

**SIMPLIFIED ENVIRONMENTAL IMPACT STATEMENT
(SEIS)
TIMOR GAP Pualaca Block 2D Seismic Acquisition Project
2024**

TG-CEO-QHSE-SEIS-24-001

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ABBREVIATIONS

2D	2 Dimension
ADB	Asian Development Bank
ANP	<i>Autoridade Nacional do Petróleo</i> /The National Authority of Petroleum
DL	Decree Law
EIS	Environmental Impact Assessment
EMP	Environmental Management Plant
ENSO	El-Niño Southern Oscillation
GoTL	Government of Timor-Leste
HSE	Health, Safety and Environment
IBA	Important Environment Areas
IFC	International Finance Corporation
IUCN	International Union for Conservation
MP	Ministerial Diploma
PSC	Production Sharing Contract
QHSE	Quality, Health, Safety and Environment
RDTL	<i>Republica Democratica de Timor-Leste</i>
SEIS	Simplified Environmental Impact Statement
TGPB	TIMOR GAP Pualaca Block, Unip. Lda.

CHAPTER 1. EXECUTIVE SUMMARY

1.1 Project Background

TIMOR GAP PUALACA BLOCK (TGPB), a wholly owned subsidiary of TIMOR GAP, was awarded the PSC TL-OT-21-17 on 7 December 2021. The block covers an area of 1,575 km² and is located on the south coast of Timor-Leste. In total, it accounts for territory in three Municipalities Manatuto, Manufahi, and Viqueque,

TIMOR GAP and ANP negotiated a finalization, and minimum work program commitment plan, which was the focus of the Pualaca PSC application. This included incorporating desktop and geophysical studies such as seismic and non-seismic; full tensor gravity gradiometry and amplified geochemical imaging plans. The desktop study mainly covered onshore geological and geophysical data compilations of onshore geological and Geophysical data.

The subsidiary of TIMOR GAP, E.P. (TIMOR GAP) for the Pualaca block will hire a choice of several geophysical contractors from around the world for the proposed 2D Seismic Acquisition project for the Block in the municipalities of Manatuto, Viqueque, and Manufahi that cover contract area of PSC TL-OT-21-17.

The potential environmental impacts from the Lise Ot large, wheeled vibrator source machines consist of noise pollution, habitat disturbance; Soil compaction, and Water contamination, There Will be no cross-border and global impacts. The impact has been identified for any of the cultural sites present within -the block area, including traditional customs, historical, archaeological, and sacred sites as safe distances set out here in this document mitigate any damages, from the survey area, numerous public consultations the affected communities and regulatory bodies have been conducted. Based on the Decree-Law 39/2022 of 8 June (first amendment to Decree-Law 5/2011, of 9 February, Environmental Licensing law), The Seismic Acquisition project falls into Category B.

The 2D seismic survey is achieved by generated the wave at the surface, and the wireless nodes placed along a line record the reflected waves that bounce back from different subsurface layers. When processed this will create a 'picture' of the subsurface stratigraphic layers and structures. Vegetation clearing will be undertaken using a backhoe, machete, and saw, along the seismic lines. This will be a narrow corridor of 1 to 2.5 meters along the lines, intentionally of minimal width to minimize damage. Equipment carried by hand, and the possible use of bulldozer effort in the rivers. Where possible, vehicle access will be via existing roads and tracks. The total clearing is estimated below 10 km. but based on the experience's estimation for the total clearing to be less than 0.48 km² including the construction of several temporary accommodation camps.

Timor-Leste is rich in valuable natural resources, in particular, petroleum (RDTL 2011d); however, Timor-Leste faces a shortage of skilled workers, due to much of the population having either no or limited education i.e. not beyond primary school level (RDTL 2011d). Timor-Leste has experienced a catastrophic decline in revenue from royalties derived from offshore petroleum production). In 2016 receipts were approximately 7% of the peak in 2012. Now that expenses exceed receipts the government of Timor-Leste is focused on encouraging investment in enterprises including petroleum exploration and development, for the benefit of all the people.

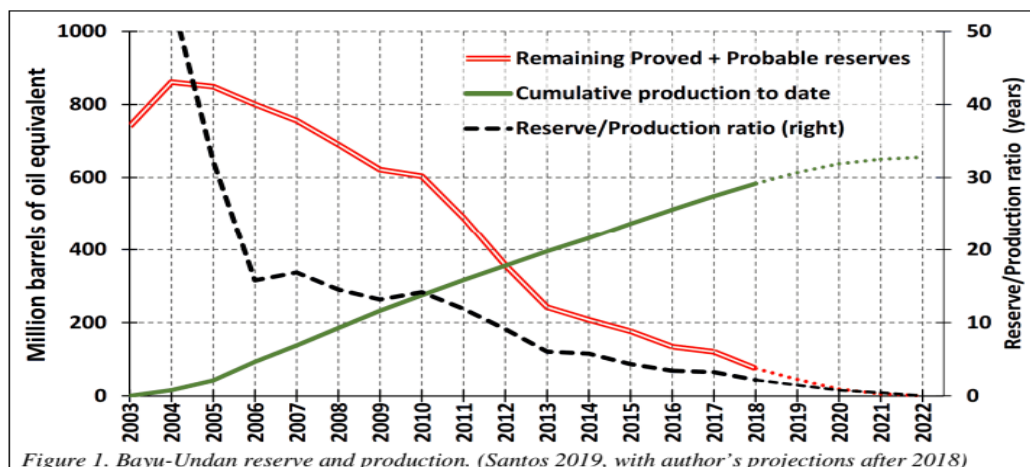


Figure 1- Annual revenue from the petroleum industry (Lao Hamutuk,2022)

1.2 Objective of SEIS

The objective of this SEIS is to explain and address the potential impacts based on the detailed field survey to identify the key environmental impacts associated with the pre-seismic survey, seismic survey, and decommissioning phase of the seismic survey.

The principal objectives of this SEIS report are as follows:

- Provide details information about the proposed project.
- Produce baseline information about the environmental, social, and economic conditions in the area of the proposed project.
- Pinpoint these potential impacts of the project.
- Provide proposed measures to avoid, reduce, or compensate for any significant negative impacts.
- Describe information on the main alternatives considered by the project proponent and the reasons for making his choice.

- Conducted Public consultations with the community, Local Authority, and stakeholders.
- Outline of the information required for the Environmental Management Plan (EMP).

1.3 Impact Assessment and Management

- Land disturbance and clearing – loss of topsoil.
- Land clearing – Disturbance of previously contaminated sites.
- Water – interconnection between previously separated aquifers
- Noise and vibration – the movement of machinery and earthmoving
- Traffic – movement of seismic vehicles and machinery/equipment
- Waste – hazardous waste spill / inappropriate disposal of waste.
- Biological – Clearing of land.
- Biological – works occurring within or close to rivers and/or wetlands.
- Rehabilitation – unsuccessful rehabilitation

Implementation of this project by the framework provided by the EMP will ensure that environmental risks are reduced to 'As Low as Reasonably Practicable' and that all environmental obligations are met. Management sub-plans will be implemented, detailing the specific measures to be applied to avoid and minimize environmental impacts relevant to the project.

1.3.1 Land Disturbance

Minimal land clearing will be required for seismic survey lines, and access roads. Potential impacts from land disturbance include loss of topsoil, erosion, damage to crops and vegetation, habitat fragmentation, loss of important fauna habitat, and interruption or diversion of water flow impacting river/wetland functions. Seismic lines will be programmed to avoid these concerns and will easily circumvent the disturbance of previously contaminated land. Where possible important habitats will be avoided. Principally the use of hand slashing devices, small shrubs and smooth projecting rocks will be used bulldozer, to allow safe passage of vehicles and people.

It is necessary to:

- Topsoil will not be removed from the referred line location.
- Move lines around large trees and areas with significant hardwood growth.
- Seismic operation is reasonably practicable and avoids dense vegetation.

- Use existing roads as much as practical and avoid dense vegetation.
- Leave isolated trees and significant stands of vegetation undisturbed practically.
- Weave around trees using the path of least resistance to minimize timber loss.
- Choose a direction in which to fell trees to reduce collateral effects and promote regeneration.
- Cut tree limbs so that tree trunks fall flat to the ground to speed up decay.

1.3.2 Subsurface and Groundwater

Surface water and groundwater may be impacted through waterway crossings, should these activities be placed near springs and water wells. There is a potential risk of contamination, increased turbidity, erosion, damage to aquatic ecosystems, interruption or diversion of water flow, interconnection between previously separated aquifers, and reduction in water quality and quantity in neighboring water wells.

It is necessary to monitor within seismic line and camp area with:

- Use slow speeds to minimize bank erosion and adjust speed to minimize wake.
- Conduct seismic surveys during the dry season and short duration of works
- No vehicles in swampy wet ground
- All hazardous materials were removed by completion of the seismic survey.
- Prompt cleanup of any accidental spills or leakages (e.g. hydrocarbons, lubricants etc. from vehicles and machinery).
- The water-sealed fenced-camp
- Daily inspect Sewage system
- All hazardous materials stored in the right place
- Camp cleaning regularly

Where avoidance is not possible, seismic lines will cross rivers, creeks, and wetlands, under these circumstances the following management will be employed:

- Avoidance of dense or significant stands (e.g. large trees) of riparian vegetation.
- Protection of waterway from impacts of runoff, erosion and sedimentation.

- Lines should in no way impede the flow of water or cause ponding.
- Water flow shall not be restricted, diverted, or blocked.

1.3.3 Noise and Vibration

Noise and vibrations may be generated by machinery, vehicles, generators, and earthmoving equipment. Mitigation measures include appropriate personal protective equipment (PPE), such as hearing protection, which must be worn when noise is anticipated at greater than 85 dB; equipment silencer; noise control equipment and vehicle maintenance. Vibroseis seismic will not occur in areas that may contain significant species e.g. gully vegetation and natural reserves.

1.3.4 Summary of environmental description and summary of the key findings and conclusions of the SEIS

The summary of the environmental description and summary of the key findings and conclusions is attached in table 1 format below:

Activity and Environmental Component	Key Conclusions
Physical Environment	<u>Soil erosion</u> Pre-Seismic survey phase: Land clearing can cause erosion with the resultant silt degrading the water quality, which in turn affects aquatic and marine life, if no mitigation measures are taken.
	<u>Air and Noise</u> Operation of seismic survey phase: Environmental disturbances, such as dust dispersion and noise are common. These environmental problems are temporary and can be easily mitigated by using conventional measures and best management plane base on Timor Gap Risk and opportunity Management TG-IMS-P-003-Rev-03 for exploration activities in onshore areas.
	<u>Water Pollution</u> Operation of seismic survey phase: Water quality pollution has been cited as an important negative impact occurring mostly during commencement of seismic survey, water quality test in the project area. These could range from short to long-term as the operation of the Project is short-term. Baseline data, location test, area have conducted on 19 of August 2024.
Biological Environment	<u>Marine Ecology</u> Marine flora and fauna in the nearshore waters from the TGPB project area are rich a variety of fish and marine life. Operation of the seismic survey phase: Water pollutants from a campsite that flow to the coastal areas can cause adverse impacts to these flora and fauna. Generally, corals can tolerate a small amount of silt and nutrients, which can enrich their growth. However, in large amounts, they get smothered, choked, and die or bleached.

Activity and Environmental Component	Key Conclusions
	<u>Terrestrial Ecology</u> Terrestrial floral diversity along the Project site is rare Most of the plants are economic plants. The diversity of the terrestrial fauna along the site is also riche. Many of the mammals found at the site are domesticated ones.
Social Economic Environment	<u>Infrastructure and Utilities</u> • The project will be quite fast moving and involves the short-term use of the land as the seismic lines are set, data gathered and moved on to the next line segment. This will mean that these land tracks will be handed back to landowners quickly and rehabilitation will only cover the small disturbed area of the lines. • During the project execution can be cause social conflict the proponent is require involvements of the local community.
Rehabilitation of environmental disturbance	<u>Post seismic survey phase:</u> Rehabilitation of the access track of seismic lines will ensure that land is stabilized as soon as possible after disturbance to reduce the occurrence of erosion, sedimentation, loss of topsoil and weed invasion. Avoidance of heavily weed infested areas, and regular weed checks on vehicles etc.

Table 1- Environmental description and summary of the key findings and conclusions

CHAPTER 2. DETAILS OF THE PROPONENT

2.1 Details of the Proponent

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CHAPTER 3. DETAILS OF THE CONSULTANT

3.1 Introduction

The Consultant Established in 2018 in Dili, **Halona Serena, Lda.** is an innovative and dynamic consultancy firm specializing in environmental and engineering consulting. Founded with the mission to provide superior technical consulting services to both public and private sector clients, Halona Serena has quickly become a key player in addressing the growing demands for consultancy services in Timor-Leste, especially in the face of rapidly expanding infrastructure development.

At the core of Halona Serena's success is its team of professional staff, boasting both local and international expertise. Committed to meeting client expectations, the team comprises a diverse range of specialists including Senior Environmental Experts, Engineers, Health, Safety, and Environment (HSE) Specialists, Sociologists, Biologists, and more. This multidisciplinary approach ensures comprehensive solutions across various project aspects.

Halona Serena's portfolio includes a range of completed and ongoing projects, demonstrating its capability and versatility:

- Oil and Gas projects, including the Category A Project for Timor Resources in Betano.
- Infrastructure projects like the East to South Coast Road Connectivity Project for the Asian Development Bank.
- Baseline study for 72 MW solar panels to be installed in Laleia Manatuto, project for the Asian Development Bank.
- Environmental licensing for significant developments such as the Dili Central (Timor Plaza) project.
- Various environmental assessments and feasibility studies, particularly in water resources and management.

Driven by a vision to be a leading consultancy firm in Timor-Leste, Halona Serena is dedicated to delivering solutions that are environmentally sustainable, socially responsible, and economically viable. The firm's mission focuses on protecting people, clients, and the environment, underpinned by a commitment to high-quality service and a pursuit of excellence.

Halona Serena offers a wide range of services, including Environmental Impact Assessment, Water and Waste Management, Air Pollution Management, Geotechnical Engineering, Social Studies and Resettlement, Various monitoring, and mapping services.

The firm is led by Maria do Ceu do Rosario Rosales, an experienced environmental scientist and business law expert, alongside a team of seasoned professionals like Lawrence Lazaro, Senior Environmental and Sanitary Engineer, Jacinto Soares, Senior Geologist, Januario da Costa, Senior Engineer in Water Treatment, Pedro Pinto, Senior Biologist, Charles Tan, Manager of Wastewater Treatment and Water Management, and others. Each member brings a wealth of experience and specialized knowledge, contributing to the firm's robust capability in handling complex environmental and engineering challenges.

3.2 Consultant who carried out the Study and prepared SEIS

Details of the consultant:

Company Name : Halona Serena Lda.
Director : Maria do Ceu do Rosario Rosales
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CHAPTER 4: DESCRIPTION OF THE PROJECT

4.1 Description of the project

TIMOR GAP PUALACA BLOCK (TGPB), a wholly owned subsidiary of TIMOR GAP E.P., was awarded the PSC TL-OT-21-17 on 7 December 2021. The block covers an area of 1,575 km² and is located on the south coast of Timor-Leste. The Pualaca block accounts for territory in three Municipalities Manatuto, Manufahi, and Viqueque. TIMORGAP is committed to expanding and improve its portfolio Exploration & Production.

There are a several geophysical contractors from around the world that have been considered to be hired by TGPB for 2D Seismic Acquisition project for the Block PSC TL-OT-21-17.

The seismic survey will deploy a broader grid of vibroseis seismic lines along roads and dry river valleys as shown in Figure 2-Proposed Seismic Lines. The project acquisition design will be recorded using vibroseis source equipment the source interval will be 20m. The receiver equipment for recording will be a nodal system deployed at 20m intervals. A live recording spread is also to be provided to ensure noise thresholds are not exceeded during recording. 20 stations of “live receivers” will be deployed 100m away from the recording truck and spread out over 20m intervals to ensure clean recording. The sweep parameters will be finalized based on testing using one 12 second sweeps with a 6 second listen time.

The targeted reservoir is sandstone of the Triassic Babulu Group, and the length of the project will be approximately 266 linear kilometers over 16 lines. The estimated duration of this 2D seismic acquisition for the Pualaca Block is 3 months. Details of the Municipalities, Post Administrative and Sucos, local receptors (existing buildings, schools, health facility, sacred sites, etc.) within the proposed seismic lines and any other project components as shown in Figure 2. The project is based entirely on roads, and they are steep and quite densely overgrown in some areas so much effort will be needed in line clearance and preparation. Line clearance for the seismic survey points will be undertaken by the locals using machete, backhoe, and saw. The lines will be diverted to avoid important habitat, infrastructure and other significant features (e.g. sacred sites).

The seismic line positions provided in Figure 4 are indicative of their final positions. The line positions will be finalized during survey operations after taking into account the geological and operational variations that will occur. A nominal corridor width of 100 m will be identified around the indicated lines, and the most appropriate final route will be within this corridor. If any of the final seismic survey line falls outside of the identified 100-meter corridor the relevant government department and

appropriate community leaders will be notified and a response time limit of 7 days to the company will be maintained to avoid costly delays.

Should TIMOR GAP Pualaca Block, Unip. Lda find that new lines different within this document, are required, then the proponent will undertake consultations with the relevant authority to determine the most appropriate process and timeline for inclusion of the new line/s.

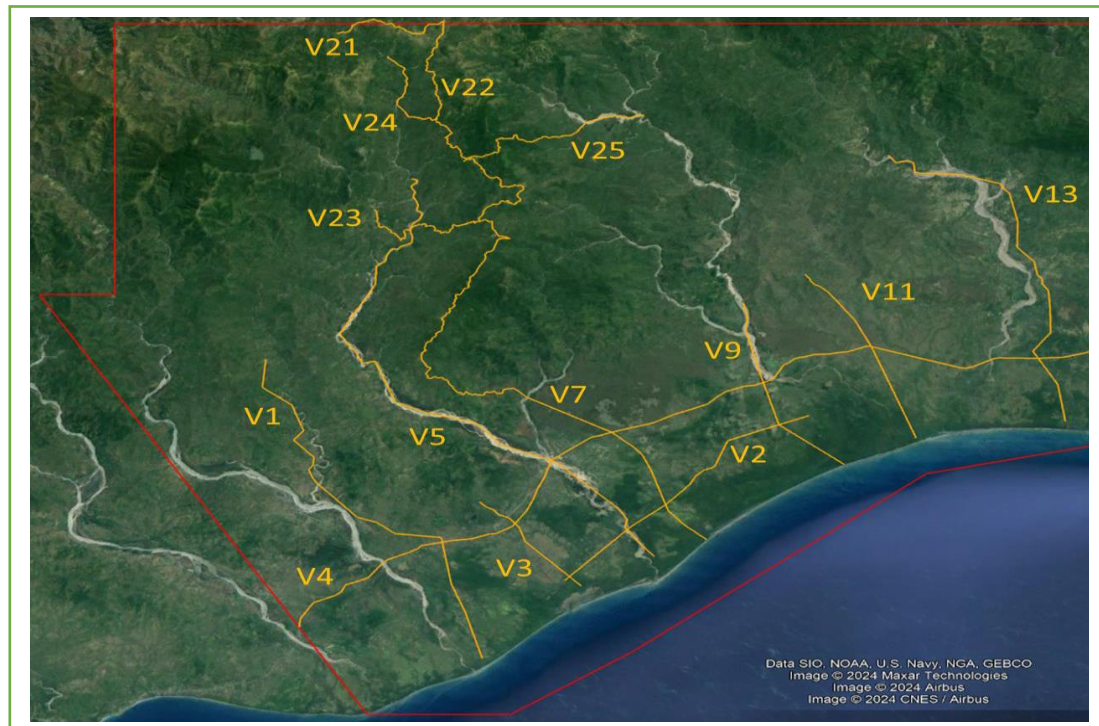


Figure 2-Proposed Seismic Lines

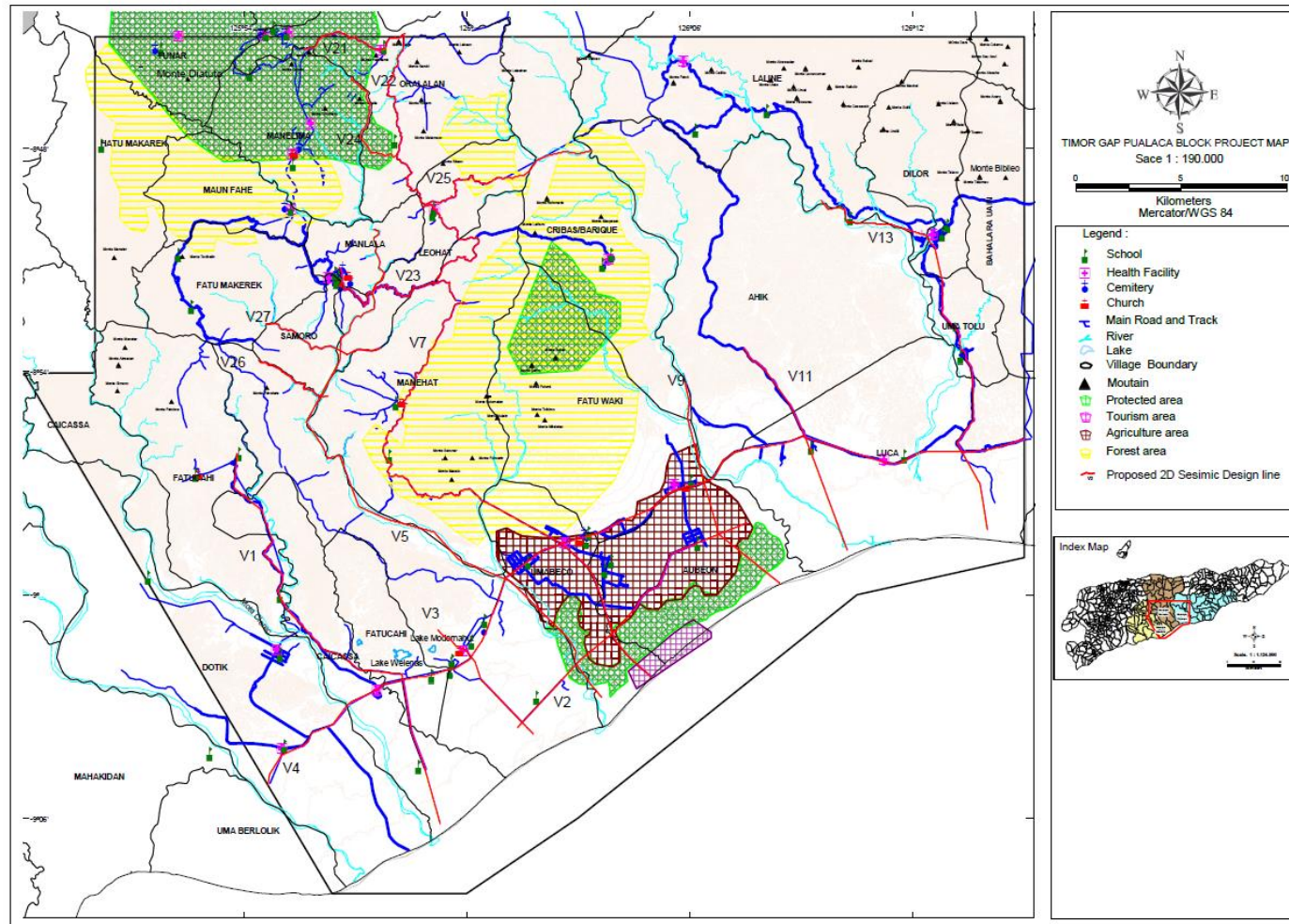


Figure 3-Detailed Map including effected community.

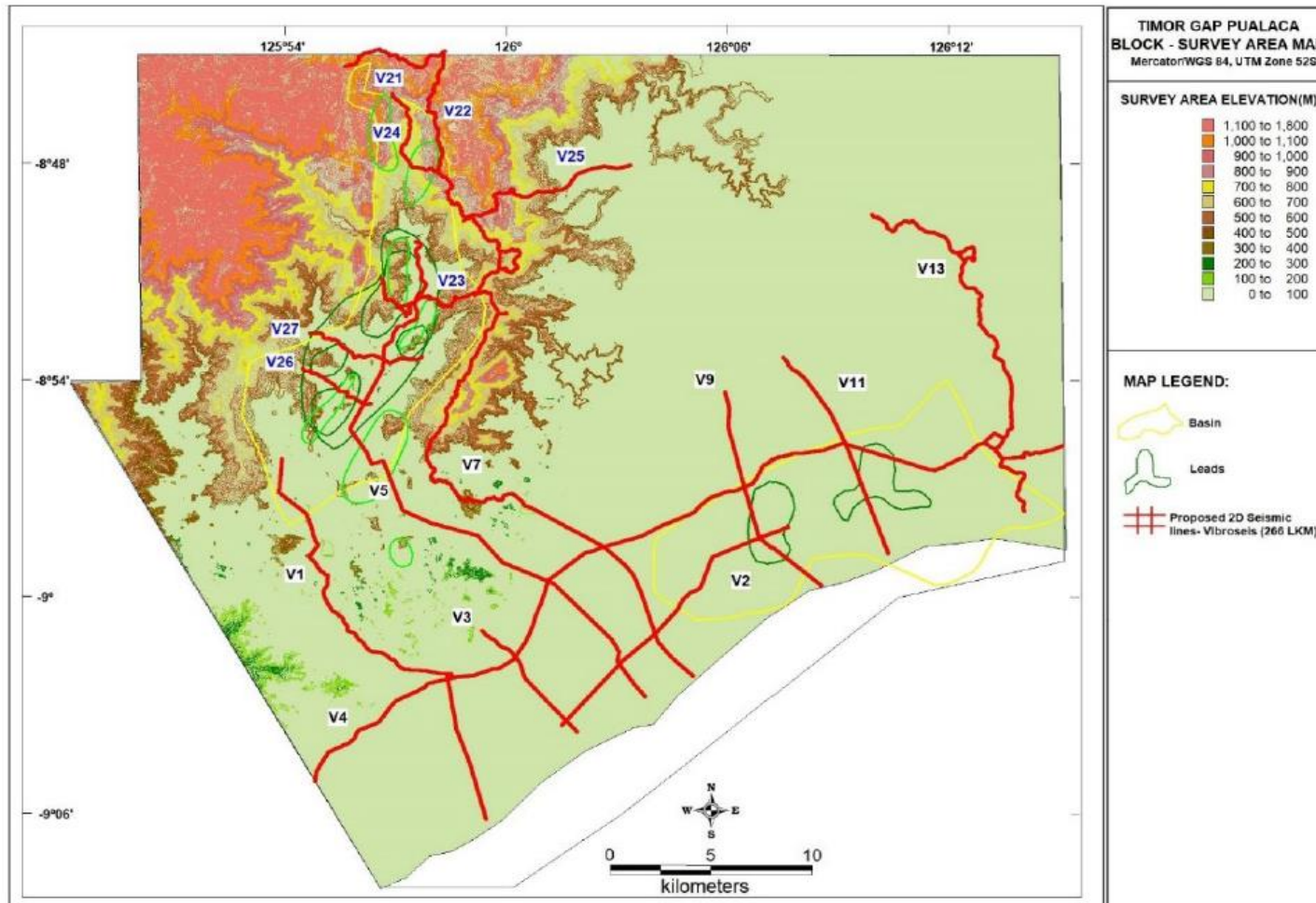


Figure 4-Proposed area for survey and Scouting 16 seismic lines.

The seismic line positions provided in Figure 4 are indicative of their final positions. The line positions will be finalized during survey operations after taking into account the geological and operational variations that will occur. A nominal corridor width of 100m will be identified around the indicated lines and the most appropriate final route will be within this corridor. If any of the final seismic survey line falls outside of the identified 100-meter corridor the relevant government department and appropriate community leaders will be notified and a response time limit of <7 days to the company will be maintained to avoid costly delays.

Should TIMOR GAP Pualaca Block, Unip. Lda find that new lines different within this document, are required, then the proponent will undertake consultations with the relevant authority to determine the most appropriate process and timeline for inclusion of the new line/s.

4.2 Project Category

The IX Government Constitutional through the National Authority for Petroleum under the Ministry of Petroleum and Mineral Resources (MPMR), approval project document and classified TGPB as a category B project with reference number ANP/HSE/S/24/100, dated 05 July 2024 in accordance with Decree Law Nu. 39/2022 first amendment of Decree Law Nu 5/2011 of the Environmental Licensing.

As mentioned in Article 4 (Definition of Categories and Type of Environmental Assessment Procedure), the category B project is the projects that may cause environmental impacts and are subject to the procedure of Initial Environmental Examination (IEE), this based on the simplified Environmental Impact Statement (SEIS) and Environmental Management Plan (EMP) in accordance with the provisions of this law.

4.3 Project Nature Size and Location

4.3.1 Nature of the Project

Based on the surface geological mapping provisionally identified at least 6 exploration prospects and leads on the basis of field geology in combination with the Full Tensor Gravity (FTG) data. The primary exploration lead identified is the Pualaca Anticline, which is interpreted as a simple anticlinal fold some 3.8 km long and 1.3 km wide developed immediately east of the Pualaca oil seeps. The reservoir target for this and other fold belt structures provisionally identified are sandstones of the Triassic Babulu Group.

The reconnaissance geological mapping of the block and supported by FTG data also formed the basis for the planning of a grid of vibroseis seismic lines.

Part of the primary justification for reconnaissance geological mapping of the entire Pualaca Block was the sensible location of a seismic grid. After initially (in 2023) considering a dynamite-sourced seismic grid focused on the Pualaca and Natarbora Basins (which proved prohibitively expensive because of logistical difficulties in acquiring seismic in the remote and high-topography Mutin-Sahem valley), it

was decided instead to acquire a broader grid of vibroseis seismic lines acquired primarily along roads and along dry river valleys.

The acquisition portion of the geophysical survey as set out will follow the guidance as provided by the Autoridade Nacional do Petróleo (ANP) / the National Petroleum Authority wherever is possible. This project will be managed by strong HSE guidelines all will be based upon International Association Geophysical Contractors (IAGC) and Oil and Gas Producers (OGP) standards. Health, Safety and Environmental (HSE) documents and standards will be bridged between the contractor and TGPB's HSE before beginning the survey.

The length of the project will be approximately 266 linear kilometers. The first stage of interaction will be a scout of the area hosted by TGPB with all the interested contractors invited to participate.

4.3.2 Location of the project

The project area lies on the South Coast of Timor Leste, it is precisely located in the Manatutu Viqueque and Manufahi Municipalities with the coordinate point are mentioning in figure 5 bellow.

The following of the area for Seismic survey line and GPS coordinate point:

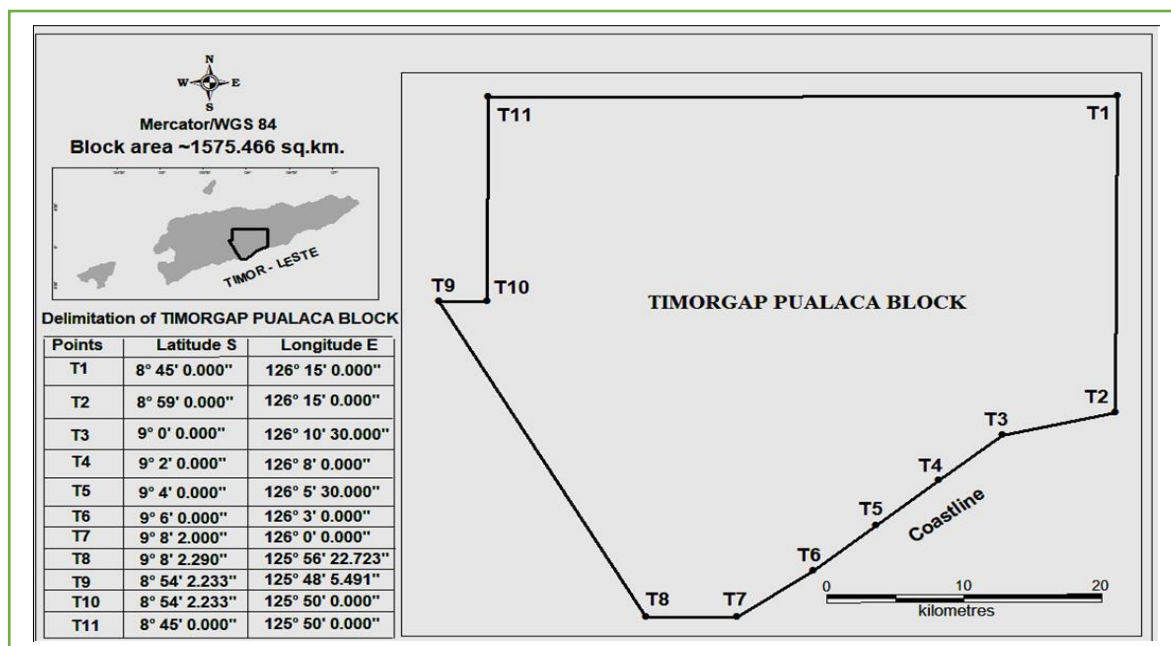


Figure 5-Seismic Survey Lines and Coordinate Point

4.3.3 Size of the project

The PUALACA BLOCK PSC TL-OT-21-17 covers an area of 1,575 km² and the project length is approximately 266 linear kilometers.

4.3.4 The 2D Seismic Survey for TGPB Project

Seismic surveys are a primary tool utilized during the exploration of hydrocarbons on land. A seismic survey is conducted by creating an energy wave commonly referred to as a „seismic wave“ on the surface of the ground along a predetermined line, using vibroses acquisition equipment.

4.3.5 Seismic Survey Objectives

The aim of the 2D seismic program is to upgrade the existing mapping after 2D seismic acquisition. This seismic reflection survey will help to further delineate the structural configurations and shall be used:

- a) To enhance image on reservoir levels for better drilling locations and development of the field.
- b) To Identify and map major and minor faults at shallow / deep exploration targets.
- c) To seek reservoir characterization, Reservoir Monitoring.

4.3.6 Seismic Survey Scale and Extent

The contractor will conduct the seismic survey operation in 2024 with total length 226 km, total lines 16 lines, receiver point (RP) approximately 13,650 and vibrator point approximately 6, 622. This activity will take approximately ten to twelve weeks beginning October 2024. The seismic survey operation will be constrained along the seismic survey lines and to the base and fly camps, as well as to the access roads of these areas.

CONTRACTOR will provide: 2D acquisition operation design and furnish the necessary equipment and personnel to carry out the seismic acquisition.

Table 2-The total length with the total lines of seismic survey activities

No.	Line Number	Line length (KM)	Coordinate systems, degree (Longitude/Latitude,WGS 1G84,UTM Zone 52S			
			Beginning of line		End of line	
			Easting (x)	Northing(y)	Easting (x)	Northing(y)
1	V1	23.73	125° 59' 17.1168"	-9° 6' 9.1188"	125° 53' 49.416"	-8° 56' 11.9256"
2	V2	15.7	126° 7' 31.998"	-8° 58' 4.2168"	126° 1' 21.9072"	-9° 3' 34.3404"
3	V3	7.15	126° 1' 47.2944"	-9° 3' 44.6004"	125° 59' 13.4556"	-9° 0' 56.7972"
4	V4	45	125° 54' 39.3336"	-9° 5' 7.1052"	126° 15' 0.2376"	-8° 55' 48.414"
5	V5	33.2	126° 3' 37.8432"	-9° 2' 45.5712"	125° 57' 29.6928"	-8° 50' 11.3496"
6	V7	30.7	126° 4' 56.8956"	-9° 2' 11.8068"	125° 59' 55.6836"	-8° 52' 8.7888"
7	V9	11.6	126° 8' 25.296"	-8° 59' 41.442"	126° 5' 52.602"	-8° 54' 19.5192"
8	V11	11.5	126° 10' 14.106"	-8° 58' 48.0972"	126° 7' 25.9572"	-8° 53' 22.452"
9	V13	21.9	126° 14' 0.186"	-8° 58' 15.0816"	126° 9' 32.292"	-8° 49' 24.2868"
10	V21	6.51	125° 58' 20.5068"	-8° 44' 54.3912"	125° 55' 37.0812"	-8° 45' 20.1204"
11	V22	19.6	125° 59' 13.5096"	-8° 51' 36.54"	125° 58' 16.7736"	-8° 44' 56.8248"
12	V23	11.3	125° 59' 43.0692"	-8° 52' 5.214"	125° 56' 33.8244"	-8° 51' 12.2472"
13	V24	6.12	125° 58' 9.2856"	-8° 48' 10.8396"	125° 56' 54.5676"	-8° 46' 5.4048"
14	V25	10.9	125° 58' 48.9756"	-8° 49' 36.4116"	126° 3' 22.0104"	-8° 48' 3.456"

15	V26	4.36	125° 57' 39.4452"	-8° 53' 22.5024"	125° 54' 36.3924"	-8° 52' 43.3092"
16	V27	6.59	125° 56' 15.738"	-8° 54' 39.8196"	125° 54' 24.2316"	-8° 53' 41.1504"
Total line		266				

4.3.7 Personnel and Timeline

The 2D seismic surveys are expected to take about three or four months by the contractor with their personnel team were site in table 3. Where possible, unskilled and semi-skilled workers will be hired locally from towns and villages representative of the area and after consultation with the local authorities and communities. The aim will be to ensure a fair distribution of employment opportunities.

Table 3-The Roles and Quantities for the seismic project

No	Roles	Quantities
1	Part Chief	1
2	Recording Observer (05 to 15 Year's Experience)	3
3	QC Geophysicists (05 to 15 year's experience)	2
4	On-site seismic data processor (05 to 15 year's experience)	2
5	HSE Advisor (one for base and one for fly camp)	2
6	Medical Doctor	2
7	Accounts /Admin Assistants	2
8	Surveyors	7
9	Radio Operator	2
10	Recording Field Assistant	2
11	Drilling Technicians	0
12	Vibrator Technicians & Shooting Supervisor	3
13	Vibrator Operators	6
14	Plant Attendant Electrician	2
15	Mechanics	5
16	Carpenter	1
17	Dozer Operator	As required
18	Line Crew / Line Boss	As required
19	Any other as per requirement (cook & bearer)	

4.3.8 Field Equipment

The contractor required to conduct 2D seismic survey activity using Vibroseis with the field equipment are mentioned below.

A. Recording Equipment

1. Recording / Instrument Type / Make / Model / Specification providing manufacturer details and capacity for all components (hardware / software), including node harvesting and charging.
2. Number of available Geophone nodes. Contractor should be providing Technical Literature

3. Detail of auxiliary / test equipment for geophone nodal system
4. Encoder / Decoder (Shooting Equipment) Equipped with GPS.

B. Source Equipment

Vibrators (At least 05 Nos.), Peak force not less than 60000 lb equipped with DGPS System.

C. On-Site Seismic Data Processing Unit and 2D Planning and Designing Software Make / Model of Hardware / Plotter 2 Detail of 2D Processing Software

1. Make / Model of Hardware / Plotter
2. Detail of 2D Processing Software

D. GPS and Survey Equipment

1. Make /Model of GPS and other equipment.
2. Version Number
3. Survey Computation Software

E. Detail of vehicles and other machinery like dozers, tractors and Generators in the crew

F. Radio and Communication equipment & facilities

G. Experience of working



Figure 6-Vibroiseis and Wireless Nodes (Source: Dawson Geophysical Web site)

4.3.9 Seismic Acquisition "Source and Receiver Parameters

- Source : Vibroseis,
Source interval : 40m.,
The receiver : nodal system
Receiver interval : 20m intervals.
- Receiver: appx. 12,400 receiver point (RP)

- Source :appx. 6,200 source point (SP)

The sweep parameters will be finalized based on testing using two 12 second sweeps with a 6 second listen time.

A live recording:

- 20 stations of “live receivers”
- 100m away from the recording truck
- 20m intervals.
- 30mv noise level

The safe distances to be observed during the acquisition:

- Houses - 50m
- Grave sites - 100m.
- Water wells - 75m

4.3.10 Seismic Acquisition “Source and Receiver Parameters

The seismic Acquisition source and receiver parameters as follow:

- a) Sufficient base station locations for the survey system, as required.
- b) Hazard Maps.
- c) Operational Risk Assessment
- d) Baseline Environmental assessment of the survey area
- e) Evaluate effects and disturbance of the operation on the local habitats. f) Road Maps and location of airstrips
- f) Location of proposed base camp
- g) Local logistics and infrastructure
- h) Local legal framework, in particular for labor and safety regulations.
- i) Licensing permits and tax requirements

4.3.11 Geodetic Parameters

The geodetic parameters in the table below:

Table 4 - Geodetic parameters

SPHEROID	WGS-84
DATUM	WGS-1984
PROJECTION	UTM Zone 51 S
CENTRAL MERIDIAN (CM)	123 Degrees East
REFERENCE LATITUDE	Equator or 0 degrees North
SCALE FACTOR, K	0.9996
FALSE EASTING	500,000 m
FALSE NORTHING	1,000,000 m
PROJECTION UNITS	Meters

4.3.12 Parameters And Technical Standards “TBD”

Parameter and Technical standards “TBD” as in the table below:

Table 5 - Parameter and Technical standards “TBD”

a) Instrument	a) Details of harvester / charging system
b) Sample rate	2ms
c) Record length	6 seconds
d) Low cut filter	Out (or to be confirmed)
e) High cut filter	250Hz (or out to be confirmed)
f) Format	SEG-Y
g) Pre-amplifier gain	12 dB (To be confirmed)
h) Recording medium	Hard Drive
i) All acquisition & auxiliary equipment	Pass test and have not been repaired

EQUIPMENT TESTING BEFORE COMMENCEMENT OF SURVEY COMPANY will observe the tests laid down hereunder and will inspect CONTRACTOR's equipment at mobilization to ensure all equipment are in good condition and functioning in accordance with the manufacturer's specifications. All tests shall be performed in the presence of and verified by COMPANY Representatives.

❑ TECHNICAL SPECIFICATIONS

Option:	A	B
Geometry (meters)	5000 SP40m	5000
Number of live traces:	500	500
Trace Interval:	20m	20m
Shot point Interval:	40m	

SOURCE	
a)Type	SERCEL or INOVA Vibrator
b)Hold down weight	62000 lbs (at least) equivalent
c)Maximum Peak force	60000 lbs (at least)
d)Drive Level	70-75% after test
e)No. of vibrator	5 (4 working, 1 spare)
f)Sweep length	12 s after test
g)Sweep frequency	5-96 Hz, after test
h)Sweep type	Linear
i)Taper	300 ms after test
j)Vertical Stack	2 after test
k)Vibrator distance	12.5 m
l)Vibrator QC	Sercel VE432/464 QC or equivalente
m)Shot position	Array centered between two receiver stations

❑ EQUIPMENT TESTING DURING OPERATION

The recommended selection of tests from the manufacturer's tests listed above shall be performed and recorded daily throughout the survey including but not limited to:

- Vibrator radio similarities test (daily) and wire line similarities test(weekly)
- Correlator test "or" Tests as specified by COMPANY Representative on site COMPANY Representative shall be promptly informed of any Equipment breakdown or malfunction as well as operational anomalies, situations out of specifications or which may cause a potential problem.

4.4 Justification and Need for the Project

Economic development, specifically of the petroleum industry, is identified as a target within the Strategic Development Plan 2011-2030 (SDP), with the aim of moving the country from a low income to a middle-income nation. The petroleum sector is a key component of future development with revenue that can potentially be used to provide health care, education, and security for the Timorese. It will create opportunities for the people in Timor-Leste to improve their living standards through high-level employment as well as the associated training opportunities. Training can be provided in geology, petroleum and chemical engineering, petroleum finance, and business and project management, as well as for operational staff.

This project will directly assist Timor-Leste in reaching the stated target in the SDP: The private sector will be the primary source of growth in incomes and employment in rural areas of Timor-Leste particularly for territory in three Municipalities: Manatuto, Manufahi, and Viqueque.

4.5 The Proponent's Endorsement of SEIS

TIMOR GAP Pualaca Block (TGPB), as a subsidiary of TIMOR GAP, E.P, endorses the contents of this report and will abide by all recommendations contained herein.

Name	Position	Signature
Eduardo Goncalves	Managing Director	
Title	Managing Director TIMOR GAP Pualaca Block Unip. Lda.	
Mobile Phone	+670 75834612	

4.6 Structure of SEIS

As per an approved Project Document and based on Decree-Law (DL) 39/2022 on Environmental Licensing (first amendment to the DL 5/2011 on Environmental Licensing), this project is classified as Category B project. The requirement of this category is for the proponent to seek approval of Simplified Environmental Impact Statement (SEIS) and Environmental Management Plan (EMP) from Environmental Authority prior to commencing the project. The Environmental Authority in this case is by the Autoridade Nacional do Petróleo / the National Petroleum Authority (ANP).

Per Ministerial Diploma No. 46/2017 Article 8 and Annex 5, the minimum contents of a SEIS are as follow:

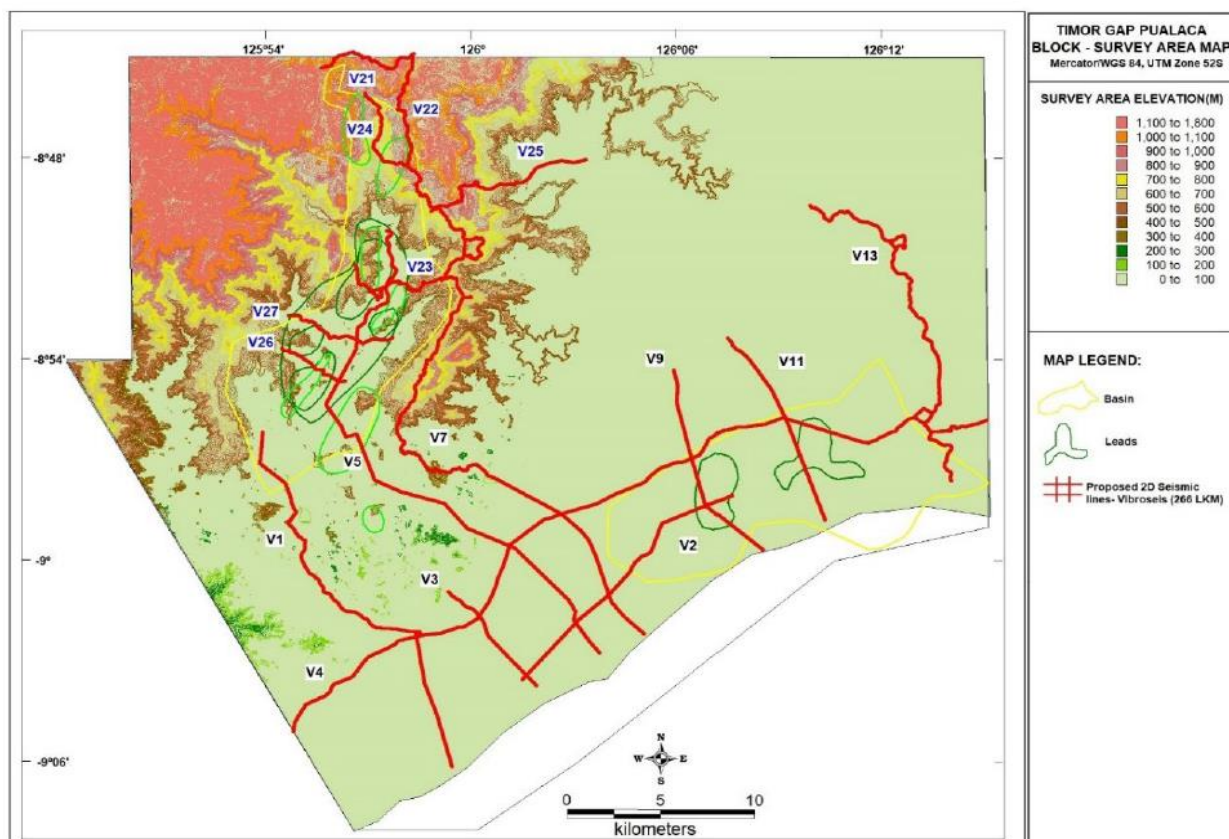
Table 6 - Structure of SEIS according to MD No.46/2017

Chapter 1	Executive Summary
Chapter 2	Details of the Project Proponent
Chapter 3	Details of the Consultants
Chapter 4	Description of the Project
Chapter 5	Legal Requirements
Chapter 6	Description of the Environment
Chapter 7	Alternatives

Chapter 8	Climate Change
Chapter 9	Impact Assessment and Mitigation Measures
Chapter 10	Summary of Environmental Management Plan
Chapter 11	Public Consultation and Information Disclosure
Chapter 12	Difficulties Encountered
Chapter 13	Conclusions and Recommendations
Chapter 14	Non-technical Summary

4.7 General Map and Affected of the Project.

Table 7-Proposed area for survey and Scouting 16 seismic lines.



CHAPTER 5: LEGAL REQUIREMENTS

5.1 Introductions

The Timor-Leste Constitution provides the constitutional foundation for the protection of the environment and preservation of natural resources. Moreover, two other articles, i.e. Articles 61 and 139 stipulated conditions for the use and preservation of the environment and natural resources, respectively with the purpose of ensuring an ecologically balanced and sustainable development approach. Decree Law 39/2022 on Environmental Licensing (first amendment to the DL 5/2011 on Environmental Licensing) contains procedures and other requirements related to securing environmental permits prior to commencing development activities.

In supporting DL 39/2022, the Ministerial Diploma No. 46/2017 contains regulation on the detailed requirements for screening, scoping, preparation of a Project Document (PD), Terms of Reference (TOR), Environmental Impact Statement (EIS), and Environmental Management Plan (EMP) for category A. On the other hand, Simplified Environmental Impact Statement (SEIS) is required for Category B instead of EIS whilst another requirement remains the same for this category.

5.2 Constitution of the Democratic Republic of Timor-Leste, of 20th May 2002

The Constitution stipulates that a healthy environment is a constitutional right. Title III of the Constitution of the Democratic Republic of Timor-Leste stipulates the following provisions for Environmental Protection:

- 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 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.

5.3 Environmental Legislation

Table 8 - Applicable Laws and Regulation in Timor-Leste for the Seismic Survey.

Title	Description	Relevance to the Project
Decree Law No. 26/2012 Basic Environmental Law	Sets the Environmental Framework in Timor-Leste; Defines Government, Proponent, and Civil Society responsibilities in the framework; Defines polluter requirements and obligations for several environmental components i.e. water, air, noise, solid waste, etc.;	Principles of Environmental Obligations (polluter/payer, etc) Environmental Assessment Study

Title	Description	Relevance to the Project
	Defines the applicability of the World Health Organization (WHO) standards as established national standards. Defines the instruments for Environmental Assessment (EA).	
Decree Law No. 39/2022 first amendment from Decree-Law No. 05/2011 - Environmental Licensing	Defines the Environmental Licensing procedure for public and private projects likely to produce environmental and social impacts. Defines the environmental classification (A = EIA; B = IEE) for said projects based on their nature, size, technical characteristics, location, and possible significant impacts, as in Annex I and II; Defines the requirements for the EIA process, and Public Consultation	Provides the environmental licensing procedure to regulate actions to encourage and protect the nature as an important instrument for sustainable development of Timor-Leste's economy.
Ministerial Diploma no. 44/2017 Regulation on Impact and Benefits Agreement;	Defines the Impacts and Benefits agreed between the proponent and the communities or individuals affected by the Project, included in the EIS and/or EMP and in the Resettlement Action Plan (RAP)	The SEIS/EMP guides the Inter-ministerial Group created by the Government to handle the EIA process of the seismic survey activity
Ministerial Diploma No. 46/2017 – Detail requirements for Screening, Scoping, Project Document, Term of Reference, EIS, SEIS, and EMP for Environmental Assessment	This Article specifies the necessary of establishing a regulation for projects that may have significant impacts to the environment. Additionally, this article outlines minimum requirement contents for documents such as Project Document, TOR, EIS, SEIS, and EMP for category A, B, and C Projects.	Providing Minimum Requirement content for SEIS and EMP for this Category B Project.
Ministerial Diploma No. 47/2017 – Public Consultation Procedure and Requirement during	This Article specifies the procedure and requirement of involvement of public and communities into different stages of the environmental assessment process through public consultation.	Provides information and communicate to the affected communities, the

Title	Description	Relevance to the Project
Environmental Baseline Process		positive and negative impact.
Biodiversity		
Decree-Law no. 05/2016 – National System of Protected Areas	This Article established the legal framework for the creation and management of the national system for protected areas, as well as identifies and classifies the existing protected Areas in the National Territory	Provides information in identifying protected areas in and/or perimeters of the project.
Draft Decree Law on Biodiversity (version dated September 2012)	Promote the sustainable use of biological resources, conservation of biodiversity, and fair and equal division of the benefits generated from genetic resources, as well as the obligation for an impact assessment of biodiversity values regarding a policy, masterplan or implementation project	Current Biodiversity (Terrestrial and Marine) situation in AOI reviewed in SEIS & EMP.
Land and Property		
Law No. 13 /2017 – Special Regime for the definition of ownership and immovable assets	This Law describe the rules on land ownership, legal clarification of ownership, and promotion of distribution and access to land, as well as the figure of community property/land.	Provides information in defining land ownership and community properties
Law no. 08/2017 – Expropriation for Public Utility	This Article established the rules and regulations for expropriation for Public Use/utility reasons, with regard to fair indemnification <i>Article no. 4 defines that "3. For the reason of expropriation, the following are motives of public utility: [...] d) reservoirs, dams, distribution structures, irrigation, and water or sanitation drainage".</i>	Provides information in shaping Socio-economic analysis and Mitigation measures.
Labor		
Decree Law No. 04/2012 – Labor Law	This law describes the duties and obligations of the private employer and employee while exercising their function within the scope of work, or the bounds of a work contract, to	SEIS - Chapter 6 presents the results of the Socio-economic study and its impacts regarding the

Title	Description	Relevance to the Project
	create good working conditions and a fair, safe, and healthy working environment.	description of the AOI's labor force, public health, and other sectors.
Cultural and Heritage		
Government Resolution No. 24/2009 – National Policy for Culture	Defines the concept of culture, heritage, and types of and how these should be identified, classified communicated to the public, and registered so as to make it a dynamic sector for the development of the identity and citizenship of Timor-Leste.	Provides information in identifying cultural and heritage in and/or around perimeter of the project.
Decree Law No. 33/2017 – Legal Framework for Cultural Heritage	Defines the concept of cultural heritage and the measures for its support, protection, preservation and conservation and the typology of cultural heritage in Timor-Lest and connects the population to the protection, conservation, and defense of cultural heritage, as well as its fruition.	Provides information in identifying cultural and heritage in and/or around perimeter of the project.
Waste Management		
Decree Law No. 3/2024 – First Alteration of DL No. 33/2008 - Hygiene and Public Order, Supported by DL No. 2/2007 – Urban Residual Waste Management	These laws provide legal framework to manage the urban solid waste and to ensure promoting hygiene in the workplace.	As the legal basis for the project proponent to manage solid waste produced during any project phase. This to be set as the minimum criteria for TGPB to establish its own waste management system.

Table 9 - Applicable International Standards and Guidelines for the Seismic Survey.

Title	Description	Relevance to the Project

WHO Guidelines for Community Noise (1999)	Compliance to the standards provisioned by WHO of acceptable sound pressure levels, relevant to project activities, for the prevention of critical health effects.	Guidelines used as reference for the Baseline evaluation for noise in SEIS.
WHO Air Quality Guidelines (2005)	Designed to offer guidance in reducing the health impacts of air pollution to protect public health in different contexts and countries where national targets are yet to be determined.	Guidelines used as reference for the Baseline evaluation for air quality in SEIS.
WHO Guidelines for Drinking-water Quality (2011)	Compliance to the standards provisioned by WHO for the quality of drinking water, especially groundwater quality.	List of water quality parameters relevant to perform references Baseline evaluation for groundwater water quality baseline reference.
IFC/WB EHS Guidelines: Environmental, Health and Safety (2007)	Contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs when host countries' national legislations are less stringent or non-existent.	The standards provisioned by IFC are also used when WHO standards are non-existent for specific components such as wastewater, contaminated land, biological hazards, etc.
United Nations Convention on Biological Diversity (UNCBD)	The Convention on Biological Diversity (CBD) has 3 main objectives: 1. The conservation of biological diversity; 2. The sustainable use of the component of biological diversity; and 3. The fair and equitable sharing of the benefit arising out of the utilization of genetic resources.	This project could have impacts on the flora and fauna or risk to the loss of the biodiversity. It is fundamental principle for TGPB to prevent or minimize the risk of biodiversity loss during the project implementation.
United Nation Framework for Climate Change Convention	Provides a framework for intergovernmental effort to reduce greenhouse gas emissions and adapt to the expected impacts of climate change. It also provides guidance to member	The project activities will release GHG emissions which would contribute to

(UNFCCC) and Kyoto Protocols including Timor-Leste's National Action Plan for Climate Change	states on developing and implementing national climate change strategies, incorporating both adaptation and mitigation actions. Timor-Leste became a signatory to the UNFCCC in October 2006.	the country's climate change issue. The GHG emissions will be kept minimal when possible.
International Union for Convention of Nature (IUCN)	This international convention focuses on the nature conservation and sustainable of utilizing the natural resources. The IUCN works in the field to promote ecological conservation in order to ensure the sustainable development concept. Timor-Leste is a signatory member of IUCN.	This project will identify all species categories listed under the IUCN red list which can be impacted by the project activities.
UNESCO Convention on Natural and Cultural Heritage	This convention mandates each signatory member to identify, protect, conserve, transmit and present to the future generations of the cultural and natural heritage. Timor-Leste is a signatory member of this convention.	This project activities will ensure the protection and conservation of any cultural and natural heritage of the project location.

CHAPTER 6: DESCRIPTION OF THE ENVIRONMENT

6.1 Physical Component

6.1.1 Climate

Method of data collection

The climate data analysis was based on the desktop review, mainly referring to the data from the Australian Bureau of Meteorology and Commonwealth Scientific and Industrial Research Organization (BoM – CSIRO) published by Pacific – Australia Climate Change Science and Adaptation Planning in 2023. The meteorological variables obtained and used in this were report temperature, rainfall, humidity, wind, and cyclone.

As a 30-year period, climatological data is recommended for calculating climatological averages (WMO, 1984) therefore the (PACCSAP, 2011) data is still relevant to the current climate conditions. In addition, a few more data sources were also obtained from RDTL – SEA (NAPA), UNDP, World Bank, CFE-DM, and Timor Port EIS. These sources were published in 2017, 2016, and 2013, respectively.

Country Climate Overview

Timor-Leste is a tropical country with distinct summer monsoonal ‘wet’ and ‘dry’ seasons. The ‘wet’ season is from October to March, while the dry season is from April to September. The two seasons go through a rapid transitioning, usually in April and September-October due to two major atmospheric pressure systems affecting the region. During the transition, the weather conditions change from very dry to very wet. Consequently, it affects the climate in Dili and south-easterly wind patterns are changed by westerly winds for the duration of the monsoon season (BoM & CSIRO, 2011). Annual climate variations in Timor-Leste are due to the El Niño – Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD). ENSO occurs around the tropical Pacific Ocean which affects weather around the world. During El Niño, Dili is drier, and this usually leads to tardiness and an early end of the wet season. In contrast, during La Niña, the dry season's rainfall is likely above normal, and the wet season starts earlier and ends late because the IOD climate pattern impacts weather all around the Indian Ocean basin. The temperature throughout the year is varied between 24°C and 30°C (CFE-DMHA, 2016)

6.1.1.1 Temperature

Temperatures in the Pacific region and Timor-Leste are dominated by several geographical features such as surface temperatures and seasonal temperature variations driven by the large land masses on the western edge of the Pacific; Australia, Asia, and the Maritime Continent (BoM & CSIRO, 2011)

According to data taken from nine Automatic Weather Stations (AWS) established at Aileu, Ainaro, Betano, Dare, Fuiloro, Maliana, Manatuto, Maubisse, and Viqueque during the last 50 years averages maximum temperature increased to 1.8°C. In contrast, the minimum temperature remains unchanged.

The month of June is known to be the coolest month of the year with a temperature around 24°C. However, there is a variation on the recorded data between the nine AWS. For example, in Maubisse maximum and minimum temperatures increased and decreased by 0.5°C and 0.4°C, respectively. Whilst the maximum temperature in Manatuto increased by 2.6°C, and the minimum temperature increased by 0.2°C (MAFF, 2013).

Based on the (CFE-DMHA, 2016) handbook, Timor-Leste's temperature year-round tends to stay between 24°C and 30°C. Furthermore, according to the UNDP (2023) as shown in **Error! Reference source not found.** the annual mean temperature of Timor-Leste, varies in every part of the region within the country. The mean temperature ranges from 21°C to >27°C with the highest temperature is observed on the coastal areas and decreases towards highland areas. The minimum temperature usually occurs during the month of June to August and the maximum temperature is experienced during the month of October to December.

The temperature in the project location is ranging between 25-27°C as shown in Figure 6.

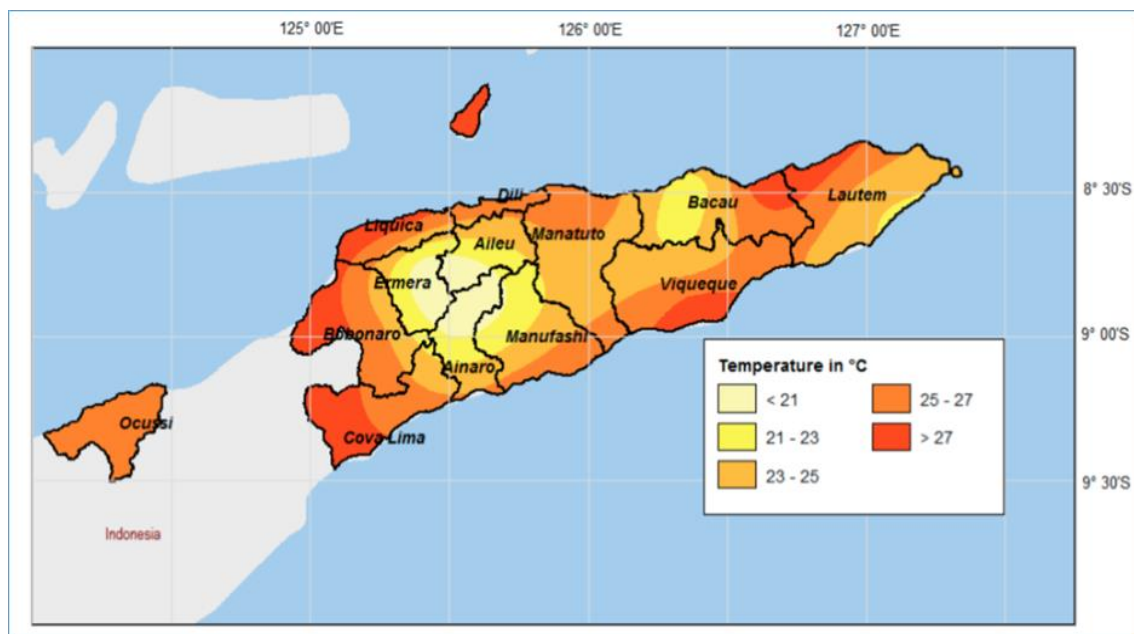


Figure 7 - Annual Average Temperature of Timor-Leste (UNDP, 2023)

6.1.1.2 Rainfall

The rainfall pattern in Timor-Leste is strongly impacted by the Australian Monsoon, where in December to April Timor-Leste experiences wet conditions and the dry season is from May to November. The heaviest rainfall is typically associated with tropical cyclones.

Annual precipitation along the northern coast is less than 1,000mm per year, while at the southern coast receives more than 2,000mm per year (Government Resolution No. 8/2022-National Climate Change Policy). Given that the proposed project is located in southern coast of the country as shown in **Error! Reference source not found.**, therefore it is expected that the area will receive heavy rainfall in December to April. Additionally, these months are also known as the tropical cyclone months. However, due to the country's proximity to equator, the tropical cyclones tend to be relatively weak.

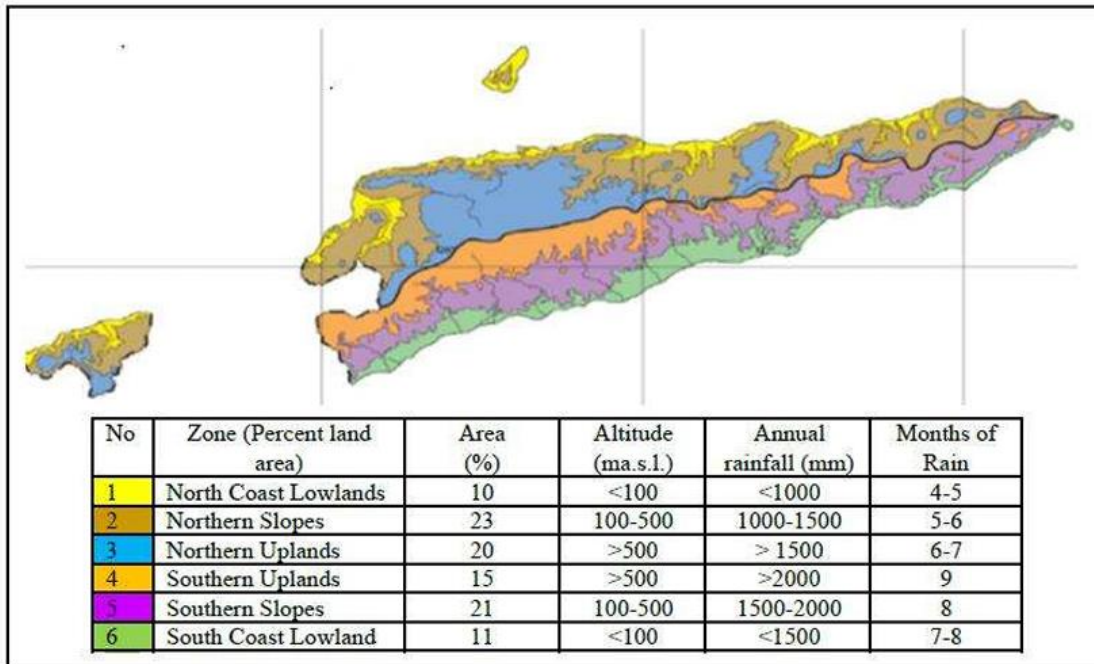


Figure 8 - Annual Rainfall Data (TL NAP, 2020)

6.1.2 Topography

The geological mapping was undertaken using the Indonesian Bakosurtanal 1:25,000 scale topographic series as base maps – Figure 9 shows an index map for the Bakosurtanal quadrangles covering the Pualaca Block.

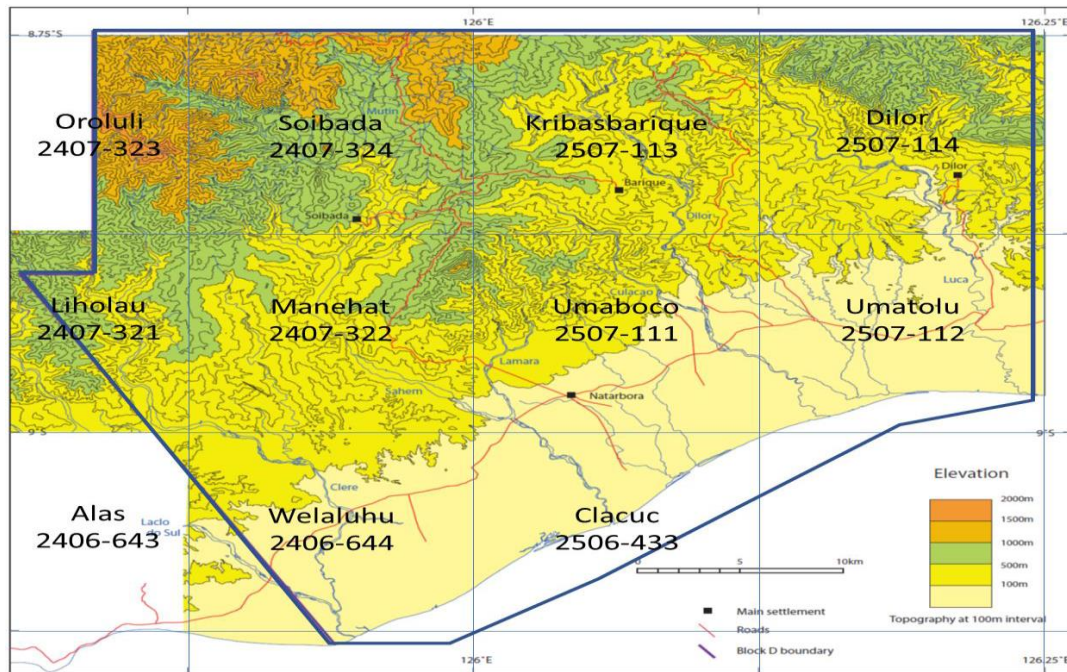


Figure 9 - Pualaca Block topography, and Bakosurtanal 1:25,000 mapping quadrangles.

6.1.3 Geology

The geology of Pualaca Block is shown in Figure 10 and described as follows:

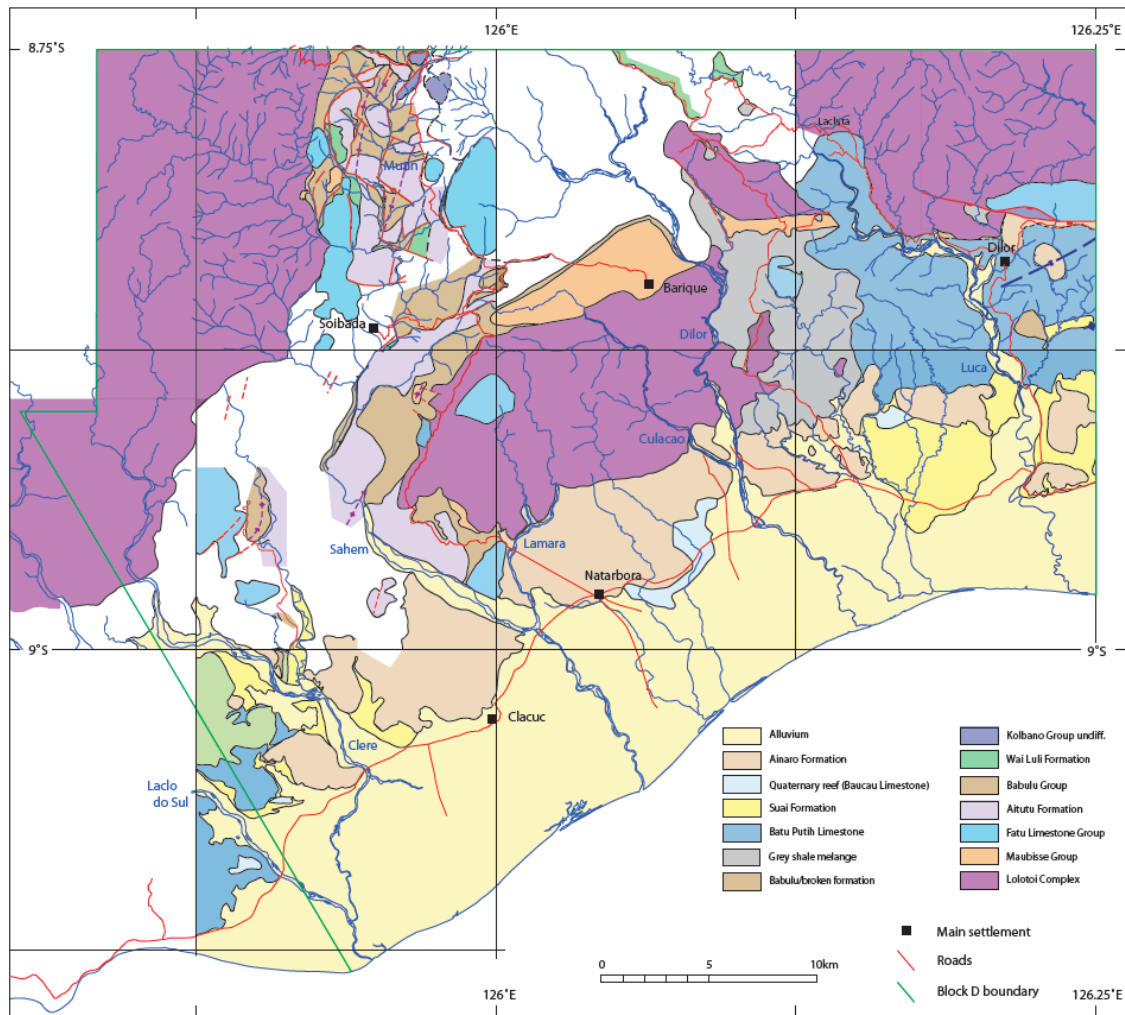


Figure 10. Geology Map of Pualaca Block.

Maubisse Group

The Permian Maubisse Group in Pualaca Block consists of limestone formations and volcanic/volcaniclastic sediments. These formations show uniform characteristics both within and outside the Pualaca Graben, suggesting minimal graben influence during deposition. Paleontological age determinations indicate a broad Permian age range. The thickness of the Maubisse Group in the Pualaca area is estimated to be about 650m, while gravity modeling suggests a thickness of up to 2000-3000m in the southern Pualaca Basin, potentially indicating Permian graben development.

Babulu Group

The Babulu Group, part of the Triassic formations in Timor, consists of shale-dominated Fatoro Formation and sand-dominated Lapunuf Formation, with a sub-element called the Foura Member. It typically overlays the Maubisse Group and might have unconformably succeeded it. Dating suggests early Carnian and possibly Ladinian ages. The Foura Member is deemed a potential oil reservoir, while the Fatoro Formation may serve as a seal. The thickness in the Pualaca area is estimated at around 600m with some uncertainty.

Cephalopod Limestone Formation

A single pinkish-white to reddish-brown cephalopod limestone sample, dated to the early Middle Triassic, was found near the Pualaca oil seeps. Identified as a possible occurrence of the Cephalopod Limestone Formation, its exact position within the stratigraphy is uncertain. It may represent a local Middle Triassic limestone deposit above the Maubisse Group unconformity.

Aitutu Formation

The Aitutu Formation, composed mainly of basinal carbonate clastic sediments (limestones and shales), contrasts with the siliciclastic basinal deposits of the Babulu Group. In the Pualaca area, it appears to succeed the Babulu Group conformably, with dating suggesting ages ranging from late Carnian to the latest Triassic. The formation's thickness in the area is estimated up to about 560m, potentially indicating thicker stratigraphic successions before erosion.

Bandeira Formation

The Bandeira Formation comprises shallow marine limestones from the Triassic period. A small outcrop of coralliferous limestones, located 500m north of the Pualaca oil seeps, has been identified based on previous fieldwork. Fieldwork in 2023 revealed a stratigraphic contact showing reefal limestones atop Aitutu Formation limestones and shales, suggesting a late Norian-Rhaetian age for the Bandeira section. This local reefal development likely indicates a shallowing of the Pualaca basinal section towards the end of the Triassic period.

Pualaca Member

The Pualaca Member acts as an intermediary between shallow marine (Bandeira Formation) and basinal (Aitutu Formation) carbonate sequences in the TIMOR GAP lithostratigraphy. It includes sedimentary breccias and thickly bedded limestones with minor shale interbeds, differing from the typical Aitutu Formation. While not distinctly mapped, it's generally classified within the Aitutu Formation. Only one sample has a precise age (late early Norian), while adjacent evidence suggests a Late Triassic age for other samples.

Wai Luli Formation

The Wai Luli Formation consists mainly of black shales from the latest Triassic to Early-Middle Jurassic. It typically interdigitates with the Aitututu Formation and is well-established in the Pualaca area. Exposed thicknesses are limited due to erosion and structural complexities, with thrusting often thinning outcrop sections. On the western margin of the basin, it transitions from shales to siltstone/shale facies dated to the latest Middle Jurassic, possibly indicating the onset of the Wai Luli Sandstone Member.

Tallibelis Member

In fieldwork near the Aitututu Anticline, a Tallibelis Member, dated to the Norian, was recognized as a basal element of the Aitututu Formation. Recent fieldwork in the same area observed black shales below the Aitututu Formation, similar to the Wai Luli Formation but stratigraphically below Aitututu. It's suspected that Tallibelis-equivalent shales may also exist in the Pualaca area. These shales could have significant source rock potential and will be investigated further through palaeontological dating and geochemical analysis.

Perdido Formation

The Perdido Formation, occurring during the Early Jurassic, comprises shallow marine limestone. It forms prominent mountain peaks along the western margin of the Pualaca Basin, with samples dated to the late Sinemurian-early Pliensbachian. Its relationship with the rest of the Pualaca succession is debated, with interpretations differing on whether it is allochthonous or endogenous. Fatu limestone massifs on the eastern margin appear similar but may transition into Triassic-aged Pualaca Member, suggesting they could be Late Triassic Bandeira Formation. Further dating and fieldwork are needed for confirmation.

Limano Nappe and high-level stratigraphic units

The northern part of the Pualaca Block, particularly the NE corner, is interpreted as forming the Limano Nappe, consisting mainly of Cretaceous-Miocene rocks with some Late Jurassic formations. There's no overlap in age between the Pualaca Basin sedimentary succession (Permian to Middle Jurassic) and the Limano Nappe (Late Jurassic to Miocene). The Wai Luli Formation serves as a structural decollement level in the Pualaca Basin, while the Limano Nappe likely forms nappe structures above it. The extent of lateral displacement between the two successions is unclear, and it's possible that the Limano Nappe originated far north of the Pualaca Basin.

Tchinver Formation

Sample locality TL-30 reveals red mudstone containing Late Jurassic belemnites and bivalves. These mudstones transition into grey limestones, possibly part of the Aitututu Formation, though they might also be Late Jurassic. They could belong to the Tchinver Formation in the TIMORGAP lithostratigraphy, pending further confirmation of its Late Jurassic age.

Kolbano Group

Cretaceous-aged deepwater limestones, now part of the Kolbano Group, were first identified by Weber on Foho Limano summit in 1910/11. These units are interpreted as part of the high-level nappe, the Limano Nappe. Haig & McCartain (2007) documented various ages from Aptian/Early Albian to early-middle Miocene in the area south and west of Orlalan village. The rocks are primarily planktonic foraminiferal micritic limestones, occasionally containing reworked Cretaceous foraminifera. The Kolbano lithostratigraphic unit was also noted on the southern Bibiliu massif, north of Dilor village, though not observed during 2023 fieldwork.

Silty shales unit

An orange-weathering stratigraphic unit, found predominantly in the north of the Pualaca Block, comprises poorly bedded siltstones and shales. It typically overlies the Aitututu Formation with a distinct stratigraphic contact. Updated samples have been collected for future palynological age determination. Similar lithologies observed on the western margin suggest equivalence with the Wai Luli Sandstone Member, possibly indicating an unconformity in the depicted stratigraphic contact. Further study is needed to confirm whether reddish/orange-weathering shales below the Limano Nappe are part of this unit.

Babulu Broken Formation

The Babulu broken formation is a chaotic lithological unit primarily derived from the Babulu Group, lacking coherent bedding. Two types are identified in the Pualaca Block: one with scattered boulders between Dilor and Umatolu villages, possibly linked to shale diapirism, and another as a shale-dominated melange near Dilor village. The latter, exhibiting thrusting rather than diapirism, overlays the Lolotoi Complex and remains undated, possibly comprising Babulu Group or Wai Luli Formation material. Further investigation is needed for both areas.

Nunuc Limestone

A discrete body of limestone of so-far indeterminate age and stratigraphic position was mapped in the mid-section of Mota Nunuc east of the Lacluta road on the boundary of the Kribas barique and Dilor map sheets. This massif, consisting of whitish hard limestone largely lacking in macrofossils, is most likely Perdido Formation because the most probable alternatives of Maubisse or Dartollu limestones usually contain recognizable macrofossils. The Nunuc limestone unit underlies (is overthrust by?) the grey shale melange unit. Samples have been collected for future dating.

Haulasi Formation

The Haulasi Formation, possibly Late Cretaceous-early Paleogene, comprises volcanic breccias and sandstones with reworked greenstone blocks from the Lolotoi Complex in Mota Cuohoo. It likely shows an unconformable relationship with the Lolotoi Complex. Alternatively, it's considered part of

the Barique Formation, previously dated to the late Paleogene, though its existence in the Pualaca Block's supposed 'type locality' is uncertain. The Barique Formation's status as a meaningful stratigraphic unit is questionable in this area, requiring further research.\

Dartollu Formation

The Dartollu Formation, characterized by Eocene limestone containing abundant large benthic foraminifera, was frequently found associated with the Lolotoi Complex during fieldwork. Benincasa (2015) dated a sample from the Dilor area as middle Eocene, consistent with regional characteristics. This formation appears to overlap both the Lolotoi Complex and the Triassic Babulu Group, forming a terrane-linking unconformity between the Pualaca Basin and the Macfahic massif. This suggests juxtaposition by the Eocene, predating Neogene orogenesis, challenging the 'allochthonous' interpretation of the Lolotoi Complex.

Batu Putih Formation

The Batu Putih Formation and Viqueque Formation in southern Timor usually occur as separate layers, with Batu Putih forming a basal layer below Viqueque. The transition between them might indicate rapid island uplift, leading to the shedding of clastic sediments southward over previously calm offshore areas. However, in the Pualaca Block, this transition is more complex, with interbedding of Batu Putih and Viqueque-type sediments. This variation may be linked to early uplift or prolonged hemipelagic sedimentation, possibly influenced by the Luca Sub-basin development. Further dating is needed to understand this anomaly better.

Suai Formation

Yellowish sandy marls, lithologically similar to the Suai Formation exposed around Suai town, outcrop mainly to the south of the widely developed Batu Putih outcrop area in the southeast of the Pualaca Block. The relationship is either conformable (Suai over Batu Putih) or perhaps more likely unconformable (Pleistocene over early Pliocene??), but at present, this is not constrained by palaeontological dating, or by observation of suitable boundary outcrops. In the west of the Pualaca Block the Suai Formation is more commonly typified by grey shales, for instance along the road section south of Weberek village.

Dilor Formation

The Dilor Formation, mainly found in western Timor-Leste, consists of older river gravels, likely from the Pleistocene era. It's distinct from present-day river alluvium and comprises a conglomerate with rounded pebbles and sandy gravels. It spans up to 5km wide between Batu Putih/Suai to the north and the coastal alluvial plain to the south, with some areas inland near Foho Bibiliu also classified as Dilor Formation.

Baucau Formation

The Baucau Formation, composed of Quaternary reef limestones, is found in only a few small outcrop areas in the southern part of the Pualaca Block. These limestone terraces mark recent uplift zones, potentially indicating subsurface anticlinal structures. One such structure, the Alas SE exploration lead, lies beneath a small outcrop area of Baucau Formation. Another potential anticline near Dotik village suggests a similar geological feature, possibly indicating significant subsurface structures in the area.

6.1.4 Air

During site visits, it was observed that the air quality in the proposed project location namely Manatuto, Viqueque and Manufahi are contaminated mainly by seasonal shifting agriculture or burning of solid wastes, transportation, and burning wood for domestic purposes. Additionally, current road rehabilitation activities contribute a lot of dust dispersions in some areas of the Municipality.

Burning of solid wastes is evident across the city, which aggravates the general ambient air quality of the area. Furthermore, wood and kerosene are the primary sources of fuel for cooking and only a small portion of the local households use electricity, gas and propane gas. Generally, air quality across three Municipalities is good during the wet season but dusty in dry season. No major sources of pollution have been identified around the area of the project site other than fugitive dust from the movement of vehicles due to unpaved roads.

The Initial Environmental Examination (IEE) for air quality was performed using a Particle Counter to measure Particulate Matter (PM) in the air. This Particle Counter measured PM_{2.5} and PM₁₀ at four different locations based on different activities around the project location with a Particle Counter. The Particle Counter use for this IEE is HTI (HT-9600) with accuracy of $\pm 12\%$ or $\pm 12\mu\text{g}/\text{m}^3$. The data collected from this IEE for the 4 different locations around the Pualaca Block is presented in table 3

Table 10 - Air Quality data collected from EBS and comparing it to WHO Air Quality Standard.

Location/Longitude-Latitude	Parameters	Duration	Guideline Value ($\mu\text{g}/\text{m}^3$) ¹	Collected Data ($\mu\text{g}/\text{m}^3$) ²
Natarbora Uma Boku (9° 1'28.66"S, 126° 4'10.93"E)	PM _{2.5}	8 hours	25	17
	PM ₁₀	8 hours	50	19
Manufahi, Fatuberliu (9° 2'15.35"S, 125°58'22.61"E)	PM _{2.5}	3 hours	25	63
	PM ₁₀	3 hours	50	68
Sikone (8°57'1.01"S, 126° 6'15.83"E)	PM _{2.5}	5 hours	25	19
	PM ₁₀	5 hours	50	32
Viqueque, Dilor (8°56'20.40"S, 126°11'2.26"E)	PM _{2.5}	5 hours	25	60
	PM ₁₀	5 hours	50	70

The recorded interval for this air quality data is between 2-3 minutes, and the high-level particulates matter only recorder once or twice for the period of the data collection. As shown in Table 3 that the data recorded in Fatuberliu are above the guideline value, however this only occurred for the period of 4 minutes. Additionally, the Fatuberliu location is within a dense community and mostly likely the trigger for the high value is due to the use of wood for cooking. Furthermore, other parameters for air quality such as Sulphur dioxide (SO₂), Nitrogen Dioxide (NO₂), and Carbon dioxide (CO₂) were not taking during IEE because there is no significant air pollution contribution around the proposed project location.

6.1.5 Surface Water

Timor-Leste is comprised of 191 “hydrologic units” or watersheds, of which a total of 29 were selected as important (JICA, 2017). Within them, in total, there are 29 main river systems, of which 12 are situated in the north and 17 in the south.

These watersheds produce an estimated 22,300 million m³ of water per year (mm³/yr), with total internal renewable water resources of 8,215 mm³/yr or 6,932 mm³/yr per inhabitant, ranking 63 out of 179 countries on renewable water resources availability per capita (World Bank, 2018). This lower potential derives from a dry tropical climate characterized by long dry seasons. Based on 2004

¹ The Guideline value is for an average period of 24-hr

² Highest reading value is reported

available data, water withdrawal was 14% of the total country's renewable water resources, of which 91% was used for irrigation and livestock and 9% for domestic use.

Surface water accessibility is more problematic than that of groundwater sources. The meteorological results in highly variable river flows and flash floods in the wet season and low or no flows in the dry season. These distinct variations between the northern and southern coastlines result in smaller river catchments with diverse hydrological patterns.

The following tables present the hydrological units in Timor-Leste, including area size and percentage in the country:

Table 11 - Hydrologic Units in Timor-Leste (FAO, 2011)

Name of Unit	Area (Km2)	As % of Country
Loes	2,184	14.7
Laclo	2,024	13.6
Clere and Belulic	1,917	12.9
Irabere	1,614	10.9
Mola and Tafara	1,533	10.3
Seical	1,510	10.2
Tukan and Sahen	1,375	9.2
Laleia	1,006	6.8
Lifau and Tono Besi	812	5.5
Vero	744	5.0
Atauro Island	140	0.9
Jaco Island	11	0.1
Total	14,780	100

Even though the 2D Seismic Acquisition project does not cross any of the hydrological unit given in table above, however, there are some smaller watercourses that are located within the project area. These watercourses are Dilor and Clerec rivers along with some unknown smaller streams as shown in Figure 11.



Figure 11 - Map of Manatuto Showing the Watercourses, Water bodies and road (Seeds of life 2013)

6.1.6 Ground Water

Around 5 km³ of water flows down the rivers of Timor-Leste annually, of this, about 1 km³ enters the groundwater system (Costin & Powell 2006). Most of the easily accessible groundwater is located around the coastline, with older limestones forming discrete inland aquifers (Costin and Powell 2006). The sustainable yield of the aquifers, or the 'exploitable' groundwater, is around 0.266 km³/year (Costin & Powell 2006). Groundwater is the principal source of drinking water in Timor-Leste and natural groundwater springs are the dominant sources of water supply in rural areas, supplying potable water to approximately 60% of the population (Asian Development Bank 2001). Shallow wells are used extensively in villages and rural areas - especially those such as Manufahi, Manatuto, and Viqueque Municipalities - near the sea or on river plains.

Table 12 - IEE Data Collection for Surface and Ground Water in Project Area and comparing it to the WHO Drinking Water Guideline.

Parameter	Unit	Guideline Values	Location					
			Dilor, Surface Water	Fafulu Oan, Ground Water	Suco Fatukahi/Tet efui River, Surface Water	Suco Fatukahi, Ground Water	Uma Boku, Surface Water	Suco Siconi, Ground Water
			8°54,14,96412"S, 126°13,15,14 028"E	8°56,11,068 61"S, 126°7,22,89 995"E	9°2,9,66408" S, 125°59,50,60 688"E	9°2,9,29184 "S, 125°59,26,1 168"E	No Signal Detected	8°57,49,506 12"S, 126°4,55,94 412"E
pH		6.5-8.5	8.4	7.4	7.9	7.4	8.4	7.5
Temperature	°C		25.6	27.3	27.5	27.8	25.5	28.2
Conductivity	μS/cm		446	497	881	845	551	911

Total Dissolved Solid (TDS)	mg /L (ppm)	1000	215	240	431	413	267	446
Salinity	%		0.2	0.2	0.4	0.4	0.3	0.4
Turbidity	NTU	5	2.8	1.1	2.1	0.4	4.3	0.9
E. Coli	CFU		4	Unaccountable	Unaccountable	1	Unaccountable	0

Figure 12 - Evidence of the IEE Data Collection for Surface and Ground Water and air quality in Project Area



6.1.7 Noise and vibration

Noise and vibrations may be generated by machinery, vehicles, generators, and earthmoving equipment. Mitigation measures include appropriate personal protective equipment, such as: hearing protection, which must be worn when noise is anticipated at greater than 85 dB; equipment silencer; noise control and monitoring; equipment and vehicle maintenance; and respecting setback distances between seismic sources and structures.

Impacts from sub-surface are ranked overall as low to moderate, with displacement of fauna and disturbance to nearby residential areas and communities the most significant risks.

Vibroiseis Seismic

Disturbance to fauna

Sub-surface has the potential to disturb fauna, particularly in areas of dense vegetation and nature reserves because seismic line V2 Pualaca Block occur within a protected area.

The following significant fauna species may occur within the project area:

- *Cacatua sulphurea* (Yellow-crested Cockatoo) – Critically endangered
- *Gallicolumba hoedtii* (Wetar Ground Dove) – Endangered

Other species may also occur (refer to table 13). Sub-surfaces have the potential to disrupt breeding, nesting and feeding of fauna but through good management practice impacts can be reduced.

Management

Vibroiseis seismic will not occur in areas which may contain significant species gully vegetation. Sub-surface will not occur close to (within 50 m of) beaches or areas that may support shorebird species and seismic line V2 Pualaca Block pass through existing road.

Table 13 - Digital sound lap in Same Fatuberliu

Rec No	Mea Value	Weight	Time	Date	Data Group Index
1	73,5	A	17:3:23	2024-8-19	0
2	44,9	A	17:3:24	2024-8-19	1
3	44,1	A	17:3:25	2024-8-19	1
4	44	A	17:3:26	2024-8-19	1
5	45,7	A	17:3:27	2024-8-19	1
6	44,8	A	17:3:28	2024-8-19	1
7	48,2	A	17:3:29	2024-8-19	1
8	47,3	A	17:3:30	2024-8-19	1
9	48,2	A	17:3:31	2024-8-19	1
10	48,9	A	17:3:32	2024-8-19	1

11	53,2	A	17:3:33	2024-8-19	1
12	53,9	A	17:3:34	2024-8-19	1
13	51,4	A	17:3:35	2024-8-19	1
14	46,7	A	17:3:36	2024-8-19	1
15	44,2	A	17:3:37	2024-8-19	1
16	46,2	A	17:3:38	2024-8-19	1
17	47,2	A	17:3:39	2024-8-19	1
18	45,4	A	17:3:40	2024-8-19	1
19	41,1	A	17:3:41	2024-8-19	1
20	42,2	A	17:3:42	2024-8-19	1

Table 14 - Digital Sound lap Natarbora Uma-Boco

RecNo	MeaValue	Weight	Time	Date	DataGroupIndex
1	68,1	A	14:41:9	2024-8-19	0
2	49,8	A	14:41:10	2024-8-19	1
3	35,2	A	14:41:11	2024-8-19	1
4	36	A	14:41:12	2024-8-19	1
5	37,3	A	14:41:13	2024-8-19	1
6	37,1	A	14:41:14	2024-8-19	1
7	50,1	A	14:41:15	2024-8-19	1
8	44,7	A	14:41:16	2024-8-19	1
9	42,5	A	14:41:17	2024-8-19	1
10	40,4	A	14:41:18	2024-8-19	1
11	42	A	14:41:19	2024-8-19	1
12	44,8	A	14:41:20	2024-8-19	1
13	42,5	A	14:41:21	2024-8-19	1
14	42,7	A	14:41:22	2024-8-19	1
15	42,3	A	14:41:23	2024-8-19	1
16	42,9	A	14:41:24	2024-8-19	1
17	43,9	A	14:41:25	2024-8-19	1
18	42,4	A	14:41:26	2024-8-19	1
19	43,9	A	14:41:27	2024-8-19	1
20	44,7	A	14:41:28	2024-8-19	1

6.2 Ecological Component

6.2.1 Wetland

There are 24 key wetland sites in Timor-Leste that have been identified as environmentally significant and in need of conservation and resource management (RDTL 2011a). Wetlands are

protected under the United Nations Transitional Administration in East Timor (UNTAET) regulation 2000/19.

While there are not many recognized wetlands within Timor-Leste, there is a diversity of aquatic habitats including freshwater and saline lakes, rivers, freshwater springs, swamps and marshes, inter-tidal sand and mudflats, sandy and rocky beaches, mangrove and exposed coral reefs (Trainor et al. 2007).

Within the Project area there are lakes; Lake Welenas and Modernahut. However, the seismic line will avoid two lakes.

6.2.2 Mangrove

Total mangrove cover is small and occurs predominantly along the south coast of Timor-Leste (Alongi 2013). Originally it was estimated that mangroves covered 9000 hectares (in 1940), but this had reduced to around 1802 hectares in 2008, mostly due to harvesting of wood for timber and fuel (RD TL 2011b). More recent estimates (2013) put the figure closer to 1300 hectares (Alongi 2013).

Mangroves and other coastal wetlands (i.e. seagrasses and coral reefs) provide physical protection to the shoreline by creating a buffer – protecting coastal communities from sea level rise, and absorbing the impact of waves, storm surges, and in extreme cases, small-scale tsunamis. In addition to coastal protection, mangroves, and coastal wetlands provide multiple ecosystem services and benefits for coastal communities, such as provisioning services (e.g. timber, fuel wood, and charcoal), regulating services (e.g. protection against floods, storms, and erosion control, prevention of saltwater intrusion), habitat (e.g. breeding, spawning and nursery habitat for fish species, biodiversity), and cultural services (e.g. recreation and aesthetic values). Mangroves are also among the most carbon-rich forests in the tropics, storing an immense amount of carbon from the steady accumulation of organic matter over several millennia.

Studies by Mumby et al. (2004) showed that mangroves strongly influence the community structure of fish on neighboring reefs through the provision of fish nursery habitats. The study showed that the biomass of reefs connected to mangroves was double that of those connected to systems where the mangroves had been removed (Wyatt 2004) and this would be true for the remaining mangroves in Timor-Leste.

There is a Mangrove Forest near the project area, along Natarbore coastal.

6.2.3 Fisheries

Line and net fishing from boats are the most widespread fishing activities in Timor-Leste, occurring adjacent to 11 coastal municipalities, including Viqueque (WorldFish, 2019). The top fish species that fishers in Timor-Leste consider most important for sale are:

1. Sardines (*Sardinella* spp. and others);
2. Short-bodied mackerel (*Rastrelliger* spp. and possibly some *Decapterus* spp.);
3. Bullet tuna (*Auxis* spp.);
4. Garfish (*Hemiramphus* sp.);
5. Trevally (*Carangoides* spp.);
6. Grouper/rock cod (*Epinephelus* sp.);
7. Spanish mackerel (*Scomberomorus* sp.);
8. Flying fish (*Cypselurus* spp.); and
9. Snapper (*Lutjanus* sp.).

Given the substantial distance of the project to the coast, the project is not expected to contribute with an impact that may affect this component such as i.e. siltation of coastal waters directly from the project activities.

Fisheries and Fishing in TGPB project area

In Manatuto, 399 fishermen were registered in 2019. More than 36 % of the fishermen have utilized machines to conduct their daily fishing.

In 2019, a total of 250 fishermen were recorded in Viqueque, unlike fishermen in Manatuto, most of the fisherman (nearly 41%) in Viqueque use traditional fishing (lines, nets, and spears).

The ocean surrounding Timor-Leste offers outstanding fishing opportunities. The local populace is skilled with nets, spears, and traps. Some of the large fish that are frequent to Timor-Leste's water include giant trevally, yellowfin tuna, Spanish mackerel, sailfish, and marlin.

In fishing activities, Same, Betano, Fatuberliu and Alas are fish farming centers such as; Lake Welenas, Lake Welada, Lake Modmahuk, Lake Gasolina, Lake Wetanu, Lake Gasolina-Nutur, Lake Namdalok. These fishing activities can be developed and can meet the needs of the general community in Timor-Leste in the future.

6.2.4 Protected Areas and National Park

Timor-Leste has a total of 49 declared Protected Areas (PA), according to Decree-Law No. 5/2016 – Protected Areas Network in Timor-Leste, containing the majority of the country's remaining primary forest cover. The majority of these areas are mountainous and have high species endemism. The first and most established Protected Area in the country is Nino Konis Santana National Park, composed of three main areas, namely, Jaco Island Marine Park, the Lake Iralalaru Park, and the community-led

marine protected area in the vicinity of Com Village. Below is the list of protected areas within the Pualaca Block to the Decree Law No. 05/2016 on the National System of Protected Areas/Sistema Nacional de Áreas Protegida (SNAP).

Table 15 - List of Protected Areas within Pualaca Block

No.	Name	Village	Municipality
1	Mount Bibileo	Dilor	Viqueque
2	Mount Diatuto	Funar	Manatuto
3	Ribeira de Clere	Uma Berloik, Dotik Caicasa	Manufahi
4	Lake Modornahut	Fatukahi	Manufahi
5	Lake Welenas	Fatukahi	Manufahi

However, explanation about seismic line whiten protected area as fallow:

1. Several proposed lines intersected with the protected areas as indicated in the table above. However, these lines mostly follow the existing roads and rivers. Project proponent ensure will not damage or change the origin of these protected areas. Following is the 2D seismic lines that intersected protected areas.

2D Seismic Line V21: Over 50 percent of the total length of V21 intersected Mount Diatuto. However, this line is designed to follow the main road that connects Natarbora and Laklubar. TGPB ensures will not disturb or change the protected area of Mount Diatuto origin.

2. 2D Seismic Line V24:

Almost the total length of the V24 intersects with the protected area of Mount Diatuto. However, this line is designed to follow the road and river system. Only minor line clearance inside of the roads and river.

3. V2, V5, and V7 passing through the protected areas of the South Coast of Natarbora. However, these lines are passing through existing roads and the use of vibroseis tracks is not expected to bring any negative impact to the vicinity.

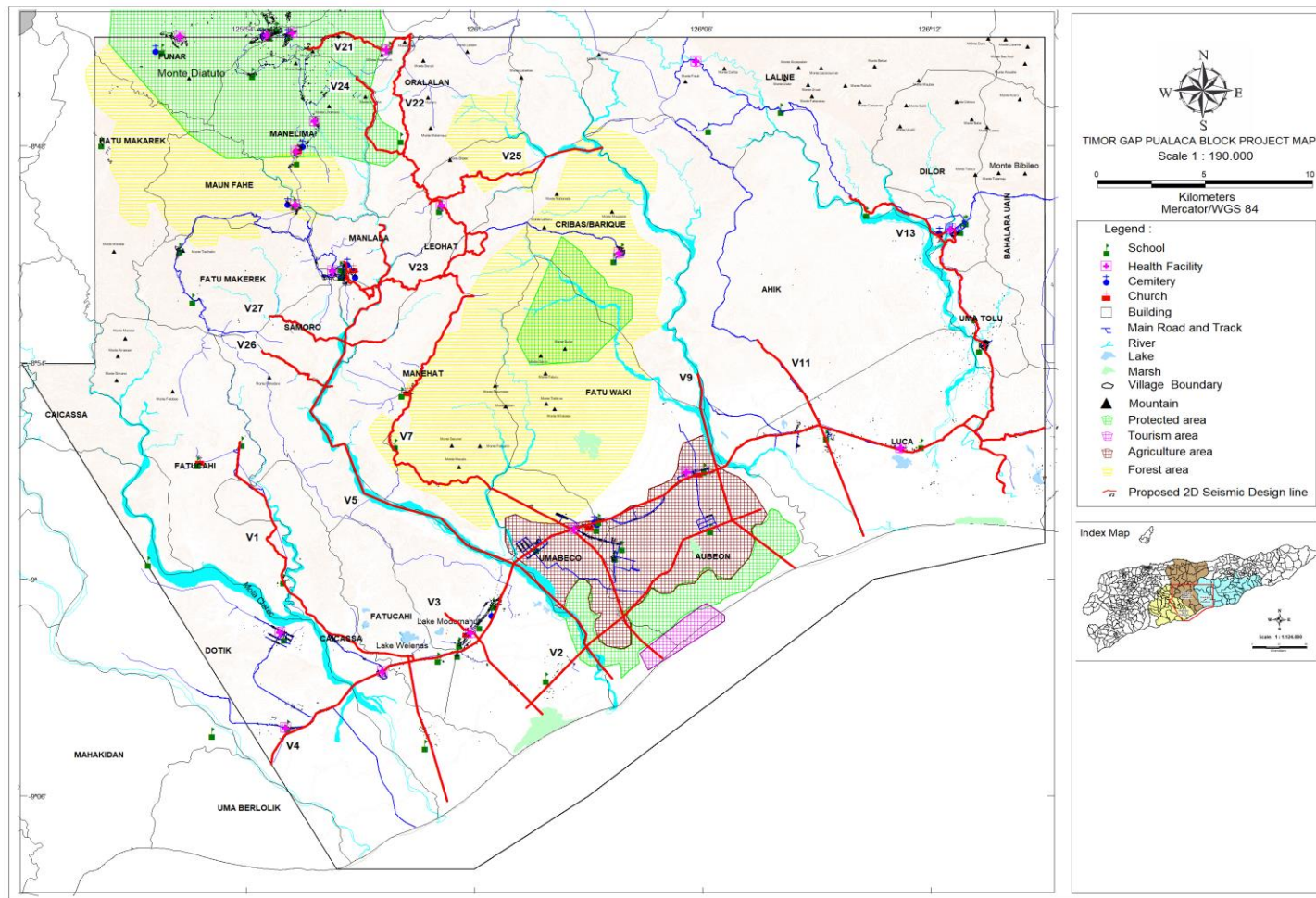


Figure 13. Map of TGPB Protected Areas

6.2.5 Flora

In general, forest and woodland of several structural types are the predominant original vegetation throughout much of Timor-Leste. Tall evergreen forests grow in areas with high moisture while drier and more extreme climatic conditions lead to the appearance of semi-deciduous and tropical dry forests (JICA, 2013).

Prior to the country's independence, its forest had been significantly exploited due to the foreign demand of country products, such as sandalwood (*Santalum album*). From 1.5 million hectares of total land in Timor-Leste, 57% are classified as forest or woodland (GovTL, 2010). The identified forest woodland has been degraded due to Timber harvesting and illegal logging, and slash-and-burn for agricultural practices.

In 2012 the forest area of Timor-Leste was estimated in the draft National Forest Conservation Plan (Nippon Koei, 2013) to be 869 thousand hectares, which represented 58% of the whole country. Dense forest with a crown cover was found on 60 to 70% of the forestland, the remaining balance being sparse forest. Agricultural land was estimated at 26 % of the whole country.

Altogether, the area of sparse forest is almost 1.8 times the size of the area of dense forest. Based on the national forest maps, only 1.7% of the total land area of Timor-Leste is still covered by primary forest; significant areas can be seen in Lautem and Covalima municipalities. The last major stretches of old primary forest are mainly located in the Tutuala, Post Administrative Lautem.

Timor-Leste is located in the Milesian region, with high plant biodiversity of estimated 41,000 plant species, including 70 percent of species endemic to the region (GovTL, 2015)

Based on a preliminary survey of the flora and fauna of Timor-Leste conducted in collaboration with Birdlife International, more than 251 tree species had been identified as native with a great deal of biodiversity in agriculture. The agro-biodiversity database elaborated by MAF, GIZ/AMBERO, UNTL and Permatil, listed 200 crop species in 555 varieties that are cultivated and/or used by Timorese farmers. While the database only includes data from 26 villages (sucos) distributed over five municipalities, actual diversity is likely to be much higher.

Flora and Forests around the Project Area

The vegetation in Viqueque consists of sparse moist lowland forest and dense moist highland forest, however it is not as dense as Manufahi. This is due to intense slash and burning for subsistence agricultural purposes and urban expansion.

The National Directorate of Forest in collaboration with Japan International Cooperation System (JISC) have prepared a Forest Transition Report. This report illustrated that from 2003 to 2010, Viqueque is the municipality with the most significantly decreased its forest covers (20.9% of its total forest cover,

loss of 31,265.87 ha), followed by Manufahi (29.6% of its total forest cover, a loss of 30,978.72 ha), (JICA, 2017).

In the City of Viqueque, there are patches of very open forest or scattered trees over grassland and weed communities are introduced, with Tree species recorded including *Borassus flabellifer*, *Schleichera oleosa*, *Pterocarpus indicus*, *Santalum album*, *Dichrostachys cinerea*, *Acacia nilotica* subsp. *indica*, *Cassia javanica* ssp. *nodosa*, *Timonius timon*, *Swietenia mahagoni*, *Glochidion xerocarpum*, *Ziziphus timoriensis*, and *Casuarina* sp. *affin. Junghuhniana*, as well as Coconut, mango and teak trees. Siam weed, Coffee bush, Crown flower and Golden false beard grass (*Chrysopogon aciculatus*) are prevalent. (Worley Parsons, 2012).

6.2.6 Fauna

The 5th UNCBD Report (GovTL, 2015) indicates that bird life in Timor-Leste is better documented than the non-bird fauna, although some main species groups such as mammals, reptiles, and amphibians have been studied to some degree at some locations within the country. Roughly half of the bird fauna originates from Asia and Australasia, whereas the mammal, amphibian and reptile faunas are dominated by Asian families and species. New species of bats, frogs, geckos and skinks have been discovered with evidence indicating high levels of endemism.

Timor-Leste hosts 262 bird species with 39 of them are threatened or restricted range species. Out of the 39 species, 8 of which are endemic to Timor- Leste (GovTL, 2010). Realizing the importance of conserving the birds to maintain the ecosystem services that the species are offering, the country has determined an Important Bird Area (IBA) with accumulative land of 1,852 km² across the municipalities in Timor-Leste (Trainor, 2007). The 5th National Report to the UNCBD (GoRDTL, 2015) states that these Important Bird Areas (IBAs) form the core of a network of sites for all wildlife: the Key Biodiversity Areas (KBAs). They are 16 IBAs, 14 on the mainland and two (2) on offshore islands (Atauro and Jaco islands). The IBAs covering roughly 12.5% of Timor-Leste's total land area, supporting populations of both restricted-range birds of the Timor and Wetar Endemic Bird Area (EBA), as well as globally threatened bird species.

The NBSAP (G-RDTL, 2015), based on studies conducted by (Trainor, 2007), substantiates this importance, registering at least 262 bird species that are known to Native to Timor, from which 169 are considered residents, 76 regular migrants and 17 are considered as vagrants. Of all these, three (3) species are identified as endangered, namely the Timor Green Pigeon (*Treron psittacea*, local name (LN): Punai Timor], the Timor Imperial Pigeon (*Ducula cineracea*, LN: Pergam Timor) and the Wetar Ground Dove (*Gallicolumba hoetdii*, LN: Delimukan Wetar). Additionally, one is classified as critically endangered – Yellow-Crested Cockatoo (*Cacatua sulphurea*, LN: Kakatua jambulkuning) and another as vulnerable is Timor Sparrow (*Padda fuscata*, LN: Gelatik Timor).

The country also has a rich, highly endemic, oceanic island terrestrial fauna that also consists of 60 mammals, including 24 non-volant (non-flying) mammals. Out of the non-volant mammals, two of which are the Timor Shrew *Crocidura tenuis* and Timor Rat *Rattus timorensis*. However, the 60 mammals are dominated by 31 bat species and 40 reptiles (15 lizard and 15 snake) species, one of which, the crocodile (*Crocodylus porosus*) is very important spiritually in Timor-Leste. Other common species of low conservation significance are the Timor Deer, Common spotted Cuscus, Common Palm Civet, pigs and Long-tailed Macaque. Almost all these land mammals are introduced, and all are affected by hunting and habitat loss.

Fauna around in the TGPB Project Area, Viqueque Manatuto and Same

Previous studies have concluded that fauna dispersion and variety is generalized throughout the Southern coast of Timor-Leste (Worley Parsons, 2012) and many existing IBAs and protected areas scattered throughout the South coast. Along the Southern Coast of Timor-Leste, a significant foraging and nesting habitat potential for vertebrate fauna species and in particular species of conservation significance are shown in table below.

Table 16 - Fauna Species found in Southern Coast of Timor-Leste (Santana, 2006 and Trainor, 2007)

Common Name	Scientific Name
AVIFAUNA	
Yellow-Crested Cockatoo	<i>Cacatua Sulphurea</i>
Slaty Cuckoo Dove	<i>Turacoena Modesta</i>
Pink-Headed Imperial Pigeon	<i>Ducula Rosacea</i>
Olive Shouldered Parrot	<i>Aprosmictus Jonquillaceus</i>
Spotted Dove	<i>Streptopelia Chinensis</i>
Barred Dove	<i>Geopelia Maugei</i>
Streak Breasted Honeyeater	<i>Meliphaga Reticulate</i>
REPTILES	
Tokay	<i>Gekko Gecko</i>
Asian House Gecko	<i>Hemidactylus Frenatus</i>
Fat-tailed House Gecko	<i>Hemidactylus Platyurus</i>
Wolf Snake	<i>Lycodon Capucinus</i>
Indonesian Water Python	<i>Liasis Macklotti</i>
Saltwater Crocodile	<i>Crocodylus Porosus</i>
MAMMALS	
Crab-Eating Macaque	<i>Macaca Fascicularis</i>

Common Name	Scientific Name
Nothorn Common Cuscus	<i>Phalanger Orientalis</i>
Javan Rusa	<i>Cervus Timorensis</i>
Timor Rat	<i>Rattus Timorensis</i>
Wild Boar	<i>Sus Scrofa</i>
Large-eared Horseshoe Bat	<i>Rhinolophus Philippensis Montanus</i>
Asian Palm Civet	<i>Paradoxurus Hermaphroditus</i>
Indonesian Short-nosed Fruit Bat	<i>Cynopterus Titthaechilus</i>
DOMESTIC MAMMALS	
Dog/Dingo	<i>Canis Familiaris</i>
Pig	<i>Sus Scrofa</i>
Bali Cattle	<i>Bos Javanicus</i>
Cattle	<i>Bos Taurus</i>
Goat	<i>Capra Hircus</i>

Previous studies have also recorded several species of conservation significance, such as the Canut's Horseshoe Bat (*Rhinolophus canuti*), listed as Vulnerable on the IUCN Red List, canut's horseshoe bat (*Rhinolophus canuti timoriensis*), beach thick-knee (*Esacus magnirostris*), slaty cuckoo dove (*Turacoena modesta*) and Timor bush-chat (*Saxicola gutturalis*) (Worley Parsons, 2012).

Threatened species In Timor-Leste

According to the International Union for Conservation of Nature (IUCN) there are 26 species identified as threatened – that is, critically endangered, endangered or vulnerable (Table 17), in Timor-Leste. However, there is little known about the country's reptiles, amphibians and flora species (RDTL 2011c) and it is therefore likely that this number is an underestimation.

Table 17 - IUCN Red List (2017)-Threatened species of Timor-Leste

Genus	Species	Common name	IUCN Red List Status
<i>Aetobatus</i>	<i>ocellatus</i>	Spotted Eagle Ray	VU (Vulnerable)
<i>Aipysurus</i>	<i>fuscus</i>	Dusky Sea Snake, Timor Reef Snake	EN (Endangered)
<i>Aldrovanda</i>	<i>vesiculosa</i>	Waterwheel, Common Aldrovanda	EN
<i>Alopecoenas</i>	<i>hoedtii</i>	Wetar Ground-dove	EN

<i>Amblyglyphidodon</i>	<i>batunai</i>	Green Sergeant	VU
<i>Amblyglyphidodon</i>	<i>ternatensis</i>	Ternate Damsel, Ternate Sergeant	VU
<i>Balaenoptera</i>	<i>musculus</i>	Blue Whale	EN
<i>Cacatua</i>	<i>sulphurea</i>	Yellow-crested Cockatoo	CR
<i>Calidris</i>	<i>tenuirostris</i>	Great Knot	EN
<i>Cheilinus</i>	<i>undulatus</i>	Giant Wrasse	EN
<i>Chelonia</i>	<i>mydas</i>	Green Turtle	EN
<i>Dugong</i>	<i>dugon</i>	Dugong	VU
<i>Fregata</i>	<i>andrewsi</i>	Christmas Frigatebird	CR
<i>Holothuria</i>	<i>fuscogilva</i>	White Teatfish	VU
<i>Isurus</i>	<i>oxyrinchus</i>	Shortfin Mako	VU
<i>Numenius</i>	<i>madagascariensis</i>	Far Eastern Curlew, Eastern Curlew	EN
<i>Nyctimene</i>	<i>keasti</i>	Keast's Tube-nosed Fruit Bat	VU
<i>Oxymonacanthus</i>	<i>longirostris</i>	Harlequin Filefish	VU
<i>Physeter</i>	<i>macrocephalus</i>	Sperm Whale	VU
<i>Plectropomus</i>	<i>areolatus</i>	Squaretail Coralgroup, Spotted Coral Trout	VU
<i>Pristis</i>	<i>zijsron</i>	Green Sawfish	CR
<i>Rhinolophus</i>	<i>montanus</i>	Timorese Horseshoe Bat	EN
<i>Stegostoma</i>	<i>fasciatum</i>	Zebra Shark	EN
<i>Taeniurops</i>	<i>meyeni</i>	Blotched Fantail Ray	VU
<i>Thunnus</i>	<i>obesus</i>	Bigeye Tuna	VU
<i>Treron</i>	<i>psittaceus</i>	Timor Green-pigeon	EN

Sensitive vegetation types

Timor-Leste is home to globally significant ecosystems, such as tropical rainforests, mangroves, wetlands like the Lake Iralalaru basin, agricultural and marine ecosystems (RDTL 2011c). Mangroves are protected by UNTAET Regulation 2000/19 and also protected under traditional practices (Tara bandu) (RDTL 2011c).

Weeds and introduced fauna

Timor-Leste has a high weed burden, and in particular, suffers from the introduction of Siam Weed (*Chromolaena odorata*) which has become widespread and threatens crops, natural areas and

animals, as well as increasing the risk of fire (RDTL 2011c). Other potential invasive species are (RDTL 2011c):

- *Lantana Gorse*
- *Catharanthus roseus*
- *Jatropha gossypifolia*
- *Ziziphus mauritiana*
- *Calotropis gigantea*
- *Leucaena leucocephala*
- *Thevetia peruviana*
- *Mimosa diplotricha*.

It has been estimated that one-third of Timor-Leste's mammals are introduced, including (RDTL 2011c):

- Common Spotted Cuscus (*Phalanger orientalis*);
- Long-tailed Macaque (*Macaca fascicularis*);
- Common Palm Civet (*Paradoxurus hermaphrodites*)
- Eurasian Wild Pig (*Sus scrofa*)
- Rusa Deer *Cervus* (*Timorensis russa*)
- House Mouse (*Mus musculus*)
- House Rat (*Rattus tanezumi*)
- Brown Rat (*Rattus norvegicus*)
- Polynesian Rat (*Rattus exulans*)
- House Shrew (*Suncus murinus*)
- Common Carp (*Cyprinus carpio*)
- Bluestripe Snapper (*Lutjanus Kasmira*)
- Red Junglefowl (*Gallus gallus*)
- Western Swampen (*Porphyrio porphyrio*)
- Mangrove Monitor (*Varanus indicus*)

6.2.7 Coastal Resources

Timor-Leste has approximately 700 km of coastline, holding many coastal and marine resources including fish, sea grasses, seaweeds, coral reefs, mangrove forests and pristine beaches (very suitable for recreation and with a high tourism value). These coastal habitats vary from region to region around the country, with areas such as lagoons, fringing coral reefs, sea grass beds and steep cliffs with adjacent deep-water drop-offs, mangrove stands, beaches and shallow bays. These coastal habitats are

places of varying abundance and diversity of fish stocks, some representing spawning grounds whilst others a transition area between onshore and offshore habitats or seasonal migratory pathways to many megafauna species. Thus, the coastal zone (and habitats) of Timor-Leste is subject to a high degree of human dependency and impact resources for Tourism or socioeconomic activities. For example, mangrove forests have been reduced at an alarming rate throughout decades since 1940, due to timber harvesting, fuel wood, and opening up spaces near the mangrove forests for shrimp and fishponds.

Being part of the Coral Triangle also befits Timor-Leste of a rich Marine fauna, since it is estimated the Coral Triangle harbors 76 percent of the world's coral species, six of the world's seven marine turtle species, more than 3,000 reef fish species, whale sharks, manta rays and a diversity of marine megafauna, such as saltwater crocodiles, 22 dolphin species and a variety of whale species (G-RDTL, 2010).

This declaration follows reports such as Veron (2000) where Timor-Leste is among those places on the planet with the highest coral species diversity. There are over 500 species of coral reported from the sea around Timor-Leste, putting emphasis on the fact that any activity along the coastline, coastal development projects, marine pollution, sedimentation, overfishing and destructive fishing are considered having an impact to the corals.

This enormous marine resource places Fisheries in Timor-Leste as a primary food source, although it is still considered small-scale and mainly for subsistence purposes. The fishermen usually use non-motorized boats with gill nets and hook and line to capture reef and surface-dwelling fish. The Fish and Animal Consumption and Availability Survey conducted in 2011 by Regional Fisheries Livelihoods Program in five municipalities, estimated average fish consumption to be 6.1 kg/person/year all throughout Timor-Leste, while people living near the coast stood at 17.6 kg/person/year versus those living inland consumed 4/kg/person/year (Población, 2013).

6.3 Economic Component

6.3.1 Employment Sector

The Strategic Development Plan (SDP) 2011-2030 expresses the vision of the Timorese people to build a prosperous and peaceful nation. By 2030 Timor-Leste should be an upper middle-income country, where extreme poverty has been eradicated and with “a modern, diversified economy based on the agriculture, tourism and petroleum industries, with a flourishing private sector and new opportunities for all our people will be literate, knowledgeable and skilled. They will be healthy and live long, productive lives. They will actively participate in economic, social and political development, promoting social equality and national unity.”

Based on the Timor-Leste SDP the government through the General Directorate of Statistics (GDS), and Ministry of Finance conducted the Labor Force Survey (LFS) 2021 that Timor-Leste provides robust

data to present a comprehensive picture of the Timor-Leste labor market. This LFS report analyses various labor market indicators and provides detailed information disaggregated by sex, age, and region on the economic characteristics of the working-age population – including employment, wages and earnings, hours of work, labor underutilization, and economic inactivity.

The results of the Labor Force Survey in 2021 estimated that in Timor-Leste, the total population amounted 1.3 million with 668.3 thousand men and 618.4 thousand women. The information on employment from the LFS estimated that employment in 2021 amounted to 234.3 thousand, comprising of 142 thousand men and 92.3 thousand women. The employment-to-population ratio was 28.9 percent, indicating that a large share (71.1 percent) of the population was not involved directly in market-related activities.

In Manufahi, specifically in community of Post Administrative of Faturbeliu depends on agriculture and fishing trades as a means to provide for their family (Interview with local leaders). In the commercial sectors of small industry, there are activities such as agricultural products, carpentry, tais weaving, ‘homan’, Ironworkers for production of machete; backhoe, crowbar, knives and others. Some locals produce herbal or “traditional” medicine, gravel grinding, and bricks for construction.

Similarly, the community in Lakluta, Viqueque mainly depends on their agriculture production such as fruits and vegetables. However, due to the road condition which connect the local to the national, the community face great challenge in providing for their family.

Moreover, in Natarbora (Manatuto), the field survey had shown that agriculture is the major source of income for the majority (~85%) of respondent households, although some of households were also engaged in livestock rearing and fishing activities. Agriculture, livestock and fisheries largely contributed to their households’ income. However, respondent households’ incomes are relatively low as observed during data collection. Respondent households confirmed that livestock was the most common secondary source of income followed by fisheries.

6.3.2 Infrastructure Installation

The Infrastructure Installation in the TGPB project areas such as Institutions, Schools, and Health Facilities in Manatuto, Manufahi, and Viqueque areas is provided in the table below:

Posto Administrativos	Escolas Ensino Pre-Escolar		
	Público	Privado	Público + Privado
Natarbora	x	x	x
Soibada	x	x	x
Laclubar	x	x	x
Manatuto	x	x	x
Laclo	x	x	x
Laleia	x	x	x
Total	4	9	13

Posto Administrativos	Escolas Ensino Básico		
	Público	Privado	Público+Privado
Natarbora	9	1	10
Soibada	7	1	8
Laclubar	21	0	21
Manatuto	12	3	15
Laclo	14	1	15
Laleia	6	0	6
Total	69	6	75

Posto Administrativos	Escolas Ensino Secundário Geral		
	Público	Privado	Público+Privado
Natarbora	0	1	1
Soibada	0	0	0
Laclubar	0	1	1
Manatuto	1	1	2
Laclo	0	1	1
Laleia	1	0	1
Total	2	4	6

Table 18 - Schools in Manatuto

Manatuto does not have a general hospital, only small public clinics and very few private clinics (see table 19 below):

Table 19 - Health facilities in Manatuto (Directorate General of Statistics TL, 2019)

Posto Administra- tivos	Público			Total	Clinicas Privadas	Total
	Hospital	Centro da Saúde	Posto da Saúde			
Natarbora	-	1	3	4	1	5
Soibada	-	1	3	4	0	4
Laclubar	-	1	5	6	1	7
Manatuto	-	1	3	4	0	4
Laclo	-	1	4	5	0	5
Laleia	-	1	1	2	0	2
Total	-	6	19	25	2	27

Table 20 - School facilities in Manufahi for pre-school (a), primary school (b), and secondary school (c) (Directorate General of Statistics TL, 2019)

Posto Administrativos	Escolas Pre-Escolar		
	Público	Privado	Público + Privado
Alas	7	1	8
Fatuberliu	7	1	8
Same	14	4	18
Turiscail	4	0	4
Total	32	6	38

(a)

Posto Administrativos	Escolas Ensino Básico		
	Público	Privado	Público + Privado
Alas	12	2	14
Fatuberliu	12	1	13
Same	30	5	35
Turiscail	14	0	14
Total	68	8	76

(b)

Posto Administrativos	Escolas Ensino Secundário Geral		
	Público	Privado	Público + Privado
Alas	0	1	1
Fatuberliu	1	1	2
Same	1	1	2
Turiscail	0	1	1
Total	2	4	6

(c)

Manufahi, from the 2019 database, has a total of 28 health facilities across its territories (refer to table 21).

Table 21 - Health Facilities in Manufahi (Directorate General of Statistics TL, 2019)

Posto administra- tivos	Fasilidade de Saúde					
	Sentro da Saúde	Posto da Saúde	Clinika Privado	Sisca (Kategoria)		
				A	B	C
Alas	1	6	0	0	38	46
Fatuberliu	1	4	0	0	36	24
Same	1	10	1	7	80	9
Turiscail	1	3	0	10	64	10
Total	4	23	1	17	218	89

Viqueque's school facilities can be viewed from the following tables below:

Table 22 - School facilities in Viqueque for pre-school (a), primary school (b), and secondary school (c) (Directorate General of Statistics TL, 2019)

Posto Administrativos	Escolas Pre-Escolar		
	Público	Privado	Público + Privado
Lacluta	3	2	5
Ossu	5	1	6
Watu Carbau	2	1	3
Uatu-Lari	4	2	6
Viqueque	14	3	17
Total	28	9	37

(a)

Posto Administrativos	Escolas Ensino Basico		
	Público	Privado	Público + Privado
Lacluta	8	1	9
Ossu	27	1	28
Watu-Carbau	13	0	13
Uatu-Lari	23	2	25
Viqueque	23	2	25
Total	94	6	100

(b)

Posto Administrativos	Escolas Ensino Secundário Geral		
	Público	Privado	Público + Privado
Lacluta	0	1	1
Ossu	1	1	2
Watu-Carbau	1	0	1
Uatu-Lari	2	0	2
Viqueque	2	1	3
Total	6	3	9

(c)

The number of health facilities in Viqueque is represented in Table 23 below.

Table 23 - Health Facilities in Viqueque (Directorate General of Statistics TL, 2019)

Posto Administrativos	Público					Clinicas Privadas	Total
	Hospital	Centro da Saúde	Posto da Saúde	SISca	Total		
Lacluta	0	1	4	6	11	0	0
Ossu	0	1	10	11	22	0	0
Uatu-Carbau	0	1	5	7	13	0	0
Uatu-Lari	0	1	12	10	23	1	1
Viqueque	1	1	12	13	27	1	1
Total	1	5	43	47	96	2	2

6.3.3 Land Use

The total land area of Timor-Leste is 14,870 square kilometres. Forests cover approximately 54 percent of the land area, but deforestation rates are some of the highest in the region with total forest cover decreasing by 1.3 percent annually between 2000 and 2005. Estimates of the total arable land range

from of 8.2 percent to 13 percent. Land in permanent cropland is 4.6 percent of the country's area and only 1,065 square kilometres of this is irrigated (FAO/WFP 2007; CIA 2010)

Viqueque has been identified as having similar topographical and biological conditions to Manufahi and Manatuto Municipalities (Worley Parsons, 2012). The higher regions of the Northern and Eastern upstream area of Viqueque consist of tropical rainforest, with high species diversity, whilst the lower land area is a predominantly mix-use setting i.e. urban with some rural activity, transitioning from forested areas with some stands of tropical evergreen to semi-evergreen forest to dry forest.

Manatuto, Viqueque, and Manufahi Municipalities are also identified as a rural agricultural district where traditional agriculture is practiced, such as non-irrigated rice, corn, cassava, beans, and other staples. These activities have put extreme pressure on the mid to high-range forest areas, where the loss in dense forest has been occurring over the years and deforested areas are higher than sparse forest areas (ADB, 2016).

6.3.4 Use of Forest and Other Natural Resources

Several of the tree species mentioned in 6.2.7 are of economic or local importance, primarily for timber, fruit harvesting as food crops or for firewood or household use for cooking. However, this use is deemed to be more for household use and no small or medium industrial-scale forest activities were identified in the TGPB project area.

A positive note was the identification of Vetiver grass (*Chrysopogon zizanioides*) abundant use at roadside construction direction Manatuto to Laclubar, which is good news for erosion control and slope protection within the TGPB project area (ADB, 2016).

6.3.5 Agriculture

The agriculture products produced in Viqueque, Manatuto, and Manufahi such as Coffee, Rice, Corn, Cassava, Sweet potatoes, Soybeans, Cabbage, Mangoes, Banana, and Vanilla

6.3.6 Tourism

During site visits and interviews with stakeholders in the TGPB seismic lines and base on the Municipality data base "No Tourism area along the seismic Lines in TGPB area".

6.3.7 Other Industry

Proposed project TGPB may have an impact to any existing industries, buildings, community houses and others in the vicinity along the seismic lines, the evidence has provided in the figure 14- detailed map and affected community.

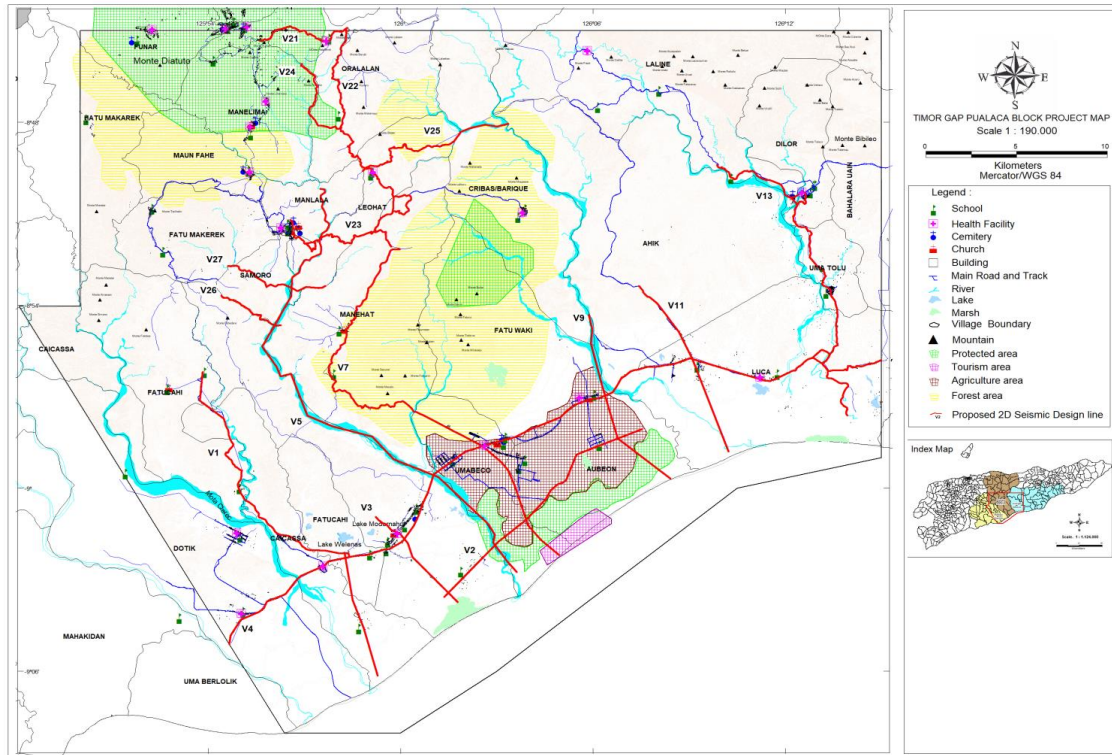


Figure 14. Detailed map and affected community.

6.4 Social Component

6.4.1 Population and Community

Manatuto Municipality

Table 24 - National Census Data on Population in Barique, Manatuto (2019)

Population						Total Area	Density
Barique	Total	Male	Female	Sex Ratio	Barique	398.29	13.7
Aubeon	1,358	702	656	107.01	Aubeon	48.95	27.7
Barique	1,258	663	595	111.43	Barique	122.13	10.3
Fatuwaque	438	220	218	100.92	Fatuwaque	39.86	11.0
Manehat	688	369	319	115.67	Manehat	101.86	6.8
Uma Boco	1,696	934	762	122.57	Uma Boco	85.49	19.8
Max	1696	934	762	122.57	Max	398.29	27.7
Min	438	220	218	100.92	Min	39.86	6.8
Average	1,088	578	510	111.52	Average	79.66	15.1

Viqueque Municipality

The population in Viqueque was projected, in 2018 to be at 78,265 persons and the aggregated population of Suco Caraubalu, Uma Uain Craic, and Uma Quic are estimated to be 14,784 persons (DGE Viqueque, 2018). The total number of households in Viqueque Administrative Post is at 5,032 and an extremely low unemployment rate of 1%, countered by an economically inactive rate of 48% of the population, which is in line with previous reports (World Bank, 2016) of 36.9% poverty rate in the Municipality.

Manufahi Municipality

The population in Manufahi was projected, in 2015 (General Directorate of Statistics, 2019) to be 53,691 persons the population of Babulo to be 4,468 persons of Letefoho to be 7,573 persons and of Holarua to be 6,871 persons.

6.4.2 Health Profile

Viqueque Municipality

There are 36,200 live births and 9,209 deaths reported to have occurred in 2015 by the Government of Timor-Leste (Census 2015), which gives an approximate 4 birth-to-1 death ratio in Timor-Leste. The healthy life expectancy in 2019 for the people of Timor-Leste is at 69.5 years (World bank, 2019) for both females and males.

Fertility rates in Viqueque municipality are average (4.6 births per woman) in comparison with other municipalities but still above the national average of 4.5 births for every woman aged 14 to 49 (Census, 2015). Under-5 mortality rate (85 deaths/1,000 live births) was 13 points higher than the National average at 72 deaths/1,000 live births (National Statistics Directorate, 2019).

Up to 2015, the mortality ratio for children under five years and maternal mortality ratio has declined by 8.37% which indicates that the country is making effective improvements in reducing child mortality (WHO, 2015).

The nutritional status of children in the country has been suffering from stunted growth and malnutrition. In Viqueque alone, 52% of the children under five years have stunted growth, at the 2nd highest tier among the other municipalities (highest at 60%) (National Statistics Directorate, 2019).

The top 10 causes of death in Timor-Leste have been (in descending order): Tuberculosis, Lower respiratory infections, Ischaemic heart disease, Stroke, Birth asphyxia and birth trauma, Diarrheal diseases, Preterm birth complications, Road injury, Neonatal sepsis and infections and Cancer. The highest being Tuberculosis, killing 800 people in 2012 (WHO, 2015). The leading causes of death for children are acute respiratory infections, birth asphyxia, prematurity, diarrhea, neonatal sepsis, injuries, congenital anomalies, and malaria. Diarrhea remains to be the second leading cause of child mortality under 5 years of age. Diarrhoea, helminth infection, malaria, and dengue are still prevailing due to a lack of proper sanitation facilities across the country.

However, the prevalence of stunting is lower among children of families who had access to improved sanitation and hand-washing facilities, perhaps because there is less exposure to potential sources of infection due to better hygiene practices (National Statistics Directorate, 2019).

Manufahi Municipality

There are 36,200 live births and 9,209 deaths reported to have occurred in 2015 by the Government of Timor-Leste (Census 2015), which gives an approximate 4 birth-to-1 death ratio in Timor-Leste. The healthy life expectancy in 2019 for the people of Timor-Leste is at 69.5 years (World Bank, 2019) for both female and males.

Fertility rates in Manufahi municipality average (4.9 births per woman) in comparison with other municipalities but still above the national average of 4.5 births for every woman aged 14 to 49 (Census, 2015), while under-5 mortality rate (156 deaths/1,000 live births) was 84 points higher than the National average at 72 deaths/1,000 live births (National Statistics Directorate, 2019)

The nutritional status of children in the country also suffers from stunted growth and malnutrition. Based on data from the General Directorate of Statistics indicates that Manufahi has 30 children with moderate malnutrition and 8 children with significant malnutrition under 5 years of age (Direccao Geral de Estatistica Municipio de Manufahi, 2019). The top 10 causes of death in Timor-Leste have been (in descending order): Tuberculosis, Lower respiratory infections, Ischaemic heart disease, Stroke, Birth asphyxia and birth trauma, Diarrheal diseases, Preterm birth complications, Road injury, Neonatal sepsis and infections and Cancer, the highest being Tuberculosis, killing 800 people in 2012 (WHO, 2015). The leading causes of death for children are acute respiratory infections, birth asphyxia, prematurity, diarrhoea, neonatal sepsis, injuries, congenital anomalies and malaria. Diarrhea remains to be the second leading cause of child mortality under 5 years of age. Diarrhea, helminth infection, malaria, and dengue are still prevailing and have been associated with a lack of proper sanitation facilities across the country. However, the prevalence of stunting

is lower among children of families who had access to improved sanitation and hand-washing facilities, perhaps because there is less exposure to potential sources of infection due to better hygiene practices (National Statistics Directorate, 2019).

6.4.3 Institutions, Schools and Health Services

The information about this section is provided in sub section 6.3.2 about Infrastructure installations in TGPB area.

6.4.4 Community and Family Structure

Community Structure and Family Structure in Viqueque Municipality, Manatuto Municipality and Manufahi Municipality similar same tradition. Despite being a 95% Catholic country, there is an underlying and very vast animistic culture in all the ethno-linguistic communities of Timor-Leste, maintaining institutional forms associated with the importance of the “Sacred” or Lulik beliefs in contemporary social.

Society and households in Timor-Leste engage with in a variety of ways such as exchange relationships and customs that maintain narrative stories and founding myths, ancestral regalia and inherited knowledge, as well as landed property and ritual practices. These extend to the ritual of agriculture management and seasonal monsoons, life cycle ceremonies (birth, marriage and funerals), clan group rituals of solidarity and, more importantly, as a traditional approach to land management.

Viqueque society follows (with slight local variation e.g. local dialect) in line with the general indications of those practiced in Timor-Leste, where the sacred or Lulik plays a central role in their contemporary social relationships and community, especially in the regards to agricultural management and conservation of resources. ‘Lulik’ areas appear in more disperse but nevertheless

important symbols such as trees or water sources. In regards to Springs and water Sources, the Lia-Na'in (or traditional leader) has the core role to lead a procession accompanied and witnessed by the representative of the community, local authorities, and other relevant and interested parties throughout the ritual. Offerings are usually provided before commencing the ritual according to the objective that the interested party wants to achieve. The Lia-Nain will then start to pray whilst presenting the offerings to God, Ancestors and Sacred Objects.

6.4.5 Land Ownership

The land area for the TIMOR GAP Pualaca Block is about 1,575 km, covering 3 municipalities: Manatuto, Viqueque, and Manufahi. It is reported that there is no proper land registry/ no recording or verification of land, no framework to determine competing claims to "land ownership" and transition are largely based around the family unit. The proposed project will not cause any impact to the community land and properties as TGPB is the holder Of PSC TL-OT-21-17 as awarded by ANP.

6.4.6 Any type of Common or Individual Rights on Natural Resources

The Municipality of Viqueque has natural resources that can be developed as Petroleum - Natural Gas (Aliambata), Oil, Anar Rock, Magnetic Rock and others. There are no natural resources that exist in the project area. The natural resources in Viqueque Municipality such as; We-Manas Lulik and Kraras are due to geothermal activity. This natural resource is commonly used and is known as National Park. Additionally, Foho Mundo Perdido, this mount is very important as it serves as water resource and give a lot of benefit to the community in this area aside from being a hiking destination. However, the proposed project will not affect these areas since they are outside of project radius.

6.5 Cultural Components

6.5.1 Cultural Heritage

According to Trindade (2011), "Lulik' regulates social interaction and provides moral standards regarding the relationships of people. In the case of human relations with nature, Lulik demands that nature (land, water, trees/forests, rocks) must be respected. Trindade (2011) explains that this is the reason for ceremonies such as rituals after harvesting corn and before planting seeds. This ritual was intended to show gratitude and appreciation of soil fertility. He also mentioned that the 'Sau Batar' ceremony is usually carried out before harvesting corn and it is one of the important rituals for Timorese people. The 2D Seismic Acquisition in Pualaca Block will be conducted carefully without jeopardizing or affecting this cultural site.

There are some existing traditional houses within the proposed project location that are being used during the harvest (Silu-batar) period and thanksgiving events such as kasu, etc. The local leaders (Xefe Suku and Xefe Aldeia) reiterated that usually there are only 2 major cultural events per year.

6.5.2 Archeological sites

During the Portuguese and Indonesian occupation, there were very few places there apart from traditional huts inhabited by the local Timorese. Most of these places were built during the Portuguese and Indonesian occupation. Currently, some of these places are still exists and can be found not far from the project area (source: local leader and www.google/archelogicalsite/viqueque). The potential tourism in the municipality that can be offered to tourists/visitors and bring in the local revenues are for example historical cultural heritage as: the Municipal Market of Ossu is built in 1963-1964, Church of Sta. Terezinha do Menino Jesus; Former Administrative Post of Ossu, Uatu Carbau, Lacluta and Uatulari; School Waida-Ossu College, etc. However, all these Archeological sites are outside of the TGPB project area.

6.5.3 Historical site

The Municipality of Viqueque has many historical sites that can be developed as tourist destinations to boost the local economy by generating jobs and incentives. Viqueque has a strong historical background. Loihunu is one of the villages of Viqueque with ancient caves where Falintil guerrillas used to protect from the Indonesian army during the independence war. Additionally, Loihunu houses very old schools and churches that were constructed during the period of Portuguese-Timor. Historic Wasa-Diga shelter in the hamlet of Loi-Huno, Viqueque Municipality, on July 12th. This historic site was used by the Resistance during the Indonesian occupation and operated intermittently between 1989 and 1996, following guerrilla tactics of “concentration and dispersion.” Taur Matan Ruak, serving at the time as the Vice Chief of Staff of Falintil, and Francisco Guterres Lú Olo, the then Secretary of the Fretilin Steering Committee, both took shelter at this place. Middle management personnel of the clandestine front, such as the Political Commissioner, Falur Rate Laek, and Political Commissioners Lintil, Political Aid, and Trix, Unit Commander, among others, were also stationed there. The killing of 14-16 Indonesian soldiers at Kraras/Bibileu on August 8, 1983 and the subsequent September 1983 ‘Kraras massacre’ of a large number of civilians by Indonesian military forces became internationally known soon after – but the detail was disputed. The massacres of civilians by Indonesian military from about September 17 1983 are documented in some detail by Jolliffe, Pilger and CAVR (Timor-Leste’s Commission for Truth). Not surprisingly, the actual numbers of dead and disappeared remain elusive. There were several separate events, and the evidence comes from multiple sources, some of whom were traumatized survivors from killing sites. A total figure of around 300 dead is oft-quoted, including

the single largest massacre at Tahu Bein/Wetuku River where 80-180 were killed in cold blood. (Source: local leader and www.google/historicalsites/viqueque Seismic survey activity is not affected by this area because of its distance from the TGPC project area.

6.5.4 Secret Site

There are numbers of sacred sites in Viqueque Municipality namely Municipal Market of Ossu is built in 1963-1964, Church of Sta. Terezinha do Menino Jesus; Former Administrative Post of Ossu, Uatu Carbau, Lacluta and Uatulari; School Waida-Ossu College, (source: local leader and www.google/sacredarea/viqueque). However, once again the 2D seismic survey activity will not affect in this area because of its distance from the TGPC project area.

6.5.5 Unique Landscape

The proposed project is located in Viqueque, Manatuto, and Manufahi Municipality There is no unique landscape that nearby the proposed project, so we consider this project not to have a negative impact on unique landscape. But in the Post Administrative Ossu we found some unique landscapes that always haunt by tourists. This place is very beautiful and sometimes they do camp in this place, namely Lariguto.

CHAPTER 7: ALTERNATIVES

7.1 Alternative locations

The TIMOR GAP Pualaca Block PSC TL-OT-21-17 was awarded to TIMORGAP by ANP as a prospective block for oil and gas activity onshore of Timor-Leste. Hence, the TGPB block is known as prospective block based on previous study and evident of seeps in the area. Therefore, to align with the Timor-Leste Strategic Development Plan of 2011-2030 (SDP) this 2D Seismic Acquisitions for Pualaca Block is necessary for future oil and gas production. In other word, this survey is one of the earlier work that required in Oil and Gas industry before development of a potential field. Thus, no alternative study or location for TIMOR GAP Pualaca Block PSC TL-OT-21-17 however, the seismic line survey can be changed in the future depending on the actual survey and the terrain.

7.2 The “no-project” alternative

Timor-Leste has identified the development of the oil and gas industry as a key target for strategic development (RDTL 2010). This project will help drive the country towards this goal and will also provide employment and training opportunities for locals. If the ‘no-project’ alternative was taken these opportunities would be lost and Timor-Leste may take longer, or even fail, to attain a higher standard of living.

TGPB does not consider the ‘no project’ alternative to be an option.

CHAPTER 8: CLIMATE CHANGES

8.1 Description of observations and trends in historical meteorological

There is limited data on historical climate records for Timor-Leste. However, according to Timor-Leste: Climate Risk Country Profile by World Bank Group (ADB, 2021), the average monthly temperature between the coldest month and the warmest month is about 1.3°C as shown in Figure 13. Moreover, data from USAID estimates a rise in temperature of 0.16° C per decade since 1950, and warming appears to have accelerated since the 1980s (ADB, 2021), with less accuracy due to the lack of historical data.

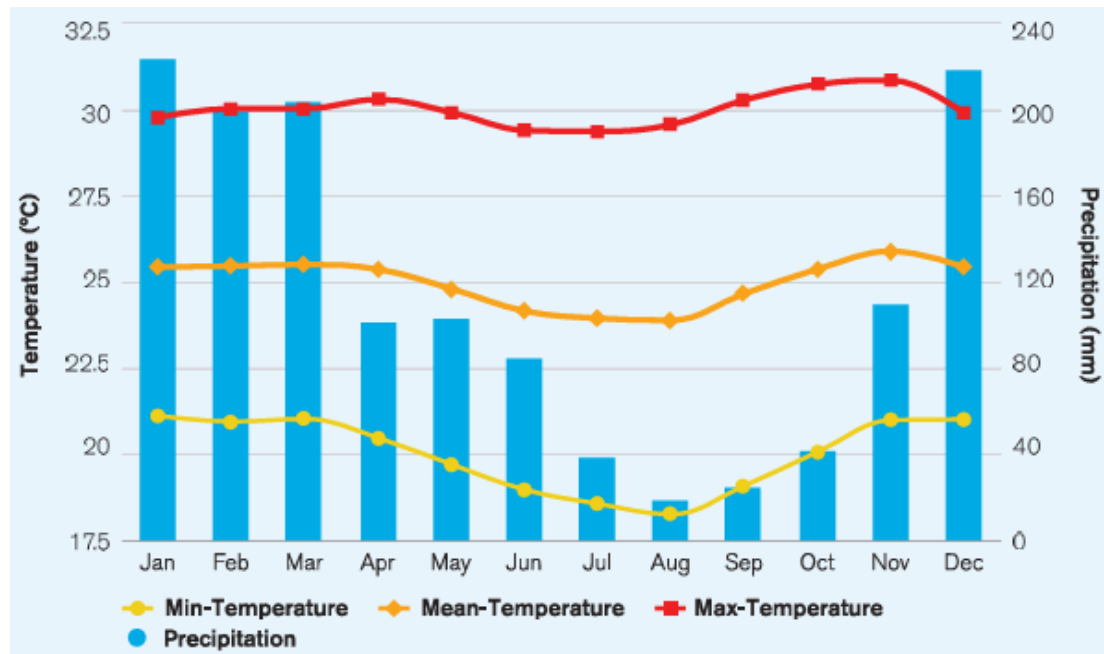


Figure 15 - Average monthly mean, minimum, and maximum temperatures and rainfall in Timor-Leste from 1991-2020 (World Bank Group, 2021)

It is important to emphasize that historic temperature records are not reliable for Timor-Leste, but it is likely that, in line with regional and global trends, there will have been a warming trend over the last 50 years. There are no significant trends in annual rainfall; however, it is predicted that there will be more extreme rainfall days in the future. It is predicted that, there will be extreme rainfall event during 'wet' season and the amount of rainfall during 'dry' season will decrease (ADB, 2021).

Sea levels have been rising at about 9 mm per year since 1993 (Australian Government 2015). Records indicate that ocean acidification in Timor-Leste's waters has been slowly increasing since the 18th century (Australian Government 2015).

Timor-Leste is one of the smallest carbon dioxide emitters in the world at an average of 0.02 tonnes per person per year (RDTL 2011).

8.2 Climate change projections

Climate change is predicted to alter the environment of Timor-Leste in several ways (*source Weather Spark*):

- Annual air temperature increases by 0.8°C by 2020 and 2.2°C by 2080.
- Annual rainfall increases by 2% by 2020 and by 6% by 2080.
- Annual potential evaporation will decrease up to 5mm per day by 2090.
- The heat wave duration index (number of consecutive days when temperatures are > 5°C above the normal maximum) will increase 2 days per year by 2050.
- Sea surface temperatures will increase by 0.6 – 0.8°C by 2030 and 1.0-1.5°C by 2050.
- Sea level is forecast to rise by 3.2 – 10.0cm by 2020, 8.9-27.8cm by 2050, and 18-79cm by 2095.
- Ocean acidification is projected to increase.
- The inter-annual variability of the Asian monsoon will increase but it is impossible to predict whether activity will increase or decrease.

8.3 Implications for the proposed project or environment as a result of trends and projections

Based on climate change projection TGPB proposed key adaptation measures including seismic lines avoiding the protected area (if possible) and minimizing habitat disturbance, water contamination, soil compaction, climate consideration, and environmentally friendly activity during the seismic survey activities.

8.4 Any adaptation measures necessary to mitigate any potential adverse impacts to the proposed project or the environment.

Timor-Leste has been focused on adaptation to climate change through the National Adaptation Programme of Action to Climate Change (NAPA), implemented by the United Nations Development Programme (UNDP) (GCF 2022), understanding the need to ‘climate proof’ and build resilience, particularly in the agricultural sector, transportation sector, water and sanitation and Agriculture.

CHAPTER 9: IMPACT ASSESSMENT AND MITIGATION MEASURES

9.1 Introduction

This Chapter examines the significance of impacts on the environment during the 2D Seismic Acquisition Survey in TIMOR GAP Pualaca Block. A Scoping Exercise was carried out at the start of the Project process to screen the environmental concerns and likely impacts to prepare the Project Document (PD), the Simplify Environmental Impact Statement (SEIS), and the Environmental Management (EMP) document. These preliminary impacts have since been refined after a thorough environmental review of the site baseline conditions (Chapter 6: Description of the Environment) that established the scale and magnitude of the impacts in Chapter 9, for which mitigation measures have been proposed to reduce the negative impacts caused by the project activity.

An impact is any change to the existing condition of the environment caused by human activity or an external influence. Impacts therefore may be positive (beneficial) or negative (adverse). They may also be direct or indirect, long-term, medium-term, or short-term, and temporary or permanent in effect. Both positive and adverse environmental impacts could arise during the seismic survey activity in the TGPB project area.

9.2 Scope of the Assessment

- The scope of this study covers seismic survey lines in Viqueque, Manatuto, and Manufahi. The area selected for study was chosen to be sufficiently large enough to consider a range of possible locations for the initial exploration in the TGPB area.
- The assessment will be based on activities that cause the impacts as identified during the surveys Initial and during the public consultation in the location of the TGPB area, and also preliminary scope of the project is described in the approved Project Document.
- The major impacts will then be described to the level where the environmental Consulting can take over to prepare the mitigation measures to abate the adverse impacts and the contractors to implement them.
- The identification of negative impact is incorporated in this Simplify Environmental Impact Assessment document (SEIS).
- The mitigation measures have been incorporated early in the Project planning and the Environmental Management Plan (EMP) for Project implementation.
- There will be residual impacts that may persist even after all mitigation measures have been implemented judiciously at different phases of work. These residual impacts will be identified

for further mitigation measures if necessary.

9.3 Methodology and Approach

The methods used for the identification and assessment of potential impacts associated with the project meet Timor-Leste legislative requirements, as defined under Environmental Licensing Decree Law 39/2022 and supporting Ministerial Diploma 46, in particular, Annex V Environmental Impact Assessment process template. The approach also to meets the Risk and opportunity Management TG-IMS-P-003-Rev-03 for exploration activities in onshore areas.

9.3.1 Types of Impacts and Definitions

An impact is any change to a resource or receipt brought about by the presence of a project component or by the execution of a project-related activity. The evaluation of baseline data provides crucial information for the process of evaluating and describing how the project could affect the biophysical and socio-economic environment. Table 25 describes Impacts according to their nature or type.

Table 25 - Impact Nature and Type

Nature or Type	Definition
Positive	Impact that is of benefit to the receiving environment
Neutral	Impact that has no cost or benefit to the receiving environment
Negative	Impact that is considered to represent an adverse change or introduces a new undesirable factor; A cost to the receiving environment
Direct	Impact that results from a direct interaction between a planned project activity and the receiving environment
Indirect	Impact that results from other activities that are encouraged to happen as a consequence of the project activity

9.3.2 Characterizations of Impacts

Predicting impacts is essentially a subjective value judgment exercise, based on a qualitative or semi-quantitative approach, to determine what is likely to happen to the environment as a consequence of the exploration of seismic survey activity. In order to address the significance of any impact it is necessary first to describe the character, nature, and type of impacts that are to be considered.

The criteria used to describe impact characteristics are detailed in Table 26 below, and are summarized as follows:

- **Extent:** The spatial scale of the impact (i.e. site-specific, local, regional, national and or international)
- **Duration:** The temporal scale of the impact, the time period over which the effect will last (i.e. short-term, medium-term, long-term, permanent).
- **Intensity - environment:** Sensitivity, resilience and/or ability to function.
- **Intensity-social/cultural/economic:** number of elements individual/households; communities/Sucos/Post Administrative/municipalities and enterprises that could be affected by the impact.
- **Likelihood:** The frequency/probability of impact or how often it might occur (i.e. Not probable, probable, highly probable, definite)

Table 26 - Provide terminology used to describe the impact characteristics.

CHARACTERISATION OF IMPACT	EVALUATION CRITERIA	RANKING
EXTENT	Site-Specific: Impacts that are limited to the boundaries of the project site	1
	Local: Impacts that extend beyond the site boundary; affect the immediate surrounding environment (i.e. up to 5 km from the Project Site Boundary	2
	Regional: Impact that extends far beyond the site boundary; widespread effect (i.e. 5 km and more from the project site boundary)	3
	National and/or international: Impact that extends far beyond the site boundary; widespread effect	4
DURATION	Short-term: Impact that is quickly reversible; 0-5 years	1
	Medium-term: Impact that is reversible over time; 5-15 years	2
	Long-term: Impact that lasts 16-30 years	3

	SIMPLIFIED ENVIRONMENTAL IMPACT STATEMENT (SEIS)	QHSE DEPARTMENT PRESIDENT & CEO OFFICE
	Permanent: Impacts that last over 30 years and result in a permanent and lasting change that will remain	4
INTENSITY - ENVIRONMENT	None: The impact on the environment is not detectable	1
	Low: Low value. The impact affects the environment in such a way that natural functions and processes are not affected.	2
	Medium: Moderate value. Where the affected environment is altered but natural functions and processes continue albeit in a modified way.	3
	High: High value. Where natural functions or processes are altered to the extent that they will temporarily or permanently cease where the affected environment is permanently altered.	4
INTENSITY OR NUMBER OF ELEMENTS -SOCIAL, CULTURAL AND ECONOMIC	None: Affecting a small number of Individuals/households, individual enterprises.	1
	Low: Affecting a small number of Individuals/households, communities or Sucos, small enterprises.	2
	Medium: Affecting more Individuals/households, communities, Sucos or Post Administrative, medium enterprises.	3
	High: Affecting a large number of Individuals/households, communities, Sucos, PA or Municipality, large enterprises	4
LIKELIHOOD	Improbable: The possibility of the impact materializing is negligible; the chance of occurrence <10 %	1

	Probable: The possibility that the impact will materialize is likely; the chance of occurrence 10-49 %	2
	Highly Probable: It is expected that the impact will occur, the chance of occurrence 50-90 %	3
	Definite: Impact will occur regardless of any prevention measures, the chance of occurrence >90 %	4

9.3.3 Impacts Significance

Impacts are described in terms of “*significance*”. Significance is a function of the magnitude, severity or consequence of the impact based on the Evaluation Criteria and the likelihood of the impact occurring. Once an assessment is made of the magnitude and likelihood, the impact significance is rated through a matrix process as shown in Table 27 and Table 28 below.

Table 27 - Significance rating matrix

SIGNIFICANCE				
EVALUATION CRITERIA	LIKELIHOOD			
Extent	Improbable 1	Probable 2	Highly Probable 3	Definite 4
Duration				
Intensity-Environment				
Intensity - Social/Cultural/Economic				
Site Specific/Short-term/None/None 1	1 Negligible	2 Negligible	3 Negligible	4 Negligible
Local/Medium Term/Low/Low 2	2 Negligible	4 Negligible	6 Minor	8 Minor
Regional/Long Term/Medium/Medium 3	Negligible 3	Minor 6	Moderate 9	Moderate 12
National/Permanent/High/High 4	4 Negligible	8 Minor	12 Moderate	16 Major

Table 28 - Significance the rating

SIGNIFICANCE RANKING	IMPACT LEVEL
13 - 16	Major
9 - 12	Moderate
5 - 8	Minor
1 - 4	Negligible
Positive impact	Beneficial

9.4 IMPACT IDENTIFICATION, ASSESSMENT AND MITIGATION MEASURES

The following sections discuss the findings of the Environmental Impact Assessment (EIA) and mitigation measures related to the Project Description and Environmental Description provided in this Simplify Environmental Impact Statement (SEIS). Each of the subsections' SEIS describes the process, and the potential impact and describes mitigation measures that are considered in TGPB project execution. The potential impacts identified in the approved project document (PD), with the environmental components described in chapter 6 in this SEIS document include the following activity and environmental components:

- Physiography and Geology
- Soils
- Air Quality (Removal of vegetation, Seismic shots);
- Surface and Ground Water Resources
- Land clearing (loss of topsoil, Erosion);
- Water Quality
- Terrestrial Environment (Habitats, Flora and Fauna)
- Land Resources and National Park
- Visual Aesthetic
- Noise and vibration (Seismic shots, Machinery usage, Injury/Death)
- Traffic movement of vehicles and machinery/equipment (Fauna strike, Increased risk of road accidents)
- Solid and Liquid Waste
- Social Characteristics

- Economic Characteristics
- Occupational Health and Safety
- Security and Public Safety
- Construction of the Campsite

9.4.1 Positive Impact Assessment

9.4.1.1 Employment Opportunities

The 2D Seismic Acquisition survey will create a positive impact through creating jobs opportunity. These jobs are namely: community consultation, community liaison officers, accommodation manager, security, administration, accounting service, cooks, cleaners, security, geologists, administration, accounting, operations management, and work team supervisors.

9.4.1.2 Procuring Goods and Services

Procurement from Timorese-owned and operated businesses in the contract area goods and services include but are not limited to:

1. Fresh food and water
2. Accommodation housing/office supply
3. Diesel supply
4. Import services for customs clearance
5. Rental of heavy equipment, trucks, cranes
6. Environmental consultancy engagement

9.4.2 Negative Impact Assessment

It is essential to achieving environmentally sound design. This section is to prepare to describe of management of risk measures is to avoid, reduce or minimize unwanted impacts and enhance beneficial impacts.

9.4.2.1 Physiography and Geology

The risk of subsidence due to passage of heavy vehicles is negligible due to the geology, but localized compaction of surface soils may occur in some places. There are few existing roads in the area and the hilly regions of the project area will pose a challenge in access and crossing over.

Mitigation measures

Use existing access roads to the extent possible;

- Pre-survey possible access routes, and use the selected routes rather than accessing work sites through free-ranging driving across the open country
- Explosives (dynamite) should be used as source instead of vibroseis in areas with highly dissected and incised surfaces
- When laying cut lines, use will be made of existing roads and tracks to avoid creating unnecessary tracks and trampling of pasture;
- Minimize, to the extent possible, the use of bulldozers to open up cut lines and access roads to minimize landscape scarring; Avoid cut lines on slopes steeper than 40° to minimize risk of landslips and rock topples;
- Optimize source energy to achieve the survey objectives to minimize risk of landslips and rock topples;
- Buffer zones of 50m should be maintained from areas posing landslip and topple hazards.

The potential residual impacts would be related to landscape scarring, and displaced sediments and boulders that may arise from landslips and rock topples related to use of the vibroseis and dynamite shots.

9.4.2.2 Soils

There are several different types of soils in the project area, each with its own peculiar geological, textural and weathering/erosion-driven properties, as well as anthropogenic footprints such as compaction by grazing animals, that are relevant to a number of issues that would need to be considered when executing the project. These issues include: ecosystem services e.g. the role of soil in support of vegetation and higher food chain members; erosion and ponding potential, as well as surface runoff and their resultant geomorphological features; rock weathering, transportation and deposition of soil-derived particulates; organic matter content, surface sealing and capping; agricultural potential.

Mitigation:

- Machinery and equipment should use existing routes as much as is practicable to avoid compaction of the surface soil
- Construct drainage channels on cut lines where natural drainage may be affected;
- Vehicles should steer away from natural drains and waterways wherever practicable, but a buffer zone of 20m should be maintained except at crossing points;
- Minimize vegetation and grassland clearance as much as possible when cutting the survey line transects
- Seismic survey should aim to be carried out as far as possible during the dry seasons;
- Use only essential vehicles and low pressure/low impact tires in areas with wet soils or that are susceptible to ponding or are prone to erosion;
- Ensure that all vehicles and machinery operating in the field and in the campsite are properly maintained so as not to have oil leaks that could contaminate the soils.
- Ensure that any in-field refueling or maintenance is performed while using a drip tray with a spill-kit available;
- All fuels and other non-aqueous fluids to be stored in suitable bonded enclosures;
- Ensure that all drivers and technicians are familiar with drip-tray and spill-kit use through daily tool-box talks; and
- Installation and proper management of camp sanitation facilities.

The potential residual impacts would be enhanced gullying and erosion due to altered runoff and drainage patterns at local scales, necessitating the implementation of mitigation measures to eliminate any long-term negative impact.

9.4.2.3 Air Quality

Air quality variations are mainly related to changes in wind speed in the area are still normal, especially in some sparsely vegetated and dry places, and the associated particulate dust carried from one place to another. This wind can generate dust but in small quantities.

Dust raised by construction activities (e.g. preparation of seismic cut lines, and building of the base camp and access ways) as well as that raised by moving vehicles and equipment, will likely contribute to transient airborne dust. Further, the disturbed surface with fine textured soils as a result of site clearance for seismic survey transects would be susceptible to wind erosion. On a micro-scale, air quality may also be affected by exhaust emissions from vehicles and machinery, but this is also of a transient and insignificant nature. Sources of offensive but localised odours would include exhaust emissions from vehicles and other equipment, as well as poorly managed waste disposal and sanitary facilities at the camp site.

Mitigation:

- Limit traffic speed and restrict movement of vehicles as is reasonable to minimize dust generation;
- Field vehicles, trucks and any other machinery should be switched off when not in use;
- Regular servicing of all trucks, service vehicles, and any other machinery powered using fossil fuels to ensure efficient combustion and minimization of exhaust emissions
- Use low sulphur fuels if available and where suitable;
- Employees working in dusty conditions must use appropriate PPE;
- If litter is to be burned, it should be done at a time of low wind movement, and preferably in areas shielded from wind by vegetation;
- Installation and proper management of camp sanitation facilities.

There shall not be any residual impacts to air quality.

Assessment Criteria

In the absence of air quality legislation or regulations, recognized international guidance from IFC and WHO will be used in this study (see Table 29). Regarding air quality, IFC refers to the WHO guideline values for particulate matter, ozone, nitrogen dioxide and Sulphur dioxide. In this project, the principle potential impacts relate to dust arising from construction campsite activities and seismic survey activities and emissions from diesel engines both for power generation and in plant and vehicles. As such this study focuses on Particulates Matters (PM_{2.5} and PM₁₀) and NO₂ and SO₂, the former using available secondary data and limited primary data collection as comparisons. In the case of engine

emissions, the levels will be calculated using recognized emission estimate methodology applicable to diesel engines.

Table 29 - WHO air Quality Guidelines 2005

Parameter	Averaging Period	Guideline Value ($\mu\text{g}/\text{m}^3$)
Sulphur Dioxide (SO₂)	24-hour	20
	10 minutes	500
Nitrogen Dioxide (NO₂)	1-year	40
	1-hour	200
Particulate Matter PM₁₀	1-year	20
	24-hour	50
Particulate Matter PM_{2.5}	1-year	10
	14-hour	25
Ozone	8-hour mean	100

9.4.2.4 Surface and Ground Water Resources

The project area, being rural and undeveloped, lacks a main, quality assured, water supply network. Water is sourced from shallow wells, shallow to deep boreholes, springs, rivers and lakes. Its patchy distribution, and the low, erratic and unpredictable rainfall, means that water is generally scarce in most of the area. This scarcity has led to human-human and human-wildlife conflicts. The seismic crew will also need to access safe potable water. Effluents generated at the campsite(s) will also need to be managed so as not to contaminate any underlying shallow, unconfined aquifers or rivers and streams

Mitigation:

- A water supply borehole should be drilled to provide the water required for the project; this could be donated to the community on completion of the seismic survey;
- It is recommended that an efficient water-use policy be adopted by the project proponent at the camp site and other work areas
- An efficient sanitation system should be put in place in the campsite(s) to handle effluents
- Hazardous and toxic waste material should be managed according to international

protocols and best practices

- Buffer zone distances between seismic lines and water sources will be established through extensive in-field ground vibration testing.
- Ensure that any in-field refueling or maintenance is performed while using a drip tray with a spill-kit available;
- Ensure that all drivers and technicians are familiar with drip-tray and spill-kit use through daily tool-box talks

Residual impacts on surface and groundwater resources are not expected if the mitigations outlined above are effected.

9.4.2.5 Water Quality

Liquid effluent discharges and oil or chemical leaks at the campsite, if not properly managed, can potentially lead to pollution of an underlying shallow groundwater source. Along the cut lines, subsurface detonation of charges could leave localized small residuals of gases and solids (e.g. water/stream, carbon-dioxide gas, nitrogen gas, calcium carbonate solid, and sodium carbonate gas). The shot-hole method could also lead to clouding of spring waters for up to several weeks. Oil leaks from vehicles operating in the field and parked at the campsite can also potentially pollute underlying groundwater.

Mitigation measures:

- Refueling areas must be underlain with spill-proof hard standing or bund, with spill kits readily available and operatives trained in their use;
- All fuels and other non-aqueous fluids to be stored in suitable bunded enclosures;
- All refuelling operations to be carefully overseen and managed;
- Pits for disposal of domestic and sanitary effluents should be sited with knowledge of the geological and soil characteristics of the area;
- Buffer zone distances between seismic lines and water sources will be established through extensive in-field ground vibration testing.
- Spill kits to be carried with vibe truck service vehicle, refueling bowser vehicles, drill crews.
- All staff to be briefed on use of these; When water is encountered during shot hole drilling, betonies or a tapered concrete plug may be used to plug the hole up to 3m above the static water level or to a depth of 1m from the ground surface;
- Ensure that all vehicles and machinery operating in the field (and in the campsite) are properly maintained so as not to have any oil leaks that could contaminate the soils
- Ensure that any in-field refueling or maintenance is performed in a bunded area or while using a drip tray with a spill-kit available;

- Ensure that all drivers and technicians are familiar with drip-tray and spill-kit use through daily tool-box talks.

Residual impacts on water quality are not expected if the mitigations outlined above are affected.

9.4.2.6 Terrestrial environmental Fauna

The region, there is several vegetated, with a number of varied habitats and some protected areas that are, as a result of their harsh climatic setting (high temperatures and low rainfall), sensitive to disturbance. These habitats do, however, exhibit a good capacity for regeneration. Domesticated animals are numerous in the area, while wildlife (and birdlife) is found primarily on the eastern.

With repeated vehicle passage and vibrator-pad compaction as would occur in this project, some damage would occur to the vegetation. The small-scale and spatial arrangement of the project operations is such that habitat is not likely to become fragmented or isolated from other areas of habitat. The vibroseis vehicles may destroy bird nests found on the ground and in low growing shrubs and trees, and the disturbance may cause some birds to abandon their nests. Burrows that serve as refuge for reptiles, amphibians, and small mammals may be compacted by the vehicles or the vibrating plate. While the seismic activities may result in some wildlife moving out of the area, the low percentage of land disturbed would affect only a small percentage of the population and their suitable habitat. The shot hole method would have little impact on the wildlife, except those individuals found within the immediate vicinity of the shot holes. Given the small percentage of land impacted (cut lines and access roads), the short duration of the project (three months maximum), its rolling-over nature (i.e. spending only a few hours at each survey locality), resulting in only localized and limited impact, any threats to endangered wildlife species are considered insignificant.

Mitigation:

- The mitigations related to soils (see above) apply;
- Trees with trunk diameter greater than 20cm should not be cut;
- Seismic survey activities to be undertaken during daylight hours only;
- Liaise with the forestry team at municipalities to ensure that wildlife disturbance and danger to the seismic team is mitigated. Any planned lines that are considered to be a threat will be relocated;
- Hunting, trapping and gathering of food resources by workers, when on and off duty should be strictly prohibited. All workers to be briefed regularly on this issue;
- The risk of introduction of weed and pests species to the region via contaminated vehicles and equipment will be mitigated by the wash-down of all vehicles and ancillary equipment at a designated location prior to the commencement of the survey.

The residual impact will be reduced vegetation cover along track lines; this will, however, regenerate in a few years. Given the small scale of the project, combined with implementation of the suggested mitigation measures, this impact is not considered significant.

9.4.2.7 Land Resources and Nasional Parks

Plantations and rice fields are the main land resources in the area and support the local people's lifestyle, while fisheries are located a little further from the project site and there are no national parks.

Mitigation:

See the (Terrestrial Environment) above.

9.4.2.8 Archaeological, Historical and Culture Sites

The project area has no known archaeological sites while cultural, sacral and historical sites are found in project location and residential neighbourhoods. Impacts to such sites can occur because of vehicles driving over the surface, compression from the Vibroseis pad on the surface, vibrations resulting from the Vibroseis testing or dynamite charges in shot holes, and the drilling of shot holes. Vibrating pads would only compress the soils up to a few inches, so cultural, sacral and historical site not will be impact.

Mitigation:

- Consultations with the Secretary of State for Art, and Culture, local authority, Lia Nain, Veteranu to take place in the design and execution of the seismic survey in historical, sacred important areas;
- Close liaison should be maintained with stakeholders such as the Local Authorities, Lia Nain, local communities and veterans as they are custodians of some of the ancient, historical, sacral, cultural sites within the project area. Lines should be relocated if necessary after consultation with stakeholders;
- Use of shot points rather than vibration is recommended for such areas;
- Seismic survey lines will not be planned to go through Historical and cultural sites
- Consultations should be undertaken with local elders to help in identifying and avoiding any sensitive cultural sites during the survey in order to prevent conflict with the.

No residual impacts are expected if the mitigations outlined above are affected.

9.4.2.9 Visual Aesthetics

It is anticipated that there will be some minor impacts on the aesthetics of the pristine environment. Dust generated by wind erosion is not expected to affect air visibility in the project area due to the limited duration and extent of the activities.

Mitigation:

- Use of modern line cutting technology, preferably mulchers for clearing of the geophysical survey transects will ensure that minimal vegetation is removed, hence ensuring that re-

vegetation will occur in a much shorter period since the rootstock, and seeds will be left along the traverses, and this will promote faster re-growth

- Campsite design should take into consideration the aesthetics of the selected area.

9.4.2.10 Noise and Vibrations

The use of heavy road construction equipment, vibroseis acoustic energy sources, dynamite charging, and power augers for shallow drilling are potential sources of environmental pollution in the form of noise generation and vibrations during the onshore survey that may affect the survey crew, neighbouring communities and their livestock, and wildlife. The base camp site can also be a source of noise pollution especially if generators are used for electricity generation.

Some noise sensitive areas (e.g. National Park, nesting sites along the shorelines, schools, hospitals and residences) are found in the project area. However, no significant impact is anticipated due to the localized and temporal nature of this project and its expected noise levels. The length of time the seismic crew spends in any one location is short, with up to 10 km per day of acquisition possible in good weather conditions. This will reduce the overall noise impacts on localised residential receptors to less than one day of actual disturbance

Mitigation:

- To reduce the expected transient impacts on wildlife, noise levels will need to be minimized to the extent possible, correct strength of dynamite charging and vibroseis use applied to achieve the survey objectives, and human contact with wildlife should also be minimized in line with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution (Control) Regulations, and the Wildlife Conservation and Management Act;
- All seismic operations should be carried out only during daylight hours;
- Ensure that vibroseis and other vehicles have working silencers to muffle noise;
- Provide full personal protective gear to workers as appropriate (e.g. helmets and ear muffs/plugs) and as specified in the Occupational Safety and Health Act;
- Workers should be sensitized on hazards likely to be encountered in such a work environment, and trained accordingly;
- Buffer zones distances between receptors and seismic sources/vehicles will be established through extensive in-field ground vibration and noise testing. Distances may vary between seismic source types, as per IAGC Guidelines. Liaison will be maintained with the relevant Kenyan government authority in deciding these distances;
- Engage local leaders in sensitizing the communities in the vicinity of the seismic operation areas about the project and its possible noise and vibration impacts;
- The communities should be informed in advance when a seismic survey operation is to be executed along a given seismic transect/location;
- Use generators with minimal noise production at camp sites and effect a noise mitigation

policy for all operations in accordance with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations

No residual impacts are expected if the mitigations outlined above are enforced.

9.4.2.11 Solid and Liquid Waste

As a result of the proposed project, it is expected that waste will be generated by the survey crew e.g. cans, wrappings, paper, plastics. Plastic waste is of particular concern especially if ingested by livestock, and for its environmental pollution effect. Waste oils and petroleum used in vehicles and exploration machinery may spill or leak on/into the ground, hence polluting the soil or water system within the project area. This may degrade water quality and affect livestock and domestic water users in the project area.

Mitigation:

- Waste materials (at the camp and in the field working areas) should be segregated into non-hazardous and hazardous waste, and consideration given to re-use, recycling, or disposal as appropriate;
- A waste management plan documenting the waste strategy, storage (including facilities and locations), handling procedures and means of disposal should be developed and should include a clear waste-tracking mechanism to track waste consignments from the originating location to the final waste treatment and disposal location in compliance with the Environmental Management and Coordination (Waste Management) Regulations;
- Hygienic sanitation and disposal of grey and black water will be covered in the waste management plan in order to protect the general health of the workers and the general public;
- Fuel and other non-aqueous liquid storage areas should be banded;
- Servicing of equipment should be carried out in a designated garage area, which has regularly maintained oil drainage traps and readily available spill kits. Workers in this area will be regularly briefed on spill prevention.

9.4.2.12 Social Characteristic

The local communities are conservative with respect to their culture. Due to the influx of people into the area, adherence to these cultures may be compromised. Owing to poverty levels in the area, school drop-out rates may also increase.

Mitigation:

- Employ Community Liaison Officers to keep communities informed prior to project mobilization and on an ongoing, continual basis to ensure sensitization of the community and stakeholders vis a vis the project objectives, activities and scheduling, potential impacts;

- The communities should be informed well in advance of the start of the seismic survey operation and prior to execution along a specific seismic transect/location using appropriate wide-penetration communication media;
- Awareness campaigns can be undertaken to inform/educate both the local communities and project employees;
- During the seismic operations, disruption of livelihood activities in the area should be avoided where possible otherwise minimized.
- Provision to be made to compensate local property and landowners for any loss or damage caused by seismic operations. Compensation rates to be agreed with Government dept before operations commence

9.4.2.13 Economic Characteristic

The infrastructure, especially roads within the project area is poor; hence some cut lines may be useful to the local communities as access roads after seismic survey completion. The proposed project will offer limited, short-term, unskilled and semi-skilled employment opportunities to the locals. This may result in an influx of people from other areas, and could lead to recruitment- related conflicts if not properly handled.

Mitigation:

- Liaise with local community leaders during the recruitment process;
- Employment policies to be strategically managed to avoid inter-community conflict and similar problems caused by migrant labourers;
- Unskilled and semi-skilled manpower to be sourced locally as far as possible;
- Gender should be factored into the employment criteria;
- Sustained public awareness and sensitization about the proposed project should be continued throughout the project lifespan.

The residual impacts in this instance would mostly be positive, including short-term employment opportunities and infrastructure improvements if access roads are designed in such a manner that they would be useful to the community's post-project. Due to strong inter-tribal rivalries, great care will have to be taken to prevent conflict during hiring of local labour.

9.4.2.14 Occupational Health and Safety

During the seismic survey, the workers, visitors and the local community may be exposed to occupational and health hazards not normally encountered during day to day life or activity in the

area. Accidents between vehicles or vehicles and humans or wildlife may occur. Workers could also be exposed to other risks in the field, such as landslips, rock falls, fires, and attacks from criminal elements.

On implementation of mitigations, no residual impacts are expected in this case. Mitigation:

- All operations will be conducted in compliance with TGPB EHS, international best practices and Timor-Leste Government requirements (as set out in the Occupational Health and Safety Act and the Public Health Act;
- Appropriate and well-stocked first aid kits and firefighting equipment should be available to all crew, and specific crew members should be trained on first aid administration and handling of firefighting equipment
- Job-specific personal protective equipment to be provided to the workers, training should be given, and their use made mandatory in designated areas
- Environmental safety and health regulations and policies/plans must be adhered to
- A Base Camp Clinic is to be provided, manned by suitably qualified field medical staff, licensed as appropriate to operate in-country, equipped with equipment and medication as appropriate, including ambulance vehicle(s);
- Adequate warning or cautionary signage will be posted as required;
- All electrical equipment shall be properly installed earthed and regularly inspected
- Only properly trained and authorized employees shall operate equipment or machinery

9.4.2.15 Security and Public Safety

Security is a major concern, especially for people living in Manufahi dan Viqueque area, due to recurrent conflicts involving the individual, group, organization. During the project course, security issues may escalate due to free movement of people. The increase in human activity, including vehicle and seismic exploration activity, could increase the potential for human-related conflicts, including ignition of wildfires.

Mitigation:

- Ensure that all workers can be identified by staff uniform and badges where applicable;
- Adequate security measures should be provided, e.g. perimeter fencing, safe havens and security manning at the campsites
- The TGPB should liaise with the Provincial Administration, Local Authority, the Police (PNTL), Military force (FDTL) and other agencies to provide adequate security during the seismic survey operation;
- Barriers and guards will be installed as necessary to protect employees and visitors from physical hazards and criminal activity;

- Camp population will be forbidden from interacting with local populace;
- Journey management policy and monitoring to be enforced. A positive residual impact is the possibility that the involvement of government agencies during the project operations may enhance long term security initiatives from the concerned parties, hence improving the security situation in the area.
- Zero harm to our people, environment and community

9.4.2.16 Construction of the Campsite

Contractors' staff will reside in a base camp. Minimal vegetation clearance is expected to give room to the camp construction. The camp will be located away from residential areas and trading centres. The camp will be constructed by a professional civil and building contractor with experience in setting up such camps. Issues such as sanitation, camp security, water provision and waste water management, accommodation, material storage and parking lot among others shall be incorporated in the camp design.

Mitigation:

- Construction of the campsite shall be undertaken during daylight hours only;
- Mitigations in sections (Physiography and Geology), (Soils), (Surface and Groundwater) and (Terrestrial Environment), (Noise and Vibrations) (Occupational Health and Safety) and (Security and Public Safety) apply;
- Excavated soil should be used in landscape design of the campsite rather than stockpiling;
- Use of T-card system or similar for access control within the campsite shall be enforced
- Campsite will be erected by a qualified and licensed civil and building contractor with workers who are qualified to carry out assigned tasks;
- Use of appropriate Personal Protective Equipment to be enforced
- Adequate temporary housing and sanitation facilities shall be provided for the construction workers;
- Construction equipment and vehicles shall be well-maintained, checked and promptly repaired to ensure no spillage of oils and fuels and to minimize gaseous emissions;
- Company employees shall comply both with the relevant national legislation, and its own in-house environmental health and safety (EHS) policies; and,
- Adequate warning signs and fire extinguishing equipment will be visibly and appropriately posted.

9.4.2.17 Impact on Social and economic

One of the key objectives of the baseline study was to establish a validated and extensive baseline for measurements of future income impacts due to activities such as, heavy emphasis was put on this topic to capture the true characteristics of a household's expenses and income behavior. The

field survey had shown that agriculture is the major source of income for the majority (~85%) of respondent households, although some of households were also engaged in livestock rearing and fishing activities.

Agriculture, livestock and fisheries largely contributed to their households' income. However, respondent households' income was relatively low as observed during data collection. Again, their main source of income was varied, from fisheries, agriculture, livestock and small kiosks. These income sources were also greatly affected by climate change variability such as drought, flash flooding, and inundation. Indeed, their expenditure per year also varied from smallest to higher (see table 29). And none of b respondent households saved their money in the bank.

Economically, the local impacts include financial benefits in the area. The key residual socio-economic impacts will be job creation, economic opportunities, temporary minimal loss of farming land and commercial trees, and a small population influx.

In table 30 and table 31 bellow as a Socio-demographic and economic description of respondent households, by villages and Respondent households cash income source, by villages this data collected by Halona Serena Consultant in 2020.

Table 30 - Socio-demographic and economic description of respondent households, by village (2020)

Descriptor	Indicator	Abatoan (n=37)			Aubeon (n=34)			Barique (n=17)			Manehat (n=23)			Umaboco (n=43)			Sicone Diloli (n=18)		
		Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Age	Age of head household (years)	45.11	29	70	45.97	19	81	44.59	30	76	51.52	30	76	49.77	29	78	54.56	32	86
Household size	Number of person living indwelling	5.86	2	18	4.26	1	9	6.07	4	8	7.96	2	16	5.67	2	9	6	3	13
Dependency	Dependent household members (<16 and > 65 years old)	2.8	1	7	2.1	1	4	2.8	2	4	2.9	1	7	2.3	1	5	2.4	1	4
	Dependency ratio (children and elderly (%) (1))	1.20	1	2	1.30	1	3	1.50	1	2	1.36	1	3	1.47	1	4	1.78	1	3
Household income	Annual household cash income (2020), (USD)	1279	50	3315	917	150	5500	3315	265	3550	1335	265	3550	2528	780	7948	1528	700	4780
Household expenditure	Expenditure (USD) (2)																		
	For food (%)	711.4	200	1200	382.3	15	720	466.7	150	2800	531.2	100	720	720	720	720	690.6	500	850
	For school (%)	199.5	24	690	383.1	15	721	225	50	800	428.8	100	2000	165.5	24	400	384	50	1000
	For traditional ceremony (%)	77.4	50	300	383.8	15	722	360	200	1800	127.9	45	500	60	60	60	189	60	500
	House Construction	2532	30	10000	384.6	15	723	0	0	0	2500	2500	2500	2835.7	200	7000	4000	4000	4000
Household saving	Household savings made 2020 (USD)	266	0	1100	8657	390	17238	266	0	2260	150	0	800	2	0	100	51	0	250

Notes: (1) Dependency ratio is a number of dependents as percentage of the number of productive household members (15-64)

Table 31 - Respondent households cash income source, by village (2020)

Village												
Income generated from differentsources	Abatoan (n=37)		Aubeon (n=34)		Barique (n=17)		Manehat (n=23)		Umaboco (n=43)		Sicone Diloli (n=18)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Fisheries products sold and non-fishcollected (USD)	10	210	5	50	1	40	-	-	10	1080	1	1500
Livestock as source of income (USD)per year	15	300	5	500	5	275	5	800	15	4100	25	2550
Agriculture sector as source ofincome (USD)	30	1,500	50	150	1	10	1	500	5	1650	5	510
Small business e.g. kiosks as sourceof income (USD)	15	800	50	650	10	50	10	1000	5	6250	5	500
Income and/or principal livelihoods during a year (2020)												
Fisheries (USD)	10	210	10	200	1	30	-	-	15	1000	1	150
Agriculture (USD)	10	3,000	5	800	5	292	5	1140	6	1500	20	2000
Livestock (USD)	30	1,500	50	500	50	700	45	640	15	4100	300	2500
Small business - kiosks (USD)	15	1,850	1	500	10	60	20	1000	50	6000	10	500
Government employees (USD)	115	400	115	280	-	-	30	120	115	350	115	280
Private employment/company (USD)	115	115	-	-	-	-	50	150	115	280	115	300
Laborer work (USD)	50	1,000	100	150	3	30	75	150	50	2000	50	100
Average respondent households income (USD)												
Fisheries (USD)	47.5		105		4.60		-		291.25		21.83	
Agriculture (USD)	810.63		229		48.67		383.18		457.83		614	
Livestock (USD)	696.82		275		233.33		306.25		1330.50		1325	
Small business - kiosks (USD)	527.5		200.33		24		593.33		1600		270	
Government employees (USD)	191.82		181.67		-		83.33		228.91		230.83	
Private employment (USD)	115		-		-		88		170		183	
Laborer work (USD)	257.5		116.25		7.63		112.50		584.38		78.12	
TOTAL												

CHAPTER 10: SUMMARY OF ENVIRONMENTAL MANAGEMENT PLAN

10.1 INTRODUCTION

This Chapter provides only a summary of the Environmental Management Plan (EMP) to address the potential adverse environmental impacts throughout the TGPB Project development for seismic survey activity.

The detailed EMP is in a separate volume as requested by ANP as per Annex 6 of the Ministerial Diploma 46/2017 Regulation on the Detailed Requirements for Environmental Management Plans (EMP).

An Environmental Management Plan (EMP) is necessary for this project. EMP is required for the formulation, implementation, and monitoring of environmental protection measures during the TGPB project development. EMP reflects the commitment of the proponent to safeguard the existing environment as well as the surrounding population in the camp site area and along of seismic line area. Therefore, the purpose of the EMP is to minimize the potential environmental impacts due to the proposed project.

The purpose of the EMP is to:

- Outline environmental protection measures to be followed during the exploration oil and gas (seismic survey activity).
- Ensure that commitments to minimize environmental effects are met
- Document environmental concerns and appropriate protection measure
- Provide contingency plans for accidental events
- Provide concise and clear instructions regarding procedures for protecting the environment and minimizing environmental impact
- Communicate changes in the program through the revision process
- Provide a reference document for personnel when planning and/or conducting specific activities
- Provide a reference to applicable legislative requirements.

10.2 MITIGATION MEASURES TO AVOID, REDUCE OR MINIMISE THE NEGATIVE IMPACTS

Tables 32 provide a summary of the project Activity, key risks for the proposed project and proposed management and mitigation measure based on the TGPB project activity. The details are in the Environmental Management Plan (separately bound)

Table 32 - Provide a summary of the potential negative impact and mitigation measures

SEISMIC CATEGORY & ACTIVITY	KEY RISK FOR THE PROPOSED PROJECT	PROPOSED MANAGEMENT & MITIGATION MEASURES
TRAFFIC • Scouting Permitting • Surveying • Line Preparation • Recording	• Vehicle movement may cause minor increased risk of road accidents. • Vehicle movement may cause Fauna and domesticated animal strikes. • Vehicle movement may cause Some damage to crops and fences • Minor disruptions to traffic flow when a machine crosses a public road. • Vehicle movement - disrupting traffic flow - recording on sealed roads	<i>Traffic issue</i> is recognized as a critical component of management for the seismic survey. TP applies the Good Practice of Traffic Management Plan including imposing speed control and limitations on night driving. Detail information and mitigation measures include : • Limitation procedure on night driving • Impose speed control procedure • Safe Drive training • Alcohol and Drug test • Implement traffic control methods when operating on roads and public spaces • Test the impact of the vibroseis on sealed road surfaces.
AIR QUALITY	• There are negligible to air quality risks associated with	Due to the short duration of work at any one location (recording time 10-15

• Scouting, Permitting, Surveying. • Line Preparation • Seismic Operational Recording	scouting, permitting and surveying activities. • Consuming fuel and breaking ground. • Consuming fuel and vibroseis baseplate vibrating against the ground. Negligible impact on air quality. Minor dust potential.	minutes/location) the actual mitigation will focus on : Traffic Management Plan will cover the traffic speed limit for light vehicle is 30 km/h and the speed adjustment when driving along : Local Village = 20 km Local Road = 30 km Main Road = ~50 km Detail information and mitigation measures include : • Limit traffic speed • Restrict movement of vehicles as is reasonable to minimize dust generated • Machinery and vehicles should be switched off when not in use. • Notification to residents prior to vibroseis activities.
WASTE • Scouting, Permitting, Surveying. • Line Preparation • Seismic Operational Recording. • Renting Base Camps	• There are negligible to environmental risks associated with scouting, permitting and surveying activities. • Equipment Leak or failure cause Fuel spills • Risk of Leak wastes • Discarded packaging scattered around camp.	Daily inspection, third-party refueling procedure, and Spill Response Management Plan. Proactive mitigation action applied in this operation includes : • Refueling procedure in place • Appropriate vehicle and refueling equipment • Refuel vehicles directly from the fuel truck to reduce the number of fuel transfers. • Catch drips and spills during the refueling operations. • Adequate absorbent rags or materials • Oil spill procedure in the plan • Camp contractors have trained utility personnel to maintain camp cleaning • Regular Waste Management Collection in place

LAND DISTURBANCE • Scouting, Permitting • Surveying • Line Preparation • Renting Camp	• There are negligible land disturbance risks from scouting and permitting activities. • Risk of Walking across along the seismic lines to identify obstacles - houses, crops swamps etc. • Risk of lack of understanding and communication when conducting a meeting with community groups and land owners to gain access agreements. • Risk of Clearing a meter-wide path through dense undergrowth crops. • Earthworks to prepare for vehicle access using bulldozers and rubber-wheeled front-end loaders. • There will be NO FURTHER LAND DISTURBANCES associated with this camp during the Vibroseis seismic survey.	Mitigation measures include : • Don't litter any waste on the project during scouting. • Use passing areas rather than overtake in the vegetation or clearing of a double width. • Use existing routes as much as practical. • Leave isolated trees and significant stands of vegetation undisturbed, if practical. • Limit the amount of land clearing required. • Use passing areas rather than overtake in the vegetation or clearing of a double width. • Limit amount of clearing required. • Avoidance of trees greater than 20 cm dBH. • Topsoil will be not removed from the referred line location. • Move lines around large trees and areas with significant hardwood growth. • Seismic operation is reasonably practicable and avoids dense vegetation • Weave around trees using the path of least resistance to minimize timber loss. • Choose a direction in which to fell trees to reduce collateral effects and promote regeneration. • Cut tree limbs so that tree trunks fall flat to the ground to speed up decay. • Seismic operation reasonably practicable and shift from residential/property. • Use existing roads as much as practical and avoid residential land.
• In order to address "dynamic (discovered) change" during the operational stages of the project, the Environmental Risk Assessment presented in the EMP / SEIS by TIMOR GAP shall be supplemented by Timor GAP SARA (Single Activity Risk Assessment). The Environmental Risk Assessment has been presented based on several exercises and studies; including but not limited to seismic surveys, land clearing surveys, community socialization and line scouting trips. Due to dynamic or discovered change that may happen during the actual operational stage, the TP SARA process will be implemented. Types of		

changes that may impact the environment and be discovered immediately before the seismic convoy approaches a specific area or a specific shot location may include but are not limited to the following (it should be noted that the line surveys only plot by GPS – the line is not demarked physically and obvious to the public);

- a. Buildings, structures or animal shelters recently erected by the public
 - b. Livestock tethered for grazing in a specific area
 - c. Recently planted crops or attempts to nurture flora for future use
 - d. Claims of crops recently planted without discernable surface evidence
 - e. Claims that a specific area has historical, archaeological or heritage significance
 - f. Recent nests & burrows occupied or under construction by any of the 26 endangered species identified in the EMP document – similar consideration shall be given to all fauna encountered
 - g. Traps and devices used in traditional hunting methods
- *Erosion and Sediment Control Plan (ESCP).*
This report will detail the potential negative impacts from proposed works, and present ESC measures to limit these impacts, as well as assigning responsibilities to ensure these strategies are implemented as per best practice erosion and sediment control guidelines.
 - Measures where surface water flow may lead to erosion and sedimentation, short duration of works.
 - *The Rehabilitation Management Plan* will be applied in case of unsuccessful natural rehabilitation within the seismic line.
 - *Complaint and Grievance Procedure*
To ensure that formal grievances from the communities or others are promptly heard, analyzed, handled, and answered in order to take preventative actions and detect causes before they can have significant implications for environmental and business performance.

WATER QUALITY & QUANTITY • Scouting, Permitting Surveying • Line Preparation & Recording • Camp Activities	• There are negligible contaminated water risks associated with scouting, permitting, surveying activity • People enter swamp areas, rivers, and coastal areas. • Machines and vehicles pass through shallow waterways.	<i>The inspection schedule</i> for the Seismic Survey is focused in achieving and demonstrating sound environmental performance by controlling the impacts of its activities and consistent with its current environmental policy and objectives. Proactive mitigation measures include: • Don't litter any waste into the water source • Ensure storage of waste during transport to minimize potential impact to the environment. • Personnel carriers should consider waste containment.
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		• Use slow speeds to minimize bank erosion and adjust speed to minimize wake. • Conduct seismic surveys during the dry season and short duration of works • No vehicles in swampy wet ground • All hazardous materials were removed at completion of seismic survey. • Prompt cleanup of any accidental spills or leakages (e.g. hydrocarbons, lubricants, etc. from vehicles and machinery). • The water-sealed fenced-camp • Daily inspect Sewage system • All hazardous materials stored in the right place • Camp cleaning regularly TP prepares <i>incident report procedures for environmental incident</i> reporting assign responsibilities and outline investigation requirements.
NOISE AND VIBRATION • Scouting, Permitting, Surveying • Line Clearing • Recording • Renting Camp	• There are negligible noise or vibration risks associated with scouting, permitting, and surveying activity. • Noise & vibration due to the operation of line clearing machines. • Noise from Vibroseis machines operating • Noise from Generator	• Socialization with surrounding people who will be affected in advance of the likely temporary noise along the designated line to do line clearance. • Silencers on machinery and equipment where appropriate • Equipment and vehicle maintenance record • PPE e.g. hearing protection when noise >85 dB expected, • <i>Noise and Vibration Management Plan</i>

	• Movement of Seismic vehicles and earth-moving	This report will detail the potential negative impacts from proposed works, and present management and monitoring strategies to limit these impacts, as well as assigning responsibilities to ensure strategies contained within this report are implemented.
WASTE • Scouting, Permitting, Surveying. • Line preparation & Recording • Renting Base Camps	• There are negligible to environment risks associated with scouting, permitting and surveying activities. • Equipment leaks of failure • Risk Leak wastes • Hazardous waste spill • Inappropriate disposal of waste	• Daily inspection • Pack in Pack out The waste produced only from lunch boxes after meal Trained person to do the task • Third-party Refueling procedure in place • Appropriate vehicle and refueling equipment • Refuel vehicles directly from the fuel truck to reduce the number of fuel transfers. • Daily inspection • Catch drips and spills during the refueling operations. • Adequate absorbent rags or materials • Oil spill procedure in place • Camp contractors have trained utility personnel to maintain camp cleaning • Regular Waste Management Collection in place • Oil spill response team. <i>Waste Management Plan</i> will include : - Collecting and maintaining an inventory of waste management

		- Reporting on compliance with the plan - Communicating requirements of the plan to personnel, contractors, and authorities, as required - Provision of waste awareness training to personnel and contractors. - Monitoring waste management performance of contractors by undertaking regular audits. • TP prepares <i>incident report procedures for environmental incident</i> reporting assigns responsibilities and outlines investigation requirements. • All hazardous materials were removed at the completion of the seismic survey. • Prompt cleanup of any accidental spills or leakages (e.g. hydrocarbons, lubricants etc. from vehicles and machinery).
BIOLOGICAL • Scouting, Permitting, Surveying. • Line preparation & Recording • Renting Base Camps	• Scouting, permitting and surveying are all low-impact for this activity. The associated risk to the biological ecosystems is considered to be negligible. • Preparing seismic lines and recording the seismic data caused disruption of fauna and flora. • Risk of disruption of the aquatic ecosystem. • The camp, as an existing operating facility will not contribute to specific biological risk.	• Relatively non-invasive clearing by backhoe, machete and/or saw • Identification of significant fauna breeding and/or nesting habitats (and avoidance). • Conduct seismic surveys during the dry season and short duration of work. • Make sure the water source no contaminated and camp clean up. • Regular Monitoring for natural rehabilitation within seismic lines
REHABILITATION		<i>Rehabilitation Plan</i> include:

	Unsuccessful rehabilitation	• Rehabilitation of the access track of seismic lines will ensure that land is stabilized as soon as possible after disturbance to reduce the occurrence of erosion, sedimentation, loss of topsoil and weed invasion. • Avoidance of heavily weed infested areas, and regular weed checks on vehicles etc.
SOCIO-ECONOMIC	Change of value of land	• <i>The socio-economic impacts are small due to, short-term activities, Low visibility.</i> • This project will directly assist Timor-Leste in reaching the stated target in the SDP: <i>The private sector will be the primary source of growth in incomes and employment in rural areas of Timor-Leste.</i> This project will hire approximately 120 national temporary employees.
CULTURAL HERITAGE	Land clearing resulting in destruction of cultural heritage sites	Consultation with stakeholders to identify cultural heritage sites within the project area and avoidance of cultural heritage sites during seismic activity.
LAND USE / TRADITIONAL	Land clearing resulting in reduced access to land for traditional purposes	Consultation with stakeholders to identify areas used for traditional purposes, and ensure access is not impacted

CHAPTER 11: PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

11.1 Introduction

The Public Consultations is required by the ANP (Autoridade Nacional do Petróleo) under Decree Law number 39/2022 first amendment of DL no 5/2011 of Environmental License, for environmental assessment involving the preparation of the Simplify Environmental Impact Statement (SEIS) and Environmental Management Plan (EMP). This requirement is aimed at addressing the public's concern, understanding and acceptance of the project, especially on how the project may affect them positively or negatively.

Public consultation for project document (PD) with the communities in the project area has been underway since June 2022 and is a crucial component of work on the project to ensure that the proposed works are understood, and any concerns addressed.

TGPB recognized that there was a need for more focused and direct consultation with community members whose farms or residences may be directly impacted by the transition lines in the seismic survey.

11.2 Purpose of the consultation during the preparation of SEIS

Public Consultation process for the environmental assessment is carried out in accordance the Ministerial Diploma for the "Regulation on the Public Consultation Procedures and Requirements during the environmental assessment process DM No 47/2017, de 2 de August with the objectives of disseminating the information on the Seismic Survey and its likely impacts on community, environment, and economy of Timor-Leste.

11.3 Methodology and Approach

The methodologies and approach used for the consultation of the Seismic survey for TIMOR GAP Pualaca Block Unip Lda as mentioned below:

11.3.1 Methodology

- Preparation (Date, Presentation materials (Project Planning, Identification of Impact and Mitigation actions)
- Identification of Stakeholders (Public and Private institutions, Interesting Line, and Communities affected) in TGPB area.

11.3.2 Approach

- Formal Meeting such as public consultation which participating directly from communities, Local Authorities, NGOs, Interesting line, and relevant ministries.

- Informal Meetings such as providing the questionnaire, door-to-door with individuals, groups, institutions and community meetings.
- Social media through the Radio, Tv, Phone, Website and Facebook page etc

Summary of main comments from participants (Will be provided after the Public Consultation)

11.4 Comments taken for consideration

Provide the important point raise by the stakeholders, communities, NGOs Etc still ongoing consultation

11.5 Details of activities and participants

(dates, venues, attendance, topics discussed, minutes of meetings and figures etc) still ongoing consultation

11.6 Description of relevant activities and materials for consultations

(such as press releases, and notifications) still ongoing consultation

11.7 Recommendation for future consultations

The project proponent will continue to collaborate with ANP. or national and local Government Institutions to share a new regulation or any amendment of law including conducting the public consultation in order to inform a technology that will be used for the project with the intention to minimize the negative impact to the communities and environment.

Notes: This chapter will be updated after the completion of Public Consultation for SEIS and EMP document.

CHAPTER 12: DIFFICULTIES ENCOUNTERED

There were several difficulties encountered in the preparation of this report, most notably:

- Prior to independence, environmental research within Timor-Leste was limited, due to safety and access issues. As a result, there is very little information available on the country's

biodiversity and natural environment. There has been an increasing amount of research and analyses carried out in Timor-Leste since 2012, but with little or no historical data it is difficult to extrapolate patterns or trends.

- There were no accredited laboratories available to conduct analysis of soil samples taken during field surveys, therefore samples had to be transported back to Kupang Indonesia for analysis and interpretation. This presented challenges in the transportation of the samples and quarantine requirements, resulting in potential delays and reduction in soundness of the samples.
- Infrastructure is poor in the region, resulting in difficulties with access, accommodation, and travel during field studies.
- It was very difficult to find information specifically relating to the project location and therefore it was necessary to rely on information from other parts of Timor-Leste, or information which was at such a large scale that its relevance might be questionable.
- Information from Government Agencies: Information on land use maps, land use zoning, flood risk maps, traffic data, volumes of solid waste, wastewater, recorded diseases and health problems, etc. were unavailable from the Government agencies, although there were indications that these datasets were collected but could be in raw form. For this reason, there was a heavy reliance on secondary information from literature reviews, limited past research, and site investigations.
- The Consultants therefore had to rely on whatever data was available and on information obtained during site investigations, knowledgeable persons, and the websites. These were the premises by which the baseline was built for assessment of the potential impacts arising from the Project, and for which mitigation measures were recommended. This could open to a lot of subjectivity when there were insufficient good datasets.

CHAPTER 13: CONCLUSIONS AND RECOMMENDATIONS

13.1 Introduction

The conclusion drawn from this Simplify Environmental Impact Statement (SEIS) is that most of the adverse impacts can be mitigated if implemented judiciously. These include soil contamination, water pollution, dust dispersion, and noise. The impacts are likely to be temporary except for the component of the environment. Conventional mitigating methods and best management practices (BMPs) during land clearing and seismic survey can render most of them to an acceptable level.

The SEIS and Environmental Management Plan (EMP – in separate volumes) are carried out based on:

- Project information provided by the Project Proponent (PP).
- Primary data was collected through environmental baseline surveys, site investigations and local and foreign literature searches.
- Drawn on experiences from the large Project Consultancy Team, the PP, and officers from the on various technical and environmental aspects prior to carrying out the assessment process.
- Environmental scoping established the main issues for assessment, both negative and positive.
- Mitigation measures proposed by the Engineering and Technical team to address the technical impact.

13.2 Summary of Key Conclusions and Recommendations

The summary of key conclusions and recommendations is attached in the table format below for easy reference.

Table 33 - Summary of key conclusions and recommendations

Activity and Environmental Component	Key Conclusions	Key Recommendations
Physical Environment	<u>Soil erosion</u> Pre-Seismic survey: Land clearing can cause erosion with the resultant silt degrading the water quality, which in turn affects aquatic and marine life, if no mitigation measures are taken.	<u>Erosion and Sediment Control</u> recommended that seismic lines do not pass through unstable soil to prevent sedimentation and erosion.
	<u>Air and Noise</u> Operation of seismic survey: Environmental disturbances, such as dust dispersion and noise are common. These environmental problems are temporary and can be easily mitigated by using best management plane base on Timor Gap Risk and opportunity Management TG-IMS-P-003-Rev-03 for exploration activities in onshore areas.	<u>Dust Dispersion Control</u> Dust is a major concern throughout the operation of the seismic activity in the TGPB area. Where possible, seismic shots will not occur within 50 m of any built structure. Where seismic shots are closer than 50 m and unavoidable, residents will be notified a minimum of 24 hours before the activity. A safety zone will be established around the shot-point sites with a minimum exclusion zone of 100 m². <u>Noise Level Control</u> Noise is not an issue except to the workers. Standard operating procedures (SOP), such as limiting work hours according to the World Health Organization's (WHO) allowable exposure levels, are recommended.
	<u>Water Pollution</u> Operation of seismic survey: Water quality pollution has been cited as an important negative impact occurring mostly during	<u>Water Pollution</u> During seismic survey activities the main issue is total suspended solids (TSS) in the coastal water or the coastal areas, a bund has been recommended to confine most if not all the silt and sediments within the Project site. This will reduce

Activity and Environmental Component	Key Conclusions	Key Recommendations
	commencement of seismic survey. These could range from short to long-term as the operation of the Project is short-term.	water pollution. - The measures proposed in the SEIS and EMP for the seismic survey activity have to be judiciously implemented. - recommended Seismic shot-hole will be 10 to 50 meters deep during the dry season and for a short duration
Biological Environment	<u>Marine Ecology</u> Marine flora and fauna in the nearshore waters from the TGPB project area are rich a variety of fish and marine life Operation of the seismic survey: Water pollutants from a campsite that flow to the coastal areas can cause adverse impacts to these flora and fauna. Generally, corals can tolerate a small amount of silt and nutrients, which can enrich their growth. However, in large amounts, they get smothered, choked, and die or bleached.	<u>Marine Ecology Management</u> - Signages warning visitors and workers not to feed, fish, catch or harass any marine life in the nearshore seas, are to be erected. - Where avoidance is not possible, seismic lines will cross rivers, creeks, and wetlands, recommended conditions the following management will be employed: - Avoidance of more highly erodible soils/banks – select the ‘best’ position for crossing. - Avoidance of dense or significant stands of riparian vegetation (e.g. large trees) - Protection of waterways from impacts of runoff, erosion, and sedimentation - Seismic lines should in no way block the flow of water or cause water to the pond. - Water flow shall not be restricted, diverted, or blocked.

Activity and Environmental Component	Key Conclusions	Key Recommendations
	<u>Terrestrial Ecology</u> Terrestrial floral diversity along the Project site is rare Most of the plants are economic plants. The diversity of the terrestrial fauna along the site is also riche. Many of the mammals found at the site are domesticated ones.	<u>Terrestrial Ecology</u> • Revegetation efforts with native plants shall be carried out to improve. • Signages warning visitors and workers not to feed, catch or harass local wildlife shall be erected in green areas along the TGPB project area.
Social Economic Environment	<u>Infrastructure and Utilities</u> the project will be quite fast moving and involves the short-term use of the land as the seismic lines are set, data gathered and moved on to the next line segment. This will mean that these land tracks will be handed. back to landowners quickly and rehabilitation will only cover the small, disturbed area of the lines	<u>Infrastructure and Utilities</u> recommended consultation with stakeholders to identify cultural heritage areas allowing avoidance of these sites will reduce any likelihood of negative impacts such as loss or damage. This will also ensure access to these sites for traditional purposes is not hindered.

CHAPTER 14: NON-TECHNICAL SUMMARY

Non-technical Summary Introduction TIMOR GAP, E.P as an owned subsidiary for PUALACA BLOCK PSC TL-OT-21-17, The block covers an area total of 1,575 km² and is located on the south coast of Timor-Leste. It's part for territory of three Municipalities such as Manatuto, Manufahi, and Viqueque. Project description TIMOR GAP PUALACA BLOCK, a wholly owned subsidiary of TIMOR GAP E.P., was awarded the PSC TL-OT-21-17 on 7 December 2021. The block covers an area of 1,575 km² and is located on the south coast of Timor-Leste. In total, it accounts for territory in three Municipalities Manatuto, Manufahi, and Viqueque, TIMORGAP's commitment to expanding and improving our Exploration & Production portfolio. TIMOR GAP E.P. will continue to uphold this as new onshore blocks are released as ANPM licensing rounds continue to open. The subsidiary of TIMOR GAP, E.P. (TIMORGAP) for the Pualaca block Will hire a choice of several geophysical contractors from around the world for the proposed 2D Seismic Acquisition project for the Block in the municipalities of Manatuto, Viqueque,	Non-technical Summary Introdusaun TIMOR GAP, E.P nu'udar subsidiáriu propriedade ba PUALACA BLOCK PSC TL-OT-21-17, Bloku ne'e kobre área totál 1,575 km² no lokaliza iha kosta súl Timor-Leste. Ida-ne'e halo parte iha teritóriu hosi Munisípiu tolu hanesan Manatuto, Manufahi, no Viqueque. Deskrisaun ba Projetu TIMOR GAP PUALACA BLOCK, ne'e subsidiáriu tomak husi TIMOR GAP E.P. nia hetan kontratu PSC TL-OT-21-17 iha loron 7 fulan-Dezembu tinan 2021. Bloku ne'e ho luan 1,575 km² no lokaliza iha kosta súl Timor-Leste nian. Partense ba Munisípiu tolu Manatuto, Manufahi, no Viqueque, TIMORGAP nia kompromisu atu habelar no hadi'a nia portfólio iha área Explorasaun no Produsaun. TIMOR GAP E.P. sei kontinua atu mantein ida-ne'e tanbá bloku foun sira iha rai-maran sei fó sai tanbá ronda lisensiamentu ANPM nian kontinua loke. Subsidiáriu husi TIMOR GAP, E.P. (TIMORGAP) ba bloku Pualaca Sei kontratu opsaun kontratór jeofíziku oioin husi mundu tomak ba proposta projetu Akizisaun Sísmika 2D ba Bloku iha munisípiu
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and Manufahi that cover contract area of PSC TL-OT-21-17.

The seismic survey will use explosive sources to generate acoustic waves that will penetrate the ground. Geophones will measure electrical pulses that are then digitally recorded and processed to create a 'picture' of the subsurface stratigraphic layers and structures.

Vegetation clearing will be undertaken using backhoe, machete and saw, along the seismic lines. The lines will be diverted to avoid important habitat, infrastructure and other significant features (e.g. sacred sites).

Portable drill rigs will be carried by vehicles and/or personnel to drill holes, with estimated depths of 10 to 50 meters and spaced at 50 to 60 m intervals along the line. Drilling techniques may include:

- (i) rotary flush drilling in softer mudstone and clay formations, and
- (ii) air hammer drilling in harder limestone and sandstone or volcanic formations.

A small explosive charge of less than 1 kg will be placed within the drill hole, following all safety and security requirements of the Petroleum Regulations (DRAFT) and good oilfield practice.

Manatuto, Viqueque, no Manufahi ne'ebé kobre área kontratu PSC TL-OT- 21-17.

Levantamentu sísmiku sei uza fonte esplozivu sira hodi hamosu laloran akustiku sira ne'ebé sei tama iha rai. Jeofone sira sei sukat pulsasaun elétriku sira hafoin ne'e grava no prosesa dijitalmente hodi kria 'imajen' ida hosi kamada no estrutura estratigráfiku sira iha sub-superfísie.

Hamoos vejetsaun sei hala'o uza emxada, katana no kado tesi ai, tuir liña sízmiku sira. Liña sira sei desvia atu evita destroi habitat importante, infraestrutura no karakterístika signifikativu sira seluk (ezemplu, fatin sagradu sira).

Perfurasau portavel sira sei lori hosi veikulu sira no/ka pessoál sira hodi fura kuak sira, ho profundidade estimativa hosi metru 10 to'o 50 no ho espasu iha intervalu 50 to'o 60 m tuir liña. Tékniku sira perfurasaun nian bele inklui:

- (i) perfurasaun rotativa iha formasaun fatuk-musan no rai-mean ne'ebé kmaan liu, no
- (ii) perfurasaun ho martelu ar iha fatuk-kalkáriu no fatuk-areia ne'ebé maka'as liu ka formasaun vulkániku sira.

Karga esplozivu ki'ik ida menus hosi 1 kg sei tau iha kuak perfurasaun nia laran, tuir rekizitu seguransa no seguransa hotu-hotu hosi Regulamentu Petróleu no prátika di'ak iha kampu petrolíferu.

Project justification

Economic development, specifically of the petroleum industry, is identified as a target within the Strategic Development Plan (SDP) 2011-2030 (RDTL 2011d), with the aim of moving the country from a low income, to a middle-income nation.

The petroleum sector is a key component of future development with revenue that can potentially be used to provide health care, education, and security for the Timorese people.

It will create opportunities for the people in Timor-Leste to improve their living standards through high-level employment as well as the associated training opportunities. Training can be provided in geology, petroleum and chemical engineering, petroleum finance, and business and project management, as well as for operational staff.

Legal Requirement

As part of the requirement under Decree Law no.39/2022 first amendment of DL no 5/2011 for environmental licensing, the project document was sent to Environmental Authority for Petroleum Sector (ANP) for the issuance of the project category. According to Annex II of the Decree Law no. 5/2011, the project falls under the Category “B” for environmental licensing. Under the category “B”, it is required by law to develop Simplify Environmental Impact Assessment (SEIS) and Environmental Management Plan (EMP).

Justifikasaun ba projetu

Dezenvolvimentu ekonómiku, espesifikamente husi indústriá petrolífera, identifika nu’udar alvu ida iha ámbitu Planu Estratéjiku Dezenvolvimentu (SDP) 2011-2030 (RDTL 2011d), ho objetivu atu muda nasaun husi rendimentu ki’ik, ba nasaun rendimentu médiu.

Setór petrolíferu nu’udar komponente xave ba dezenvolvimentu iha futuru ho reseita ne’ebé potencialmente bele uza hodi fornese kuidaú saúde, edukasaun, no seguransa ba povu Timor.

Sei kria oportunidade ba povu iha Timor-Leste atu hadi’a sira-nia padraun moris liuhosi empregu nivel aas no mós oportunidade formasaun ne’ebé asosiadu. Formasaun bele fornese iha jeolojia, petróleu no enjeñaria kímika, finansas petrolífera, no jestaun negósiu no projetu, no mós ba pesoál operasionál.

Rekerimentu Legal

Nu’udar parte ida husi ezijénsia tuir Dekretu Lei no.39/2022 alterasaun dahuluk husi DL no 5/2011 ba lisenasiamentu ambientál, dokumentu projetu ne’e haruka ba Autoridade Ambientál ba Setór Petrolíferu (ANP) ba emisaun kategoria projetu. Tuir Aneksu II Dekretu Lei nú. 5/2011, projetu ne’e tama iha Kategoria “B” ba prosesu lisenasiamentu ambientál. Tuir kategoria “B”, lei ezije atu dezenvolve deklarasaun Impaktu Ambientál simflifikada(DIAS) no Planu Jestaun Ambientál (PJA).

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