which has been selected in Tibar Bay represents the best possible outcome for the environment. The dredging programme has been planned to dredge to -16 chart datum to source fill material for the reclamation area.

This conclusion and recommendations section has been reinforced by the inclusion of the very specific and relevant comments highlighted by NDPCEI technical team during the review process of the draft EIS. Each technical comment made by NDPCEI has been responded in the relevant section of this final EIS.

The key high impacts relate to the removal of benthic habitat within the reclamation area. This is an unavoidable impact and the development and implementation of the Biodiversity Action Plan will attempt to create alternative, sustainable mangrove and benthic habitat which also contributes to community resilience. This includes the creation of offsets and mangrove conservation areas.

During reclamation activities, turbidity from return water discharge should be actively managed to ensure that excess turbidity does not significantly impact on water quality in Tibar Bay. Monitoring of turbidity and sedimentation is also recommended at selected monitoring sites inside and outside Tibar Bay for the duration of the project.

The dredging impact assessment indicates that the impact area extends to several km west and east of Tibar Bay. The plumes are highly variable in intensity and are variable in their spatial extent. Fringing corals outside Tibar Bay are likely to experience some exposure to turbid plumes; however the duration of the plumes are short and generally transient in nature. Only corals that are close to the entrance to Tibar Bay and occur in deeper water (greater than 20 m depth) are likely to be vulnerable to impact from the reduced light caused by dredging and offshore spoil disposal.

The impact from long term sedimentation in the marine waters of Tibar Bay is expected to be negligible. The anticipated port configuration does not result in significant changes to the currents and flushing behaviour through the mouth of Tibar Bay.

The impact mitigation framework includes the establishment of impact and reference sites for monitoring benthic habitat during dredging and disposal of spoil at the spoil ground.

Mitigation measures to minimise the impact on marine megafauna during dredging and piling have been recommended and include marine fauna observations.

The key impact to the local community is loss of livelihood and access to traditional fishing areas. The community relies on subsistence fishing and gathering of habitat-derived materials with strong provisioning services capacity. This impact can be effectively mitigated with the development and implementation of a Livelihood Restoration Plan by the GoTL.

16 Non-Technical Summary

ENGLISH	TETUM
Introduction: The Government of Timor-Leste (GOTL) proposes to construct a new port facility in Tibar Bay, 10km west of Dili. The principal function of the port is to replace the congested Dili port and add capability to handle bigger vessels. . Timor Port SA has been established as a consortium of parties to deliver port project on behalf of the grantor, the Democratic Republic of Timor Leste. Timor Port SA comprises: 1. Bollore Africa Logistics 2. SDV Logistics East Timor Unipessoal Limitada 3. Societe de Participations Africaines The Project Management Unit (PMU) is managing the project, as this is a critical project for the country. Timor Port SA and PMU are implementing environmental safeguards, mitigation measures and other requirements.	Introdusaun: Governo Timor-Leste proposta atu konstrui fasilidade ponti kais foun iha Tibar baia, 10km oeste husi Dili. Funsaun prinsipiu husi ponti kais ida ne'e atu troka ponti kais iha Dili nebe'e mak nakonu ona no atu aumenta kapasidade ponti kais nian atu kaer ro'o nebe'e boot liu tan. Timor Port SA hanesan kompania nebe'e mak estabele husi konsorsiu mak atu halao projeitu ponti kais ne'e hodi projeitu nain nia naran, Governo Republika Democratiku Timor – Leste. Timor Port SA kompostu husi kompania hanesan: 1. Bollore Africa Logistics 2. SDV Logistics East Timor Unipessoal Limitada 3. Societe de Participations Africaines Unidade Gestao ba Projeitu (Project Management Unit-PMU) mak maneja ba projeitu ne'e, tamba projeitu nebe'e maka importante tebes ba nasaun ida ne'e. Timor Port SA no PMU sei implementa seguransa ba ambienti, medidas ba mitigasaun no rekerementu seluk tan.
Project description: The port project is comprised of: ▪ A two-berth quay wall approximately 630 m long; ▪ Demarcation of a 250 m wide shipping channel; ▪ Dredging of the turning basin and port quay area; ▪ Reclamation and soil improvement of the 27 ha container terminal; and ▪ Supporting infrastructure for operation of the port. ▪ Investment of USD 290 million during the construction phase and USD 490 million over the 30 years concession period	**Descripsaun Projeitu** : Projeitu ponti kais ida ne'e kompostu husi: ▪ Parede para Ro'o sadere 2 ho naruk mais o menus 630m ▪ Demarcasaun kanal navigasaun ho luan 250m ▪ Ke'e Rai ba fatin ro'o hadulas fatin no area ba ponti kais ▪ Reklamasaun no aumenta rai ba 27 hektares terminal ba konteiner; no ▪ Infrastrutura atu suporta operasaun husi ponti kais ▪ Investimento de USD 290 millioes para la construção ho USD 490 millioes para tinan 30 de concessão.

ENGLISH	TETUM
Legal framework: The implementation of the Project is governed by laws, regulations, and standards for environmental protection and management of GOTL including the Basic Law of Environment (April 2012) and the Decree Law 5/11 on environmental licensing. In addition to GOTL's requirements the project must comply with IFC Environmental and Social Standards. According to both Timorese law and the IFC's Guidelines, the Project is classified as Category A because the potential adverse environmental impacts are regionally significant and require comprehensive management and mitigation measures.	Kuadru Legal: Implementasaun Projetu sei bazeia tuir Lei, regulasaun no padraun ba protesaun ambiental no gestaun husi GoTL inklui Lei Basiku do Ambiental (Abril 2012) no Dekretu Lei 5/11 konaba licenciamentu ambiental. Alem husi rekerementu husi GoTL, projeitu ida ne'e mos tenke kumpri tuir Padraun Ambiental no Sosiais husi IFC nian. Tuir lei husi Timor no mos mata dalan IFC nian, projeitu ida ne'e klasifika ona hanesan kategoria A tamba potensaun atu estraga ambienti hanesan regionalmente signifikante. No persiza genstaun no medidas mitigasaun nebe'e mak komprehensivu.
Description of Environment: The environmental setting for the Project is from the existing beach area to the south of Tibar Bay, adjacent to where the current oil jetty is and along the headland near the Tibar Retreat. The turning basin is at the middle of the bay with the shipping channel starting where the bay naturally opens up to the sea.	**Deskripsaun husi Ambiental:** Cenario ambiental husi projeitu ida ne'e husi area tasi ibun agora iha to'o parte sul husi Tibar Baia, besik ho ponti kais ba mina no tuir tanjung nebe'e besik ho Tibar Retreat. Fatin Ro'o hadulas iha klaran husi baia ho kanal navigasaun komesa iha nebe'e baia nakloke ba tasi.
Consultation: Public consultation was undertaken by the Inter Ministerial PPP working group during a Community Meeting in June 2014, which presented the potential social and environmental impacts of the project. In August 2014, Cadastral Mapping was undertaken to determine who would be impacted by the development. In 2015, the PPP working group met with the Community Business Owners to provide information on timelines and status of the project. In October 2016, Advisian undertook consultation on behalf of TPSA to collect socio-economic data and inform community members about the project; including: • Local fishermen • Local Tibar Bay community • Fr. Roberto Maaghot Boholost (SJ) Jesuit School Cassait, Liquica • Local Ulmera community • Clinic doctors at Tibar Bay and Ulmera	**Konsultasaun**: Konsulatasaun Publiku halao ona husi Grupo servisu Inter Ministeriu PPP durante enkontru komunidade iha Junu 2014, nebe'e mak apresenta pontensaun impaktu sosiais nomos ambiental husi projeitu ida ne'e. Iha fulan Augusto 2014, halo ona Mapeamento cadastral atu determina se'e mak bele hetan impaktu husi dezenvolvimentu ida ne'e. Iha 2015, Grupu Servisu PPP hasoru malu Komunidade Negosiu Nain atu fornese informasaun kona ba orario no status husi projeitu nian. Iha fulan Outubro, Advisian halao konsultasaun hodi naran husi TPSA nian atu koleta dadus sosio-ekonomiku no informa membrus komunidade kona ba projeitu: inklui ba: • Peskadores Local • Komunidade iha Tibar • Fr. Roberto Maaghot Boholost (SJ) Jesuit School Cassait, Liquica • Komunidade iha Ulmera • Doutor iha klinika Tibar nomos Ulmera Iha Desembru 2016, Advisian nomos TPSA halao

ENGLISH	TETUM
In December 2016, Advisian and TPSA undertook consultation with the following stakeholders to discuss the project implementation and proposed environmental and social impact management approaches: • The PPPLU (PPP Launch Unit) • Port Customs Unit of GoTL • PMU Road Unit • National Procurement Unit • Water and Sanitation Department (DNSA) • EDTL (National Electricity Company) A community consultation meeting was held on 23 February 2017 to share the results of the Environmental Impact Assessment and collect community and stakeholder input.	konsultasaun ho parte interesada tuir mai ne'e atu diskuti kona ba implementasaun husi projeitu no proposta oinsa atu halao gestao impaktu ambiental no sociais: • PPPLU (PPP Launch Unit) • Alfandega • PMU Road Unit • Commisao Nacional de Aprovisionamentu • Departementu Nasional Agua no Saniamentu (DNSA) • EDTL Enkontru konsultasaun ho komunidade planu sei halao iha 23 Febereiru 2017 atu fahe rezultadu husi Avaliasaun Impaktu Ambiental no atu hamutuk opiniaun husi komunidade no parte interesada sira.
Concerns and complaints: A grievance redress mechanism (GRM) will be established to help resolve issues associated with the Project. The GRM will receive concerns and facilitate resolution of affected people's complaints and grievances about the environmental and social performance of the Project. The GRM will provide a mechanism for affected persons to voice and resolve social and environmental concerns linked to the Project	**Preokupasaun no Keixa:** Mekanismu reparasaun ba Keixa (MRK) sei estabele atu ajuda resolve kestaun nebe'e iha relasaun ba projeitu. MRK sei simu preokupasaun no fasilita resulusaun husi keixa ema hirak nebe'e afeita kona ba desempenu husi ambiental no social husi projeitu ida ne'e. MRK sei oferese mekanismu ba ema nebe'e afeita atu hato'o no resolve problema sosial no ambienti nebe'e relasaun ho projeitu.
Environmental Management Plan (EMP): The environmental impacts from the Project during construction and operation will be guided by the EMP, and the construction contractor and operator will be required to apply appropriate mitigation measures to minimize environmental impacts to acceptable levels. Controls on construction and operational impacts such as dust and noise, heritage sites, Tibar Bay water quality impacts, health and safety concerns, fishing and livelihood, traffic interruption, employment opportunities and impacts to marine plants and animals will be monitored on a regular basis by the PMU. Training will be provided as necessary to ensure these impacts are mitigated to the greatest extent feasible.	**Planu Managementu Ambiental:** Impaktu ambiental husi projeitu durante konstruksaun nomos operasaun sei uza EMP hanesan mata dalan, no kontraktor ba konstruksaun no operador sei persiza atu aplika medidas mitigasaun nebe'e apropriadu atu minimiza impaktu ambiental to'o nivel nebe'e bele aseita. Kontrola ba impaktu konstruksaun no operasaun hanesan rai rahun no barulhu, fatin eransa, impaktu kualidade be'e iha Tibar baia, preokupasaun ba saude no seguransa, Peskas no subsistensia, interupsaun trafiku, oportunidade ba serbisu, impaktu ba planta no animal tasi nian persiza atu monitora be-beik husi PMU. Treinamentu sei oferese tuir nesesidade atu asegura katak impaktu hirak ne'e sei bele hanenus to'o masimu.

ENGLISH	TETUM
Conclusion and Recommendations: The construction of the project will have short term impacts on the water quality in bay in terms of sedimentation from dredging and reclamation. This may impact fishing and plants and animals in Tibar Bay. The impacts will be mitigated through the projects Biodiversity Action Plan, Dredge and Spoil Management Plan and Livelihood Restoration Plan. Construction of the Port will result in impacts on the local community from dust, noise and traffic which will be mitigated and monitored. Operation of the port will result in minor impacts on water quality in the bay, and noise, dust and traffic impacts during operation. Environmental and social impacts during the construction and operation phases of the project will be managed and monitored by TPSA and PMU with the required regulatory reporting as per the project's approved environmental license.	**Konklusaun no Rekomendasaun**: Konstruksaun husi projeitu ne'e sei iha impaktu iha tempu badak ba kualidade be'e iha baia iha termu husi sedimentasaun husi ke'e rai no reklamasaun. Ida ne'e bele iha impaktu ba peskas no planta no animal tasi iha tibar baia. Impaktu hirak ne'e sei hamenus tuir Planu Asaun Biodivesidade, Planu Gestaun Ke'e no'o Fakar Rai no Planu Restaurasaun Subsistensia. Konstruksaun husi ponti kais ne'e sei rezulta iha impaktu ba komunidade local husi rai rahun,barulhu no trafiku nebe'e sei hamenus no monitora. Operasaun husi ponti kais ne'e sei rezulta Iha impaktu minor ba kualidade be'e iha baia, no barulhu, rai rahun no trafiku durante operasaun. Impaktu Ambiental no social durante faze kontruksaun nomos operasaun husi projeitu ne'e sei maneza no monitora husi TPSA no PMU ho reportagen ba regulatory nebe'e persiza tuir lisensa ambiental nebe'e mak hetan aprova.

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Appendix A Air Quality and Greenhouse Gas

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Appendix B Noise Baseline and Modelling Report

Appendix C Hydrology Water Quality and Sedimentation Report

Appendix D Terrestrial Biological Baseline Report

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Appendix E Marine Benthic and Coastal Habitat Survey and Impact Assessment

Appendix F Megafauna Impact Assessment

Appendix G Underwater Noise Baseline

Appendix H Sedimentation and Contamination Report

Appendix I Traffic Impact Assessment

Appendix J Social Impact Assessment

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Appendix K Minutes of Consultation Meeting

Appendix L Fisheries Assessment

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Appendix M Heritage and Archaeological Assessment

Appendix N Spoil Ground Sediment and Water Quality Report

Appendix O Minutes of BAP Consultation