

**ENVIRONMENTAL IMPACT STATEMENT (EIS) – DRILLING ACTIVITY  
PSC TL-OT-17-08 BLOCK A**

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## Abbreviation

AAQ	Ambient Air Quality
ACGIH	American Conference for Governmental Industrial Hygiene
AKO	Adjustable Kick Off
ANPM	Autoridade Nacional do Petróleo e Minerais
API	American Petroleum Institute
ASTM	American Standard for Testing Materials
AWS	Automated Weather Station
BHA	Bottom Hole  Assembly
BOP	Blow Out Preventer
CO	Carbon Monoxide
CR	Critically Endangered
CSR	Corporate Social Responsibility
dBA	A-weighted decibels
DEM	Digital Elevation Model
DNAS	Direção Nacional das Aguas e Saneamento
DNMA	Direccao Nacional de Meteorologia e Geofisica
DST	Drill Stem Test
EBC	Escola Basico Central
EBF	Escola Basico Filial
EBS	Environmental Baseline Survey
ECD	Equivalent Circulating Density
ED	Eastern Drilling
EIS	Environmental Impact Statement
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
EMW	Equivalent Mud Weight
EN	Endangered
ENSO	El Nino Southern Oscillation
ERP	Emergency Response Plan
GDS	General Directorate of Statistics Timor Leste
GERTil	Grupo de Estudos de Reconstrução de Timor-Leste
HIV/AIDS	Human Immunodeficiency Virus Infection and Acquired Immune Deficiency Syndrome
HSE-MS	Health Safety Environment Management System

IADC	International Association for Drilling Contractors
IFC	International Finance Corporation
ILO	International Labour Organization
IMCI	Integrated Management Child Illnesses
IOD	Indian Ocean Dipole
IPCC	International Panel for Climate Change
ISO	International Standard for Organization
IUCN	International Union for Conservation of Nature
KCl	Pottasium Chlorite
KPI	Key Performance Indicator
Leq	Equivalent Continuous Sound Level
Lmax	Maximum Continuous Sound Level
LOC	Loss of Containment
LOT	Leak of Test
MJO	Maden-Julian Oscillation
MW	Mud Weight
MWD	Measured While Drilling
NAPA	National Adaption Plan and Action
NIOSH	National Institute of Occupational Health and Safety
NOC-TL	Nacional Oil Company of Timor Leste
NORMS	Naturally Occurring Radioactive Materials
NOx	Nitrogen Oxide
NT	Near Threatened
OECD	Organization for Economic Cooperation and Development
OSHA	Occupational Safety and Health Administration
P&A	Plug and Abandonment
PACCSAP	Pacific-Australia Climate Change Science and Adaptation Planning
PDM	Positive Displacement Motor
PM	Particulate Matters
PPE	Personal Protective Equipment
PSC	Production Sharing Contract
PSL	Product Specification Level
RPM	Rotation Per Minute
rr	Restricted Range
SISCA	Servisu Integradu Saúde Comunitária
SLM	Sound Level Meter
SMC	Safety Management Consultancy
SME	Small and Meduuum-sized Enterprises
SO2	Sulphur Dioxide

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SO <sub>x</sub>	Sulphur Oxide
TD	Total Depth
TR	Timor Resources
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nation for Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework for Climate Change Convention
URTI	Upper Respiratory Track Infection
USGS	The United States Geological Survey
VU	Vulnerable
WB	World Bank
WHO	World Health Organization
WOC	Wait on Cement

## 1. Executive Summary

Timor Resources Pty Ltd acquired onshore PSC TL-OT-17-08 Block A in Suai Municipality on 7 April 2017 to immediately start exploration activities. The area is approximately 1,000 km<sup>2</sup> in size extending along the coast for approximately 55 km and up to 30 km inland.

This Environmental Impact Assessment covers environmental baseline information as basis for future environmental observation during and after the drilling activities. The assessment is also to identify impacts of drilling activities to socio economics and physical environments such as land, air, water, population, flora and fauna and other aspects which may be impacted by the drilling activities.

Timor Resources is planning to drill 5 wells within the area of 5 Sucos with details as follows, Kumbili well has depth of 1,470 meter and located in Suco Camanasa; Raiketan well has a depth of 1,946 meter and located in Suco Belekasak/Labarai; Karau well has a depth of 1,087 meter and located in Suco Matai; Lafaek has a depth of 2,903 meter and located in Suco Labarai; and Laisapi has a depth of 1,770 meter and located in Suco Tashilin.

Well Karau, Kumbili and Laisapi are the first three wells which will be drilled as per commitment in the Production Sharing Contract (PSC) and in the event of success, Timor Resources will continue to drill Raiketan and Lafaek wells.

Timor Resources has contracted Eastern Drilling to carry out the drilling activities which is expected to be started within Quarter 1 of 2020 after receiving the Environmental Approval from ANPM.

The drilling will target below formation:

- a. The Pliocene-Pleistocene age of Viqueque Formation, syn-orogenic Basin.
- b. Lower Allochthon (Permian-Eocene)
- c. The Triassic-Jurassic age Babulu/Aitutu and Wai-Luli Formations beneath a regional metamorphic over thrust.

The three play types to be tested within the five wells to be drilled are: Karau, Kumbili (have two targets, one is primary and the other one is secondary target), Laisapi, Lafaek and Raiketan. It is however a drilling “*Play Fairway*” is required to maintain the flexibility of the drilling campaign to take into account the well results hence optimising the chance of successful drilling.

The locations of wells are alongside coastal edge up to 7 km inland between Suai and Jumalay Sub-Districts. The area of 1 hectare surrounding each well site will be fenced off as safety zone and barred of from public access for safety reasons. A 20 meters wide of road access will be built from nearest highway, arterial or local roads for logistical heavy equipment transportation.

## **Well design**

In order to maintain the integrity of wells during the drilling, each well is designed based on geological data from seismic interpretation and drilling data from offset wells. Well design will adhere to regulations, regional laws and industrial standards. The well design will also ensure to avoid drilling on different formation pressures in same hole section, have enough overbalance pressures to control well and to mitigate possible differential sticking mechanisms and for wellbore stability consideration. Offset wells data show that the target reservoir could be over pressured if below a compacted shale formation therefore hydrostatic overbalance will need to be maintained during drilling and tripping operations to avoid well flow.

Casing sizes are selected based on depth of aquifer and types of formation. A 13-<sup>3</sup>/<sub>8</sub>" Conductor Casing will be set below the deepest aquifer at approximately 85 meters which will also covers unconsolidated sand in the Suai Formation. The 9-<sup>5</sup>/<sub>8</sub>" Surface Casing will be set as deep as possible to cover the rest of unconsolidated sand section. If there is no issue during the drilling, a Liner will be installed at reservoir section otherwise an Intermediate Casing will be installed and the hole to be temporarily plug after evaluation.

## **Physical Environment**

Timor Leste is a tropical country which experiences monsoonal climate with a distinct wet and dry season. In the Block A project area, the rainfall is from 1,250 – 1,350 mm per year and most of which falls in the month of December to April wet season. The average humidity of the area is approximately 60% measured in the month of October 2019.

The average high temperature throughout the country is in range from 24°C in the dry season to 26.3°C in the wet season. However the temperature measured in the project area, measured in October 2019 is from over 25°C early in the morning to around 38°C at midday.

Timor-Leste has a tropical cyclone effects that usually occurs in the Timor Sea from November to April. This tropical cyclone is characterized by very strong winds and driving rain with high waves and storm surges. According to PACCSAP (2011), there is a record

of 31 tropical cyclones passed within about of 400km of Dili in 41 year period between 1969 and 2010.

The noise and air quality data around well sites were tested to establish current situation of air quality and noise level. The data was taken within the radius of 100 – 4000 meters from well sites. There were many considerations given to determine air and noise sampling locations to ensure appropriate representation of environmental features around the well sites. In order to obtain optimal representation, data collection activities given consideration to topography of the area, density of population, density of traffic, human activities, community infrastructures and socio-economic activities.

The air quality in all well sites is relatively varied between PM<sub>10</sub> and PM<sub>2.5</sub>. The dust particle of PM<sub>10</sub> is ranging from around 65 – 75µg/m<sup>3</sup> which is lower than adopted standard, while PM<sub>2.5</sub> shows a result ranging from 100 – 980 µg/m<sup>3</sup> which is higher than adopted standard. The highest PM<sub>2.5</sub> was recorded around both Laisapi and Raiketan well sites.

Nonetheless, PM<sub>10</sub> and PM<sub>2.5</sub> shows a distinct high particulate concentration at Raiketan in comparison to other well sites. The lowest PM<sub>2.5</sub> concentration recorded throughout the day was at Lafaek well site.

The cause of the high concentration of PM<sub>2.5</sub> may be due to various construction activities that are currently underway around Suai Municipality.

Noise observation around all five wells are ranging from 45-75dBA. The highest being recorded was at Karau well site due to its proximity with main road and local population. It is however still within the WHO noise limit and any other recognized international standards (NIOHS, ACGIH, OSHA).

### **Ecological Components**

There are three protected areas within Covalima Municipality which are Tilomar Reserves, Mount Taroman, and Komuoan / Onu Bot. These protected areas are located quite a distant to the west of all 5 well sites. Hence it is perceived that there is no impact to these respected areas.

The area surrounding the well site at Raiketan, Laisapi, Kumbili and Lafaek are ecologically referred as primary forest, thin forest or secondary forest, savanna and wetland. Fauna species which were identified in well site area and plotted (from tracking activities) areas are birds and mammals. Some of those identified species have been listed and in the category of rare species or in near extinction according to IUCN.

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The oil well drilling activities will not cause significant negative impact to identified bird species within well sites because distribution of those bird species are categorized widespread residence, which means they can live, hide and feed in types of places such as tropical forest, woods, plantations and among community residences. Therefore those bird species can move out to above mentioned places when drilling activities are being carried out.

### **Economic Components**

According to Socio-economic Census in 2015 by the Ministry of Finance, it indicated that 58% of the population in Suai is living above international based poverty line. This means that there is still a significant number of people lives below international based poverty line with average income of \$40.45 per month based on national priced index of 2014.

The employment force in Suai reached 56.97% based on the 2015 Census which may have contributed to over 50% of people who lives above international based poverty line. The main economic contributor was from self-employment, services and sales. Apart from that, the fishing activity has also contributed to the employment sector. The fisherman involve in group or individual for commercial or subsistence fishing activities. The employment number in agriculture area has decreased over the years.

Suai Municipality is located on the Southside of Timor-Leste, as such it is found to be less suitable for Tourism development in reference to S-3 (Sun, Sand and Sea). This is due to the high turbulent wave which prevents any water sport activities and to the presence of crocodiles in water (Edyvane et al., 2012).

### **Social Components**

Covalima Municipality has 1,202.66 km<sup>2</sup> of area size with projected population of 67,495 persons. This means the population density in Suai is about 55.9/km<sup>2</sup>. The literacy percentage among young people in Suai aged between 15 – 24 years old was 81.1% in 2010 and increased to 87.67% in 2015. This figure shows higher literacy rate in Suai compared to national average for the same age which was 79.1% in 2010 and 81.02 % in 2015. The census also showed that female literacy percentage is higher than male for both 2010 and 2015.

The health demographic data in Suai shows that common health problems among the population were respiratory infection and acute diarrhea for year 2016 and 2017. Another major health problem was Scabies which was increased more than double in number of cases from 2016 to 2017. Apart from those illnesses, other illnesses recorded were

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Pneumonia, Malaria, Bloody diarrhea, Leprosy and HIV/AIDS. According to census 2018 by the Ministry of Health, there is not much difference on types of health issues recorded around the health facilities in Suai.

## **Cultural Components**

Population demographic shows that more youngsters are being educated under government's education system. Population in Suai is also strong in keeping their traditions and traditional believes. They carried out ritual ceremonies in certain places such as water spring, hills, lake, trees, ocean and other ancestral ritual sites. Other rituals are also carried out for marriage, death, harvesting, digging water wells and asking permission for disturbing cultural sites in case of national projects for developments.

During the observation, there was one sacred water spring observed in quite a distant from Raiketan River and a cultural site called We Dare or Abad Laran near Kumbili well sites. Locals still visit these cultural sites occasionally for ritual ceremonies.

During the Public Consultation, local elders also requested to carry out ritual ceremony prior to spudding each well. They requested Timor Resources to provide required materials for the cultural ceremony.

## **Climate Change**

Timor Leste is a tropical country with distinctive rainy and dry season. Over the years, it has gradually experiencing climate pattern change resulting in decreasing mean rainfall indexes and increasing incidence of extreme weather events. Recent field temperature data collection in project area does indicate that at certain point of time, the temperature could rise up to 38°C.

IPCC global models also indicate that in South-East Asia, extreme weather events associated with El-Niño have been both increasing in frequency and intensity in the past 20 years. The main driver affecting the climate condition across the country is the El Niño Southern Oscillation (ENSO).

Data collected from preliminary (NAPA) studies and data analysis from West Timor, can be used to provide indication of possible changes in climate in the region.

## **Public Consultation**

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Dissemination of information on this drilling campaign was carried out through Public Consultation at 5 Sucos namely Matai, Camanasa, Tashilin, Belecasac and Labarai. Population at Suco Debos was also invited to participate the consultation as they may also be impacted by drilling activities due to close proximity of Karau well.

The participants were from general public, youth groups, cultural elders and local authorities (Police, head of Suco and head of sub-districts). The average participants on each Suco were around 90 – 100 people.

Public concerns were mainly focused on well integrity to prevent accident and negative impacts on environments, employment opportunities for both general goods and services, and technical area.

## 2. Details of the project proponent

### 2.1. Details of Project Proponent

Operator : TIMOR RESOURCES  
Address : Suite #303, Level 3, CBD 3, Timor Plaza  
Rua Presidente Nicolau Lobato, Comoro  
Dili – Timor-Leste  
Contact Person : Suellen Osborne  
Title : Chief Executive Officer (CEO)  
Mobile : +61 (0) 448 227 794  
Email : [Suellen.Osborne@timorresources.com.au](mailto:Suellen.Osborne@timorresources.com.au)

Contact Person : Jan Hulse  
Title : General Manager of Exploration  
Mobile : +670 759 42489 and +61 427 317 952  
Email : [Jan.Hulse@timorresources.com.au](mailto:Jan.Hulse@timorresources.com.au)

Contact Person : Florentino Ferreira  
Title : Director of Finance and Compliance  
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Mobile : +670 7704 2531  
Email : [Luis.Pereira@timorresources.com.au](mailto:Luis.Pereira@timorresources.com.au)

## 2.2. Company Structure



## TIMOR RESOURCES ORGANISATION CHART

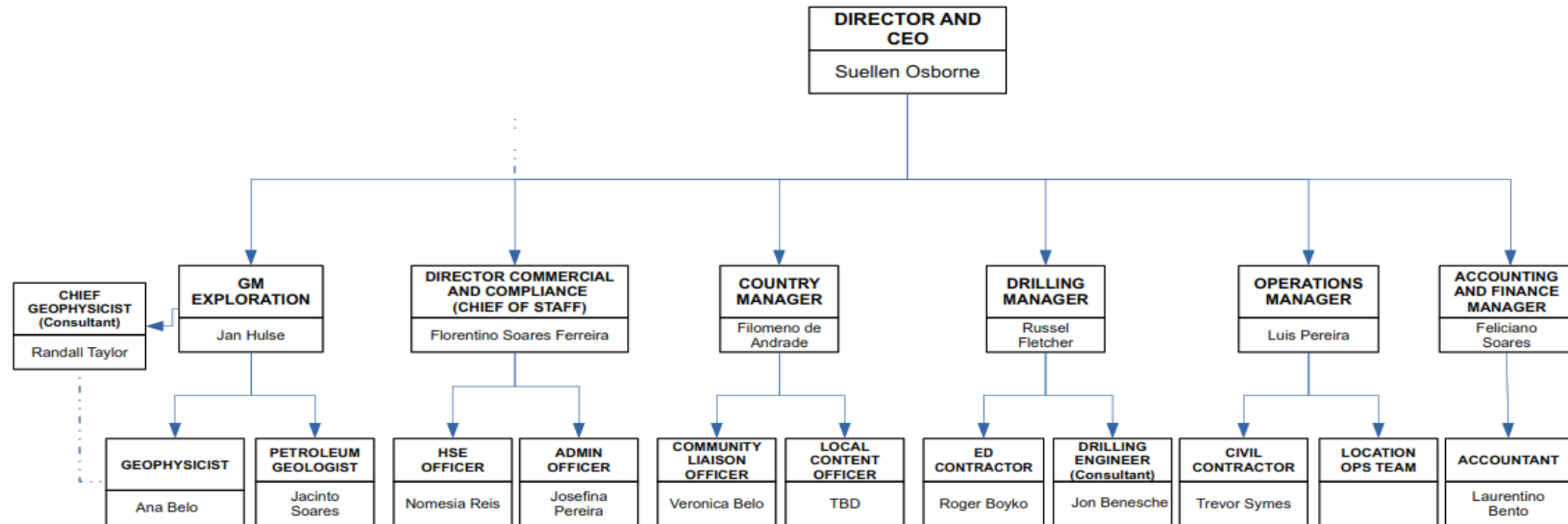


Figure 1. Timor Resources Organization Structure

### **3. Details of the EIA consultant**

#### **SAFETY MANAGEMENT CONSULTANCY (SMC) Lda.**

Address : Rua de Catedral, Villa-Verde, Dili, Timor-Leste  
Telephone : +670 7565 7185, 7740 4533, 7337 4141  
Email : info@smc-tl.biz or [alcino.pasos@smc-tl.biz](mailto:alcino.pasos@smc-tl.biz)

#### **Consultants:**

##### **1. Alcino dos Santos Passos**

Has experience more than 10 years in oil and gas industry, especially in the area of production and development. Alcino hold Bachelor Degree in Electrical and Electronic Engineering and he was Manager of Production and Development at ANPM under Directorate of Development and Production (D & P) and was responsible for production, maintenance, drilling and metering.

##### **2. Jose Azelito Soares**

Has experience more than 10 years in oil and gas industry, he has Bachelor Degree in Law and Master Degree in International Energy Policy and has completed PhD coursework in International Energy Policy. Jose Soares was Legal Manager at ANPM for two years and that time he was responsible for legal and policy development as well as PSC contract arrangements.

##### **3. Zelio Moniz**

Has experience more than 16 years in oil and gas industry and was the Health and Safety Inspector of the ANPM, under directorate of the Health, Safety and Environment (HSE). He holds Diploma in Health Science and was responsible for ANPM HSE audits or inspections, incident/accident investigations, risk management and HSE performance measurements.

##### **4. Salvador da Silva**

Has experience in the oil and gas industry for more than 5 years. He was Local Content and PSC Procurement Officer, who was responsible for review the contract arrangements, local content plans, PSC procurement and supply chain contracts. Salvador has Bachelor Degree in Biochemistry and was also Local Content and Community Liaison Officer for Timor Resource.

## **5. Palmira A. Vilanova**

Has 10 years of experiences of safety, environmental and social management in various disciplines, include oil and gas industry. She has a Bachelor of Science degree in Natural Resources and Environmental Management and a Master of Science degree in Project Management. She has been working as an Independent Consultant for Asia Foundation and latest experiences as Country Consultant for UNCCD (United Nations Convention to Combat Degradation).

## **6. Adriano P. Cardoso Amaral**

Fresh graduate from Victoria University of Wellington majoring in Geology and Environmental Science; with a first working experiences as an geologist and Geophysics intern with ANPM. The latest working experiences as Environmental and Geology consultant for SMC (Safety Management Consultancy).

## **7. Evangelita Pereira**

Has 6 years of experience working as Health and Nutrition Technical Specialist. She has been working with international NGOs implementation of quality health programs according Timor - Leste standards. She holds Bachelor of Health Sciences (Hons).

## **8. Pedro Pinto**

Has 20 years of experience as Ornithologist. He has been working under Indonesian and Timor - Leste governments for Flora and Fauna Conservation. He holds a degree in Bachelor Science of Forestry.

## **4. Description of the project**

### **4.1. Identification of the Project**

This project is to conduct exploration drilling of the five identified well locations, namely Karau, Kumbili, Lafaek, Raiketan and Laisapi. These wells are located in sub district of Suai, Maukatar and Zumalai in Covalima municipality. The exploration drilling is planned to be commenced around 27<sup>th</sup> April 2020.

### **4.2. Project Category**

The drilling activity may have significant environmental impact, thus the drilling activity falls under category ‘A’ according to the Decree Law No. 5/2011 of Environmental Licensing. Therefore, Timor Resources submits the Terms of Reference (ToR), Environmental Impact Statement (EIS) and Environmental Management Plan (EMP) seeking for authority (ANPM) and other relevant entities’ approval before the drilling is commenced or spud in.

### **4.3. Brief Description of Nature, Size and Location of the Project**

#### **4.3.1. Nature**

The exploration drilling activities are conducted into three parts pre – drilling, drilling and plug and abandonment phases.

The proposed drilling programme is designed to test three play types within the area of Block A, which are:

- a. The Pliocene-Pleistocene age Viqueque Formation, syn-orogenic Basin.
- b. Lower Allochthon (Permian-Eocene)
- c. The Triassic-Jurassic age Babulu/Aitutu and Wai-Luli Formations beneath a regional metamorphic overthrust.

The above mentioned three plays are to be tested with the five wells, namely Karau, Kumbili, Laisapi, Raiketan and Lafaek. The proposed well locations are situated between Suai and Zumalai area; and with a distance of 700 and 7000 meters inland from the coastline.

In addition to proposed wells location, a drilling “Play Fairway” will be used in order to maintain a flexibility of the drilling campaign. This is to optimize the chance of success during the course of the drilling operations.



#### **4.3.1.1. Pre-Drilling**

Pre-drilling operations include:

- (1) Soil boring survey.
- (2) Soil testing and analysis
- (3) Topographic survey
- (4) Soil integrity evaluation of the location and access road land for construction purposes.
- (5) Land clearance for road access and site constructions
- (6) Road Surveys with road and bridge upgrade plan, including highway and arterial and local roads.
- (7) Establish water supply (may include trucking, existing or new water wells, pumping from watercourse)
- (8) Well Site (including mini Camp) – Size requirement to be determined by rig footprint, ancillary equipment lay-out and local regulatory requirements
- (9) Cellar construction with recess for air pump.
- (10) Mud pits (sump) construction
- (11) Water storage pits
- (12) Rig Move

#### **4.3.1.2. Drilling Operations**

It is proposed to drill up to five wells with a cumulative depth of approximately 9,000m. The proposed well(s) designs are based on geological data supplied and interpreted predominantly by Timor Resources and the Joint Venture partner. Pore pressure and fracture pressure predictions are based on offset well drilling information.

#### **4.3.1.3. Well Program, Schematic Design and Casing Program**

##### **Safe Operation Principle**

Well design will be:

- Comply with regional laws, regulations, and industrial standards.
- Be designed to avoid drilling different formation pressures in same hole section.
- Be designed to have enough overbalance pressures to control well and to mitigate possible differential sticking mechanisms.
- Be designed to consider wellbore stability and/or weak/lost circulation formations.

### **Casing Setting Depth Principle**

The first criterion of selecting casing setting depth is the overbalance pressure without fracturing shallow formations. Kick tolerance volume is also considered for determining the casing setting depth. The formation that has been cased, needs to withstand the operation of drilling, tripping in/out, and well control for the next holes section.

### **Economic Principle**

To deliver reduced drilling time and cost, optimize hole sizes and subsequent casing sizes. General standardization of well design and should be considered for all wells to optimize cost where applicable. Contingency plan for using a liner hanger instead of additional casing is one of the options to reduce both tangibles cost and rig operating days.

#### **4.3.1.4. Well Design and Casing Selection**

A 13-<sup>3</sup>/<sub>8</sub>" external/internal flush joint conductor casing should be set below the deepest aquifer at approximately 85m and will also cover the unconsolidated sand in the Suai Formation.

Drill next section with 12-<sup>1</sup>/<sub>4</sub>" Bit. Start with a MW (mud weight) from <9.0ppg and increase gradually dependent on real time hole conditions. Limit the maximum MW based on the leak-off test and control the ECD (Equivalent Circulating Density) to avoid breakdown of the 13-<sup>3</sup>/<sub>8</sub>" shoe while drilling through the lower unconsolidated sand formations.

The 9-<sup>5</sup>/<sub>8</sub>" surface casing should be set as deep as possible to cover the remaining unconsolidated sand. Casing shoe should be set in a competent shale formation to provide enough shoe strength for the next hole section. The 9-<sup>5</sup>/<sub>8</sub>" casing shoe LOT will determine the maximum EMW, with the objective of attaining an acceptable kick tolerance volume (10bbbls is accepted industry minimum).

**Table 1. Ratio of Condition, Criteria and Scenario for Drilling (TR & DVH, 2018)**

Condition	Criteria	Scenario
Burst	1.1	<ul style="list-style-type: none"> <li>• Pressure test after WOC.</li> <li>• Fracture at shoe with gas gradient above.</li> <li>• Drill ahead.</li> <li>• Gas over mud ratio.</li> </ul>
Collapse	1.125	<ul style="list-style-type: none"> <li>• Full evacuation of gas.</li> <li>• Loss return with mud drop.</li> <li>• Drill ahead.</li> </ul>
Axial	1.6	<ul style="list-style-type: none"> <li>• Running in hole – avg speed 1 ft/s.</li> <li>• Overpull force 100,000 lbf.</li> <li>• Post-cement static load.</li> <li>• Green cement pressure test 1000 psi</li> <li>• Service Loads.</li> </ul>
Tri-axial	1.25	N/A

The 8-1/2” hole, where possible, will be drilled to well/section TD through the target reservoir formation. Offset wells show that the target reservoir could be over pressured if below a compacted shale formation. To avoid well flow, hydrostatic overbalance will need to be maintained during drilling and tripping operations. In a trouble-free success case a Casing or Liner will be run to TD and cemented to cover the reservoir zone. If the hole size at TD is reduced, due to additional intermediate casing strings, it may be necessary to set a temporary plug after evaluation.

#### **4.3.1.5. Casing Program**

The casing program will be determined by the geological interpretation at each location and be subject to the down hole conditions encountered during drilling. Two generic designs are provided in the figures below, these are expected to be similar to the final configuration.

## Typical Well Diagram

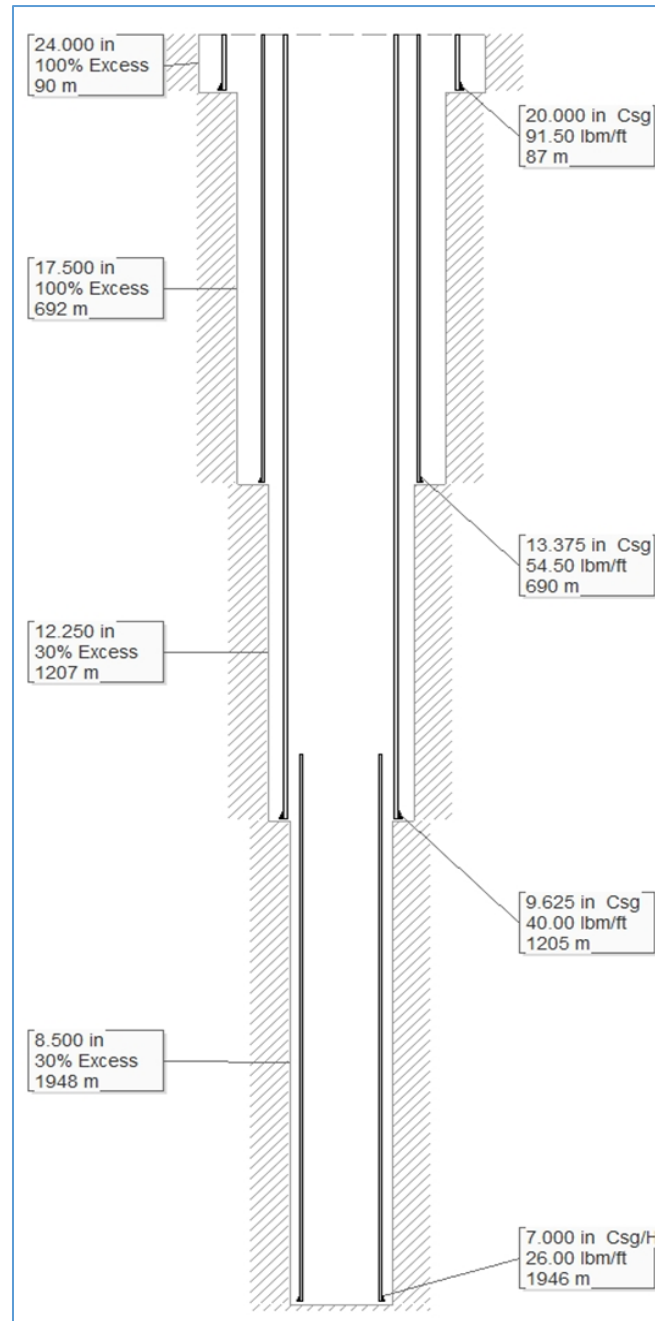


Figure 2. Typical Well Profile A (TR, 2019)

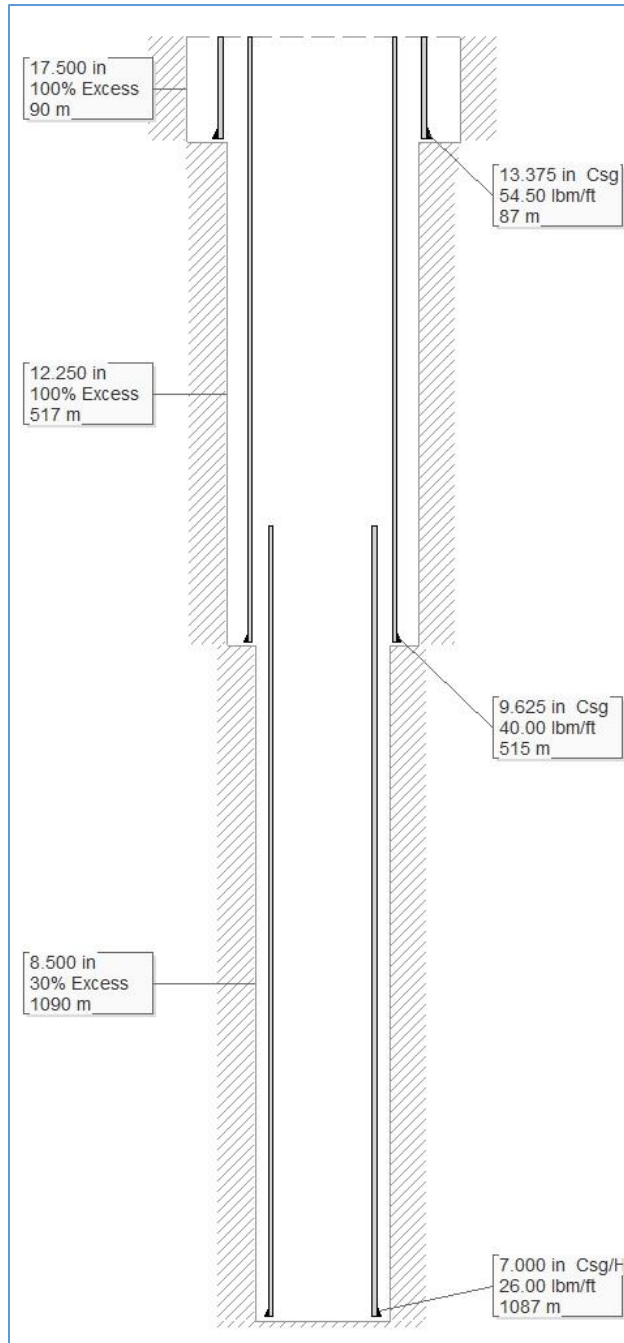


Figure 3. Typical Well Profile B (TR, 2019)

#### **4.3.1.5. Drilling Operation Overview**

##### **13 3/8" Conductor Casing**

The objective of the conductor casing is to case the hole through the ground water and shallow aquifer and the unconsolidated sand that is found in Suai Formation. Based on research for aquifer depth at Suai, Timor Leste, the deepest aquifer was found at 82m.

Casing used for conductor driving should have external and internal flush joint and comply with API 5L, PSL-2. To avoid loss circulation during cementing job, using light weight cement (10.5ppg tail and 12.5ppg lead) is recommended. Remedial cementing job (top job) is also required if there is no return to surface.

##### **12 – 1/4" Intermediate Casing**

The objective of intermediate casing is to isolate the shallow formations before entering the target reservoir and to provide sufficient LOT and kick tolerance to safely reach next section TD.

Offset well shows that the shallow formations contain shale and/or clay. KCl will be added to the pre-hydrated Bentonite drilling fluid to prevent bit balling.

Positive Displacement Motor (PDM) is recommended to be used in this hole section. With the same top drive rotation, BHA with Mud Motor will provide higher bit RPM, compared to conventional drilling with slick BHA. Higher ROP will result with Mud Motor BHA, which translates to reduction in drilling operational time. For Mud Motor BHA usage on the vertical wells, a 0.780 AKO bend angle setting on the motor is recommended, while for the directional wells, a 2oAKO bend angle setting on the motor is recommended.

The objectives for formation logging and directional surveys can be achieved by using electric line logging, gyro runs for directional kick-off and multi-shot surveys for direction. MWD Measurement While Drilling) may be used to collect near bit real-time inclination and GR data.

Increasing MW to equal ECD value prior to logging operation is necessary in order to maintain the hydrostatic overbalance. Wiper trips and circulation to ensure a clean hole condition will have a significant effect on the logging data and successful logging operation.

Casing grade is chosen to withstand the worst burst and collapse load scenario. Setting the casing seat as low as possible is required to provide an acceptable kick tolerance volume for well control operations.

Cementing is the most critical operation in the 9-5/8" surface hole section. Quality

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cementing operations will provide good isolation of well bore to surface. Good planning on the cementing sequence and cement slurry weight is required to prevent loss circulation during the cementing operations.

### **8 – 1/2” Production Casing**

Ideally, the objective of the 8 1/2” hole section is to drill the reservoir formation and case same with 7” casing to surface. If two formations are drilled in one hole section, there is increased risk of loss circulation on the weaker formation. Therefore, reservoir wellbore strengthening material (Liquid Casing\* or similar type mud additive) should be considered as an addition to the drilling mud (pre-treated) for mitigation.

Reservoir evaluation is required with at least Neutron-Density log to confirm the hydrocarbon existence. Wireline logging will be used for preliminary evaluation. Further evaluation by open hole/cased hole Drill Stem Test (DST) will be advised dependent on the logging data.

The reservoir zone will be covered with 7” long string casing to surface or liner hanger, this is to comply with the oil and gas industry standard for well integrity.

Cementing slurry should cover all the open hole formation until surface. Option to have the TOC at least 500ft above the previous casing shoe can be considered to allow for a Sidetrack hole. With this option, Operator can cut and pull the 7” casing, set a Whipstock and drill a Sidetrack hole, if desired or required.

#### **4.3.1.6. Contingency Plan**

Contingency is planned for an additional 6” hole section, if the secondary target formation cannot be drilled as one-hole section. The 6” hole section can be completed with 4-1/2” or 5” flush joint liner. The objective of using a liner hanger instead of long string casing is to minimize the wellhead sections, it’s cost effective and complies with oil and gas industry standard practice. If the secondary target is proven to not be hydrocarbon bearing, the open hole can be directly plugged and permanently abandon.

#### **4.3.2. Size**

Onshore PSC TL-OT-17-08 Block A is an area that covers of approximately 1,000 km<sup>2</sup>, extending along the coast for approximately 55 km and up to 30 km inland was identified as an area of commencement the process exploration, development and exploitation of petroleum resources under contract between Timor Resources and TL Government officially signed on 7 April 2017.

Timor Resources (TR) commits to conduct exploration drilling campaign in Block “A” Covalima municipality, wells are located in Suco Matai, Kamanasa, Labarai and Tashilin. The area size for the drilling campaign is 5 hectares in total as TR requires to secure 1 (one) hectare of land per well location including safety zones. In addition, TR will also build the access roads approximately 20 meters wide to the well sites from the nearest existing highway, arterial or local roads.

#### **4.3.3. Location**

The proposed drilling operations will carry out within three sub districts, namely: Suai, Maucatar, and Zumalai. Within these Sub-Districs, four villages (Sucos) are identified as proposed drilling area such as Matai, Kamanasa, Labarai and Tashilin. In addition, three of five proposed wells are geographically situated within the Sucos’ boundaries between Debos and Matai, Belekasak and Labarai and Raimea and Tashilin.



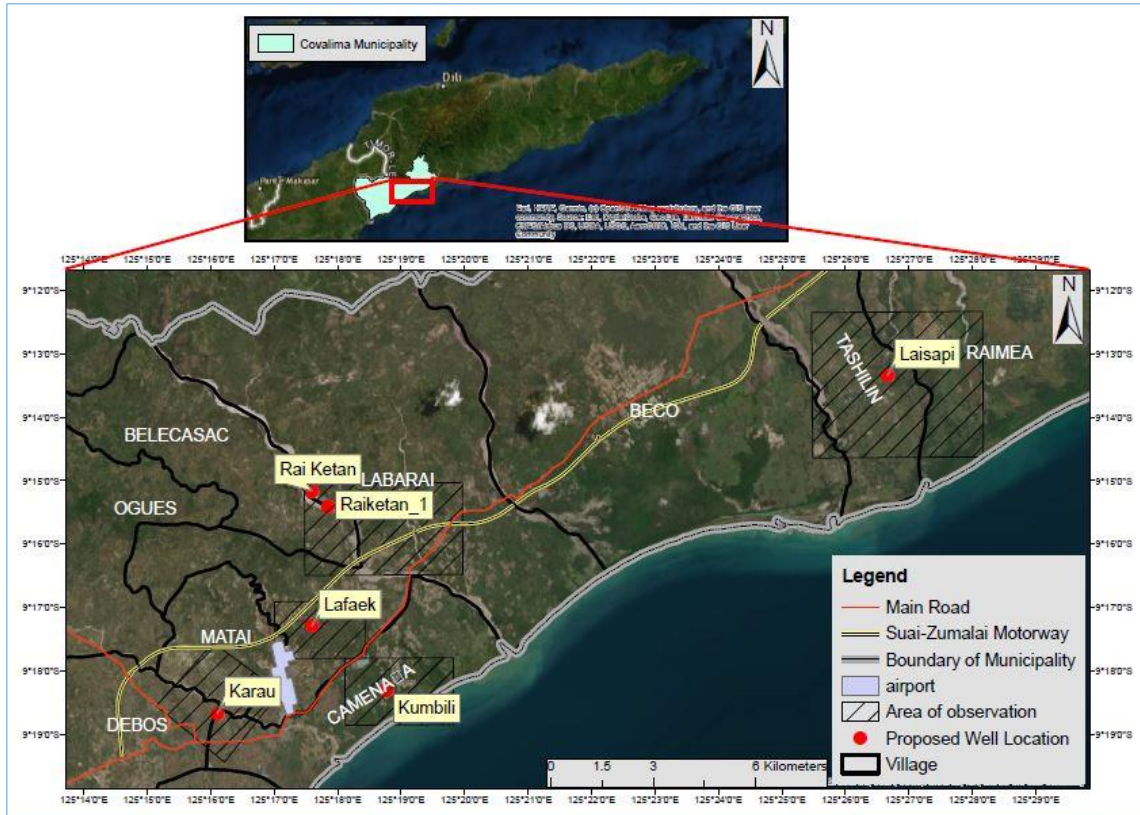


Figure 4. General Map of the Exploration Drilling Campaign Locations

The exploration drilling campaign requires to build roads to access the well sites and the site constructions for building the camps include welfare facilities and other related infrastructures such as Mud Reserve Pits and Cellar for the Drilling rig. Hence, existing public infrastructures such as highway, arterial and local roads, bridges and underpasses to be assessed and possibly upgraded or modified whenever necessary to accommodate the mobilization of the equipment to the project locations without damaging those facilities.

TR will consider all the environmental aspects including the aesthetic environmental, safety and health issues when upgrading or modifying the related public infrastructures which are impacted by the project activities. It will include architectural designs and their requirements are to be specified to ensure any change is comply with the local legislations and the industrial best practices.

The drilling project campaign will be limited to the five identified well's locations where each well site except Kumbili is located between the Suco's boundaries. This drilling

Maps from Figure 5 to 9 below show the visual site of each well location:







Figure 6. Visual site map of Kumbili Well



Figure 7. Visual site map of Laisapi Well



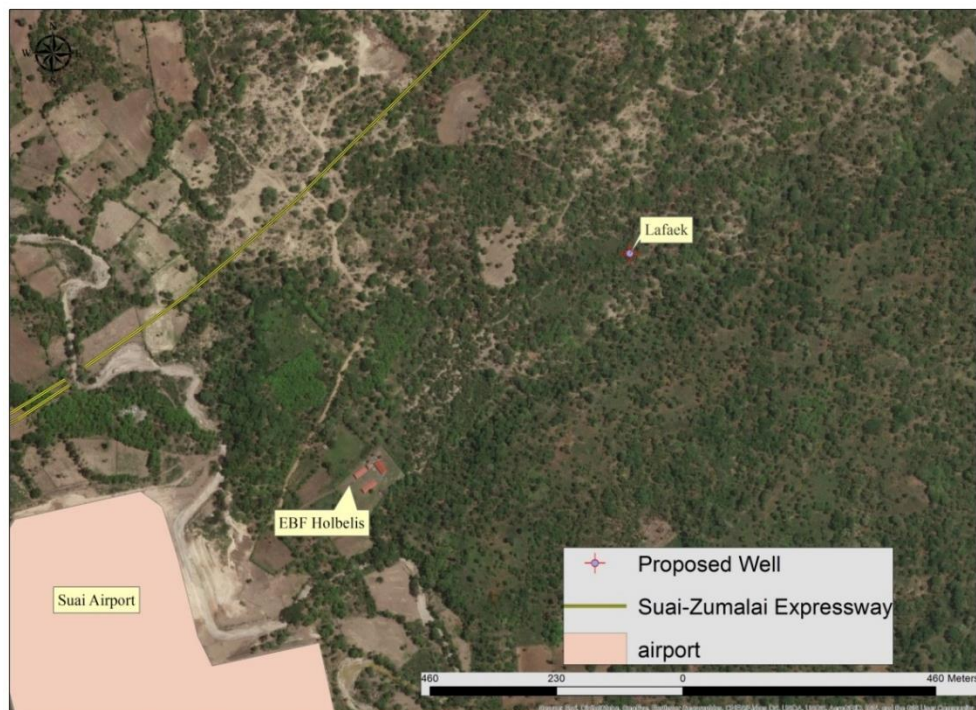


Figure 8. Visual site map of Lafaek Well

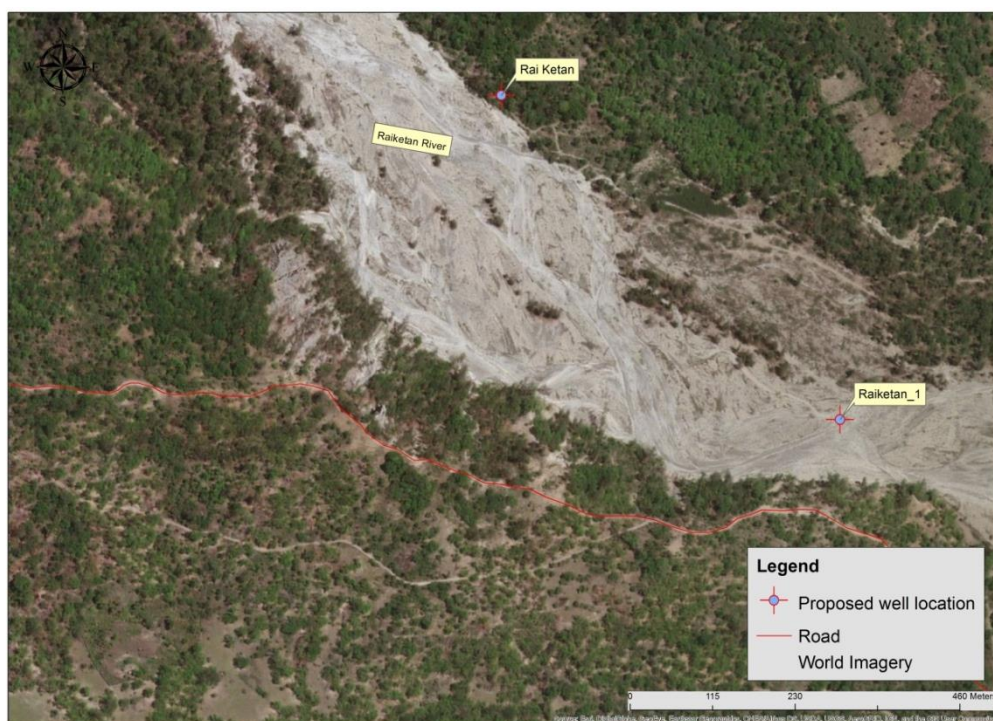


Figure 9. Visual site map of Raiketan Well

#### 4.4. Justification and need for the project

Timor Resources (TR) is a privately-owned Australian oil and gas corporation that is in joint venture with TIMOR GAP, E.P. (TG), a national oil company of the Timor-Leste (NOC - TL) Government. On 7 April 2017, TR engaged an agreement with the Timor Leste Government (Onshore PSC TL OT-17-08) permitting the company, with its partners, to begin the process of exploration, development, and exploitation of petroleum resources in the contract area, identified as Block A. The Ministry desires to promote Petroleum Operations in the Contract Area and the Contractor requests to join and assist the Ministry in doing so in the Contract Area. Exploration, development, and exploitation of petroleum resources in the contract area is encouraged and is based on data collected from 1969 to present day.

#### 4.5. The proponent's endorsement of the EIA

Timor Resources endorses the contents of this report and will abide by all recommendations contained herein.

Table 2. Project proponent's endorsement of the EIA

Name	Position	Signature
Suellen Osbourne	Managing Director	
Florentino S.Ferreira	Commercial & Compliance Director	
Jan Hulse	Exploration Manager	

#### 4.6. EIS Structure

The EIS is prepared in accordance with the template provided in Annex 4 of the Diploma Ministerial No.46/2017 of 2nd August. Hence, this EIS contents contain:

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

## 5. Policy, Legal and Institutional Framework

### Environmental Institutional:

- Constitutions of the Republic Democratic of Timor-Leste Article 61 (Environment)
- Decree Law No. 26/2012 on Basic Environmental Law
- Environmental (Licensing) Decree Law No.5/2011
- Decree Law No. 5/2016 – National System of Protected Areas (Annex 1 – List of Timor-Leste Protected Areas)
- Diploma Ministerial No.44/2017 – Impact Benefit Agreement
- Diploma Ministerial No.45/2017 – Rules and Procedures of the Evaluation Committee for Project with Category A
- Diploma Ministerial No.46/2017 – Detail requirements of Classification, Initial Assessment and Terms of Reference, Environmental Impact Statement and Environmental Management Plan
- Diploma Ministerial No.47/2017 – Public Consultation Procedure and Requirement during Environmental Baseline Process
- International Finance Corporation Standard Performance
- United Nations Convention on Biological Diversity (UNCBD)
- United Nations Framework for Climate Change Convention (UNFCCC)
- IADC Guidelines
- Health Safety Executive Guidelines
- Western Australian Department of Mines and Petroleum “Guidelines for the Development of an Onshore Oil Spill Contingency Plan 2016”
- Ministry of Environment Decree number 48/11/1996 Indonesia

### Forestry, Aquaculture and Fishing Legislation

- Law No. 14/2017 – General Regime of Forestry
- International Union for Convention of Nature (IUCN)

### Cultural Heritage Legislation

- Government Resolution No.25/2011 – Protection of Cultural Heritage (Annex 4)
- UNESCO Convention on Natural and Cultural Heritage

### Noise and Vibration Standards and Regulation

- WHO guideline for community noise

### Air Quality Guidelines

- WHO Air Quality Guidelines

**Climate Change**

- Kyoto Protocols
- Government Resolution of National Action Plan for Climate Change
- United Nations Framework Convention on Climate Change

**Water Resources**

- WHO 2008 Guideline for Drinking Water Quality

**Labor Legislation**

- Law No. 4/2012 – Timor Leste’s Labor Code

**Land legislation**

- Law No. 13/2017 - Especial Regime for the Definition of Land and Property

**Waste Management**

- Decree Law No.33/2008 – Hygiene and Public Order
- Decree Law No. 2/2007 – Urban Residual Waste Management



## 6. Description of the environment

### 6.1. Physical components

#### 6.1.1. Climate

Timor-Leste is typical tropical country with every part of the regions experience monsoonal climate with distinct wet and dry seasons. The wet season typically runs from December to April, and dry season is from May to November and within the regions, seasonal temperature is varied with diurnal temperature often greater than seasonal. The average high temperatures range from 24°C in dry season to 26.3°C in wet season (World Bank, 2017)

The climate temperature in Timor-Leste is driven by the West Pacific Monsoon and its rainfall largely regulated by the Asian Monsoon, such as El Niño, La Niña, Indian Ocean Dipole (IOD), Madden-Julian Oscillation (MJO), altitudinal and coastal effects; and these Asian-West Pacific Monsoon have been associated with the variability of inter-annual rainfall and dry season rainfall as well as the huge temperature difference between the land and ocean (UNDP, 2013). The effect of this Asian-West Pacific Monsoon is varied within every part of the region within the country.

##### 6.1.1.1 Temperature

**Error! Reference source not found.** shows the annual mean temperature of Timor-Leste, which varies in every part of the region within the country. The mean temperature ranges from < 21°C to >27°C, it is higher on the coastal areas with temperature greater than 27°C and decreases towards highland areas, which less than 21°C. The minimum temperature is usually occurred during the month of July and August, maximum temperature would be experienced during the month of October to December (UNDP, 2013).

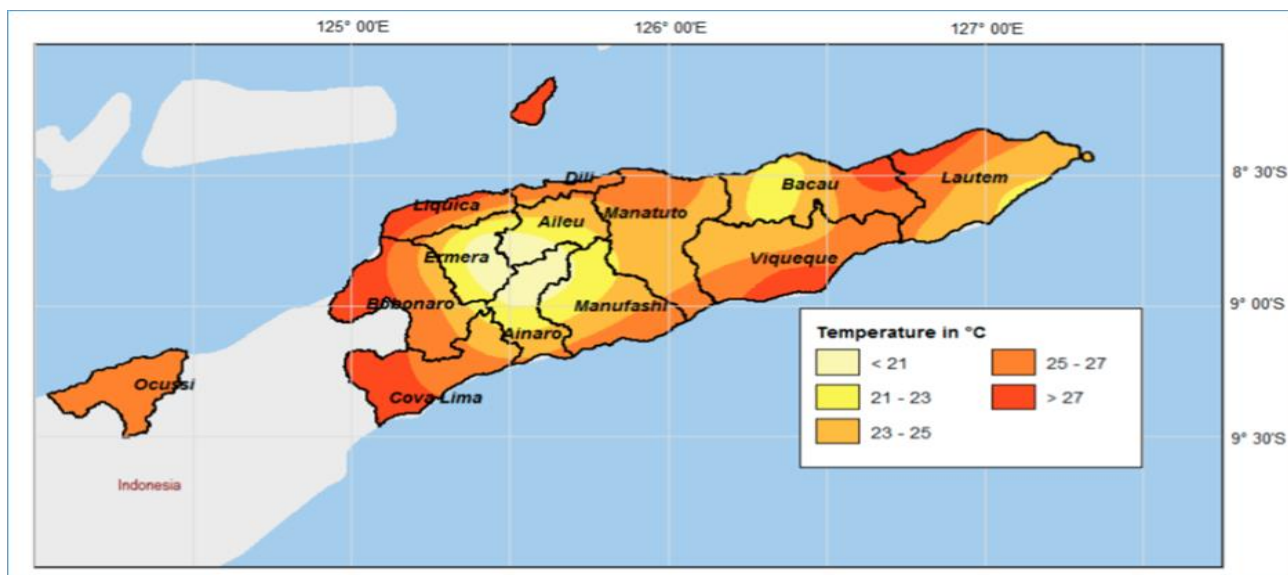


Figure 10. Annual Average Temperature of Timor-Leste (UNDP, 2013)

### 6.1.1.2 Rainfall

Likewise, the rainfall distribution is also varied within the country; the mountainous areas receive more rainfall about more than 2,500 mm/year. On the other hand, those on the coastal areas, especially on the northern sides receive fewer amount of rainfall about less than 1,000mm/year (UNDP, 2013). See

Figure 11 for the map of rainfall distribution throughout the country. The map shows that Covalima on the southern side of the country receives more and intense rainfall than those on the northern side, the rainfall ranges from 500 mm to greater than 2,000mm per year.

The northern and southern side of the country receive uneven rainfall throughout a year period. The Northern part is characterized by a single rainfall season, which has its raining season starts from December to April/June with a peak rainfall on December or January. In contrast, the southern sides of the country have bimodal rainfall patterns, which has its rainfall period last for seven to nine months and its dry season last only for three to five months. The southern sides of the country experience two rainfall peaks, which are from December-to-January and from May-to-June. Additionally, the country has high rainfall intensity during Northwest Monsoon period and low rainfall intensity during the Southeast Monsoon Period (UNDP, 2013).

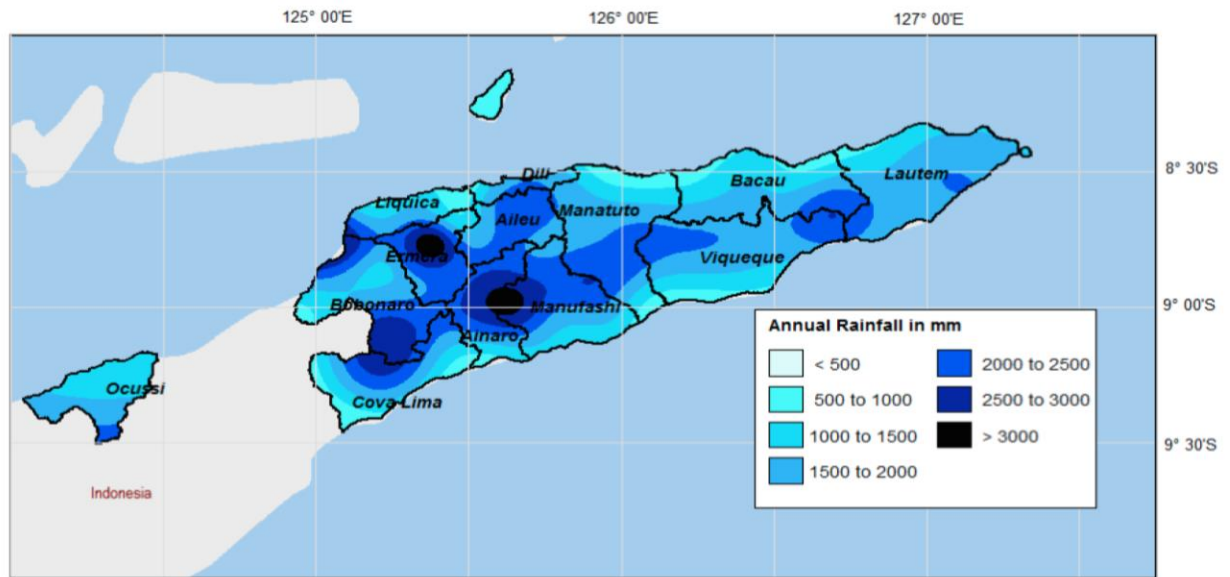


Figure 11. Annual Rainfall Distribution in Timor-Leste (UNDP, 2013)

Further, Table 3 and Table 4 below show meteorology data taken from the proposed project areas for the following parameters, temperature, relative humidity (%) and wind speeds. The data of these parameters were particularly taken from Kumbili and Karau wells site areas in September 2019.

Table 3. Meteorology Data at AAQ1 at Kumbili Well Site

No.	Description	Results	Unit
1	Temperature	37.5	°C
2	Relative Humidity	47.9	%
3	Wind Speed minimum	1.0	m/s
4	Wind speed maximum	1.5	m/s
5	Wind direction	-	-
6	Pressure	748.5	mmHg

Table 4. Meteorology Data at AAQ2 at Karau Well Site

No.	Description	Results	Unit
1	Temperature	38.5	°C
2	Relative Humidity	48.5	%

3	Wind Speed minimum	0.5	m/s
4	Wind speed maximum	1.2	m/s
5	Wind direction	-	-
6	Pressure	749.5	mmHg

The day temperature shown above at the two sites, Kumbili and Karau Wells are about 37.5°C and 38.5°C with humidity of 47.9% and 48.5% respectively; and a mild wind with speed about 0.5m/s to 1.5 m/s within the two well sites areas and air pressure of 749.5 mmHg.

In addition to these two-meteorology data, further studies were taken in October 2019 within the five Wells site. The meteorology data, nonetheless, are focused only for temperature, relative humidity (%) and wind speed. The wind speed is described in the next Section 6.1.4. Air and Noise. The data are recorded on hourly basis. There are maximum of six sample points within studies areas depending on environmental conditions of the well sites, for instance Laisapi (six sample points), Kumbili (four sample points), Karau (two sample points), Lafaek (three sample points) and Raiketan (four sample points).

**Table 5. Karau Air Temperature and Relative Humidity**

Location	Time	Temperature (°C)	Relative Humidity (%)
KAQN1	8:25	27.4	65.8
	17:04	35	52.6
KAQN2	8:51	31.2	55.3
	17:18	32.3	58.7

Table 6.Kumbili Air Temperature and Relative Humidity

Location	Time	Temperature (°C)	Relative Humidity (%)
KmAQN1	6:19	26.1	73
	10:21	34.2	49.4
KmAQN3	6:31	26.1	73
	10:07	32.6	53.5
KmAQN4	10:18	31.2	61
KmAQN5	12:01	32.5	61.2

Table 7.Laisapi Air Temperature and Relative Humidity

Location	Time	Temperature (°C)	Relative Humidity (%)
AQN1	6:59	25.8	65.6
	9:53	33.6	54.3
	2:19	34.1	53.8
AQN2	7:17	28.8	57.3
	2:46	34.4	50.4
AQN3	7:40	28.8	56.4
	2:46	34	50.4
AQN4	8:30	27.5	64.2
AQN5	10:40	31.4	52.5
AQN6	1:15	36.1	48.2

Table 8.Lafaek Air Temperature and Relative Humidity

Location	Time	Temperature (°C)	Relative Humidity (%)
AQN1	9:39	34.1	49
AQN2	9:56	33.3	50.4
AQN3	10:20	33.7	52.2

Table 9.Raiketan Air Temperature and Relative Humidity

Location	Time	Temperature (°C)	Relative Humidity (%)
RAQN1	10:58	32	61.4
RAQN2	10:42	29.7	66
RAQN3	15:10	35.8	53.5
RAQN4	16:46	30	62.2

The temperature recorded at five Wells site from Table 5 to Table 9 is within the range from 26 °C to 36 °C; and with relative humidity within the range from 40% to 75%.

### 6.1.1.3 Cyclones

Timor-Leste has a tropical cyclone effect that usually occurs in the Timor Sea from November to April. This tropical cyclone is characterized by very strong winds and driving rain with high waves and storm surges; and accordingly, the tropical cyclone activity at the Timor Sea is lower during El Niño period and higher during La Niña years.

Figure 12 shows the tropical cyclones pattern nearby the Timor Sea (NAPA, 2010). During the tropical cyclones of El Niño cycle, the country experiences less rainfall, short wet season (usually cause drought) and rainfall is concentrated on February – March; in contrast, the tropical cyclone of La Niña cycle causes the country to have more rainfall annually, longer wet season and more rainfall on dry season, which sometimes result in flooding and landslide (DNMG, 2017).

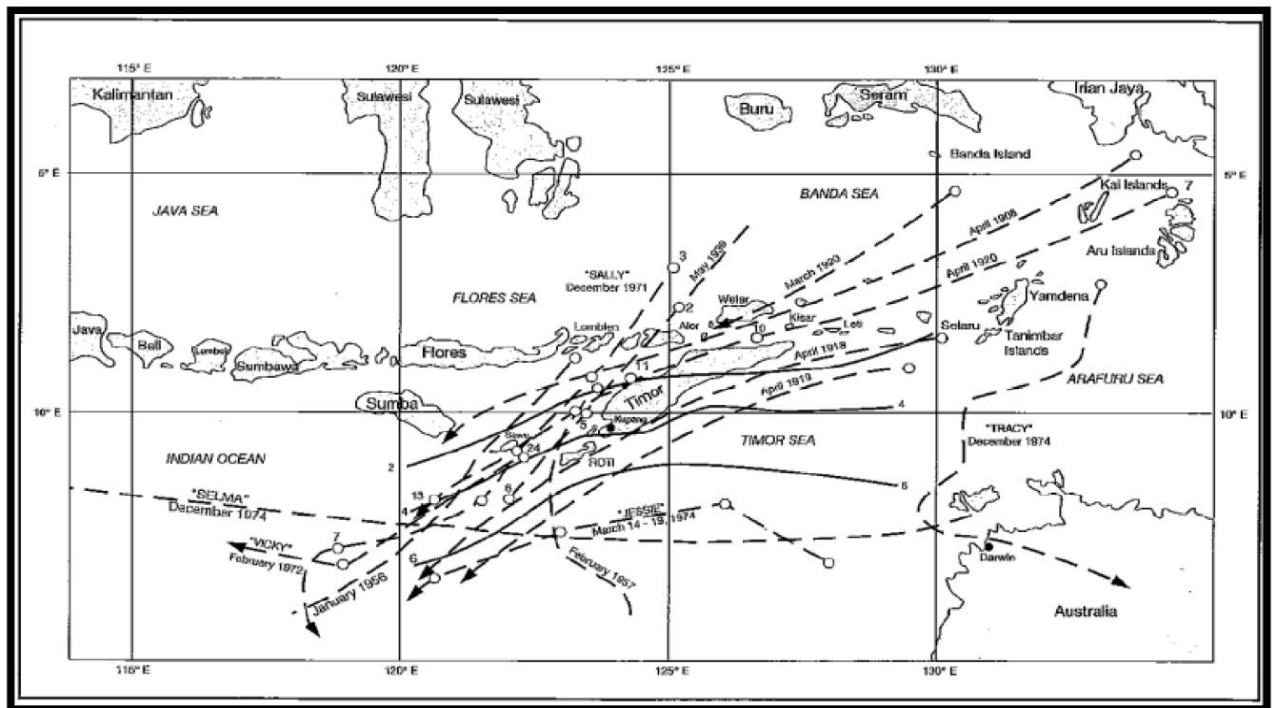


Figure 12. The Tropical Cyclone Patterns in Timor-Leste (NAPA, 2010)

Furthermore, PACCSAP (2011) stated that, there is a record of 31 tropical cyclones passed within about of 400km of Dili in 41-year period between 1969 and 2010. Figure 13 shows the number of tropical cyclones experiences by the country between 1969 and 2010, the

purple line refers to the 11-year moving average of the cyclones, which is about one cyclone per season.

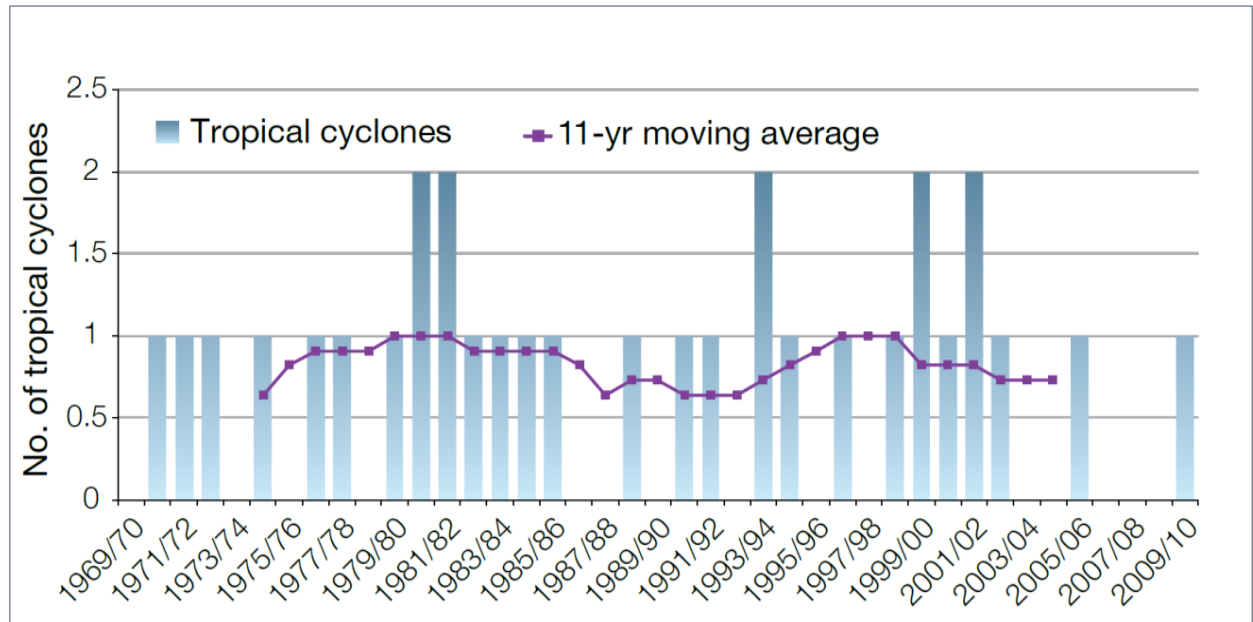


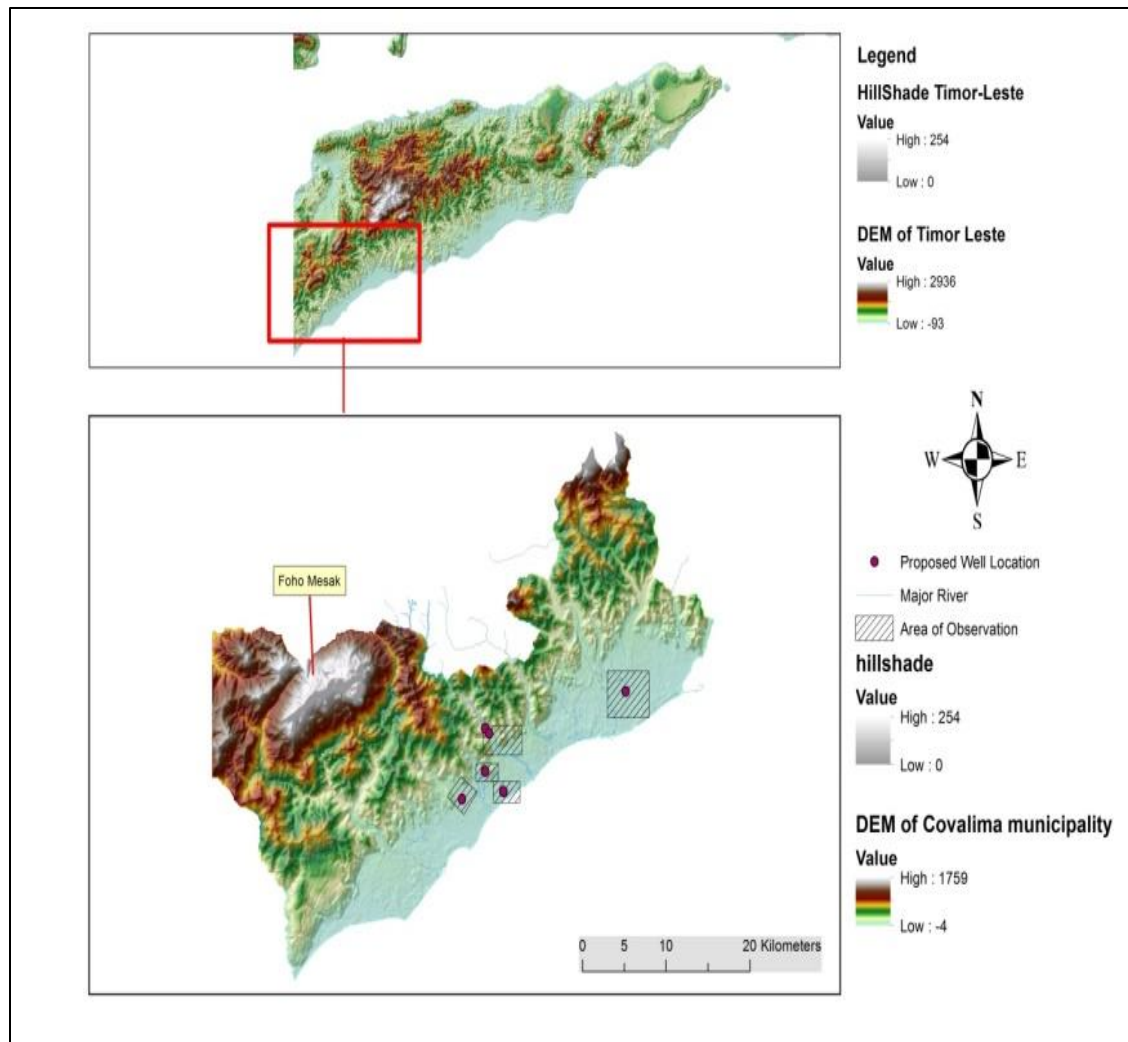
Figure 13. The Tropical Cyclones Experiences nearby the Country (Dili) in 41-Year Period Between 1969 and 2010 (PACCSAP, 2011).

### 6.1.2. Topography

About one third of Timor–Leste’s topography is mountainous. Highlands region are mainly concentrated in the Tatamailau Mountains area with the highest peak of Mount Ramelau with elevation of 2,936 m (

Figure 14). The highland region on averages rises more than 2,000 m above sea level and stretched from east to west.

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



**Figure 14. Topography of Suai Municipality created based on DEM Data**  
(Source: SMC, 2020)

Located at the southern coast of Timor (Covalima municipality), all the proposed well location situated on the lowland region bounded to the north by mountainous region with the highest peak called Foho Mesak (*Mount Mesak*) near the border between Timor-Leste and Indonesia (

Figure 15).

#### 6.1.2.1 Topography of Karau Well

The proposed Karau well is located at the relatively flat terrain with the elevation varied from 25 m in the central point to 50 m further North (



Figure 15). The highest elevation in this area is around 75 m near the Suai Referral Hospital.

### 6.1.2.2 Topography of Kumbili Well

Similarly to Karau, Kumbili well is located in the flat terrain with the elevation ranging from 0-25 meter (

Figure 15). Structural hills are located further inland about 2-3 Km away from the proposed well location

### 6.1.2.3 Topography of Lafaek Well

The proposed location is situated at the valley of the hills in the East/Southeast and North (75m) (

Figure 15). Further north, there are a few steeper hills with elevation reaching 250m above the sea level. The proposed well location is located about 900m away from the Suai-Zumalai expressway.

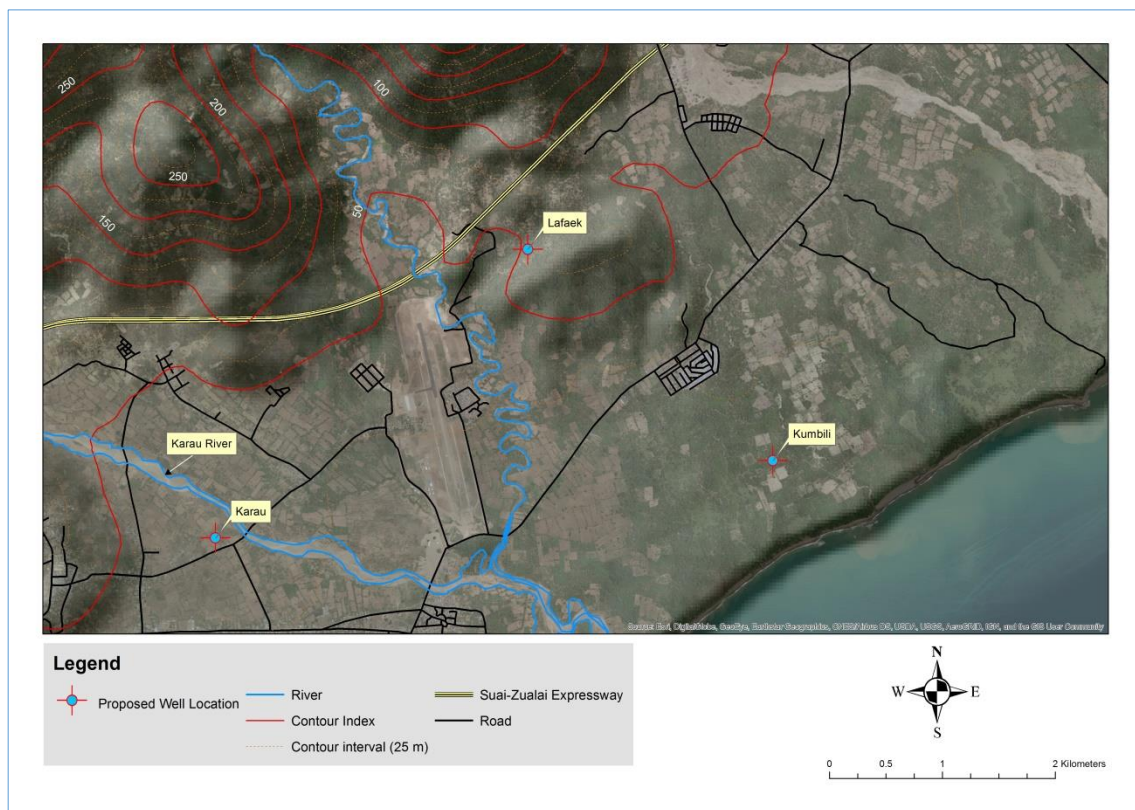
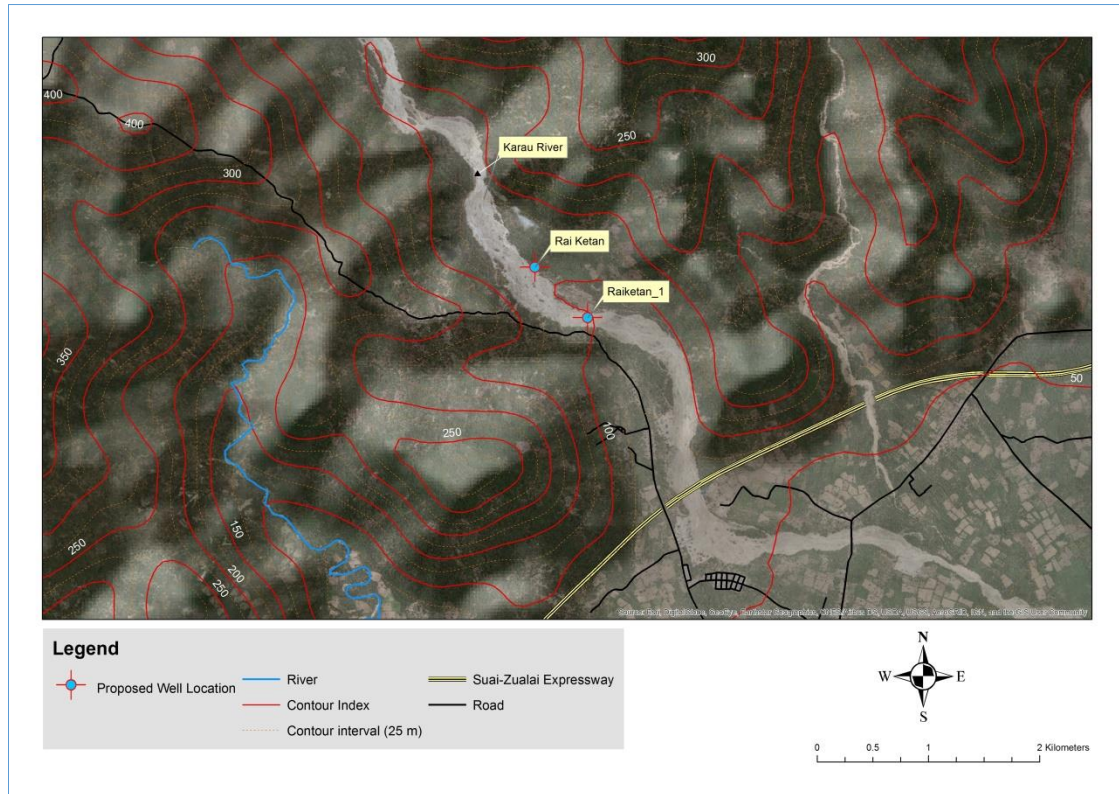


Figure 15. Topographic Map of the proposed Well Karau, Lafaek and Kumbili

### 6.1.2.4 Topography of Raiketan Well

The proposed well location is located along the river bank with hills on the East, West and Northern side (Figure 16). However, the current location might be shifted to southwest by 500m depends on civil engineering study and environmental recommendation. The general elevation on the central point is 125 m above the Mean Sea Level (MSL). At the eastern side of the well location, the highest point is 175 m above the MSL. The highest point in the western side is 250 m above MSL.



**Figure 16. Topographic Map of the proposed Raiketan Well**

#### 6.1.2.5 Topography of Laisapi Well

The proposed location for Laisapi well is located at a relatively flat terrain near the paddies field with the elevation ranging from 0 - 25 above the Mean Sea Level (

Figure 167). The drilling location is bounded to the South by the Aldeia Kuluoan within Suco Tashilin. The proposed location of Laisapi well is at approximately 750 m west of Mola Ain River.

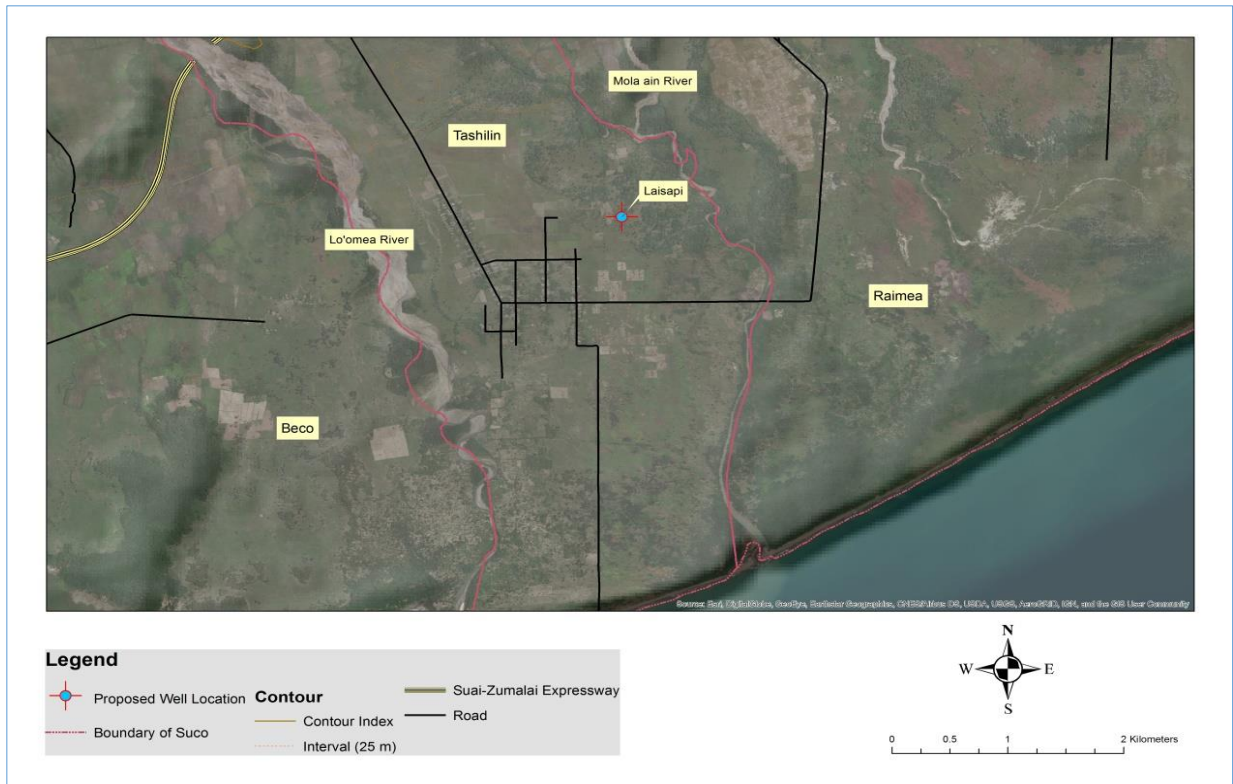


Figure 17. Topographic Map of the proposed Laisapi Well

### 6.1.3. Geology

#### 6.1.3.1 General Geological Overview

Timor Island is located at the outer part of Banda Arc (Figure 18) where it was accreted due to the Neogene collision between the Australian Passives margins with the Banda Volcanic Arc (Harris, Long, & Dilek, 2000). The Nature of the collision led to the structural complexity in the island and often become a subject of debate on the age and origin of different units.



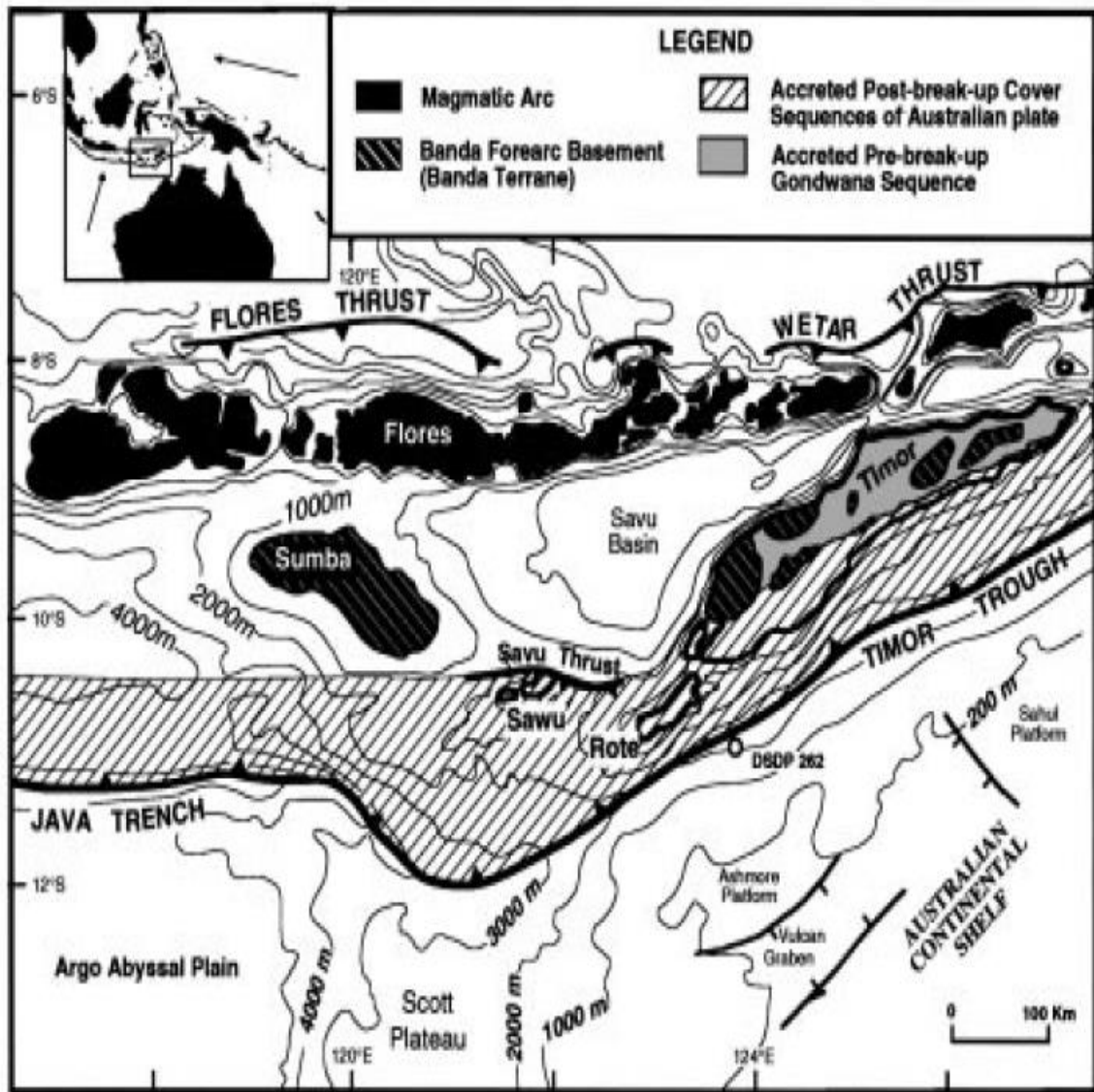


Figure 18.: simplified tectonic map of Western Banda arc including the islands of outer Banda arc such as Timor, Savu and Sumba islands (taken from Harris et al. (2000))

Stratigraphically, Timor-Leste is divided into five big units based on its age and origin (Haig et al., 2008). The oldest stratigraphic units exposed in the island are from pre-rift Permian to middle Jurassic basin sediments known as Gondwana Mega sequence. It was deposited when Australia was still part of Gondwana Supercontinent (Elly, 2009). The sequence was separated from the post-rift Australian Margin Sequences by the Jurassic breakup unconformity associated with the breakup of Gondwana Continent. These sequences were deposited during the late Jurassic to early Late Miocene.

Overlying these sequences is synorogenic mélange often known as the Bobonaro Scaly Clay (Audley-Charles, 1968). It was deposited due to the onset of collision between the Australian passive margins with the volcanic arc of Asian plate. The collision also resulted in the thrusting of older units and emplacement of series of thrust sheets known as Banda terrane of the Asian affinity units. The youngest unit is the undeformed synorogenic megasequence deposited during the emergence of Timor dominated by the Viqueque Formation Turbidites.

### 6.1.3.2 Geology of the proposed well location

All five drilling locations are located on Suai basin, a synorogenic basin of late Miocene to recent age (Figure 19). The basin itself lies unconformably above the Timor thrust belt. Origin of the basement rock itself however, is somewhat contradictory due to different interpretation of Lolotoi Metamorphic Complex.

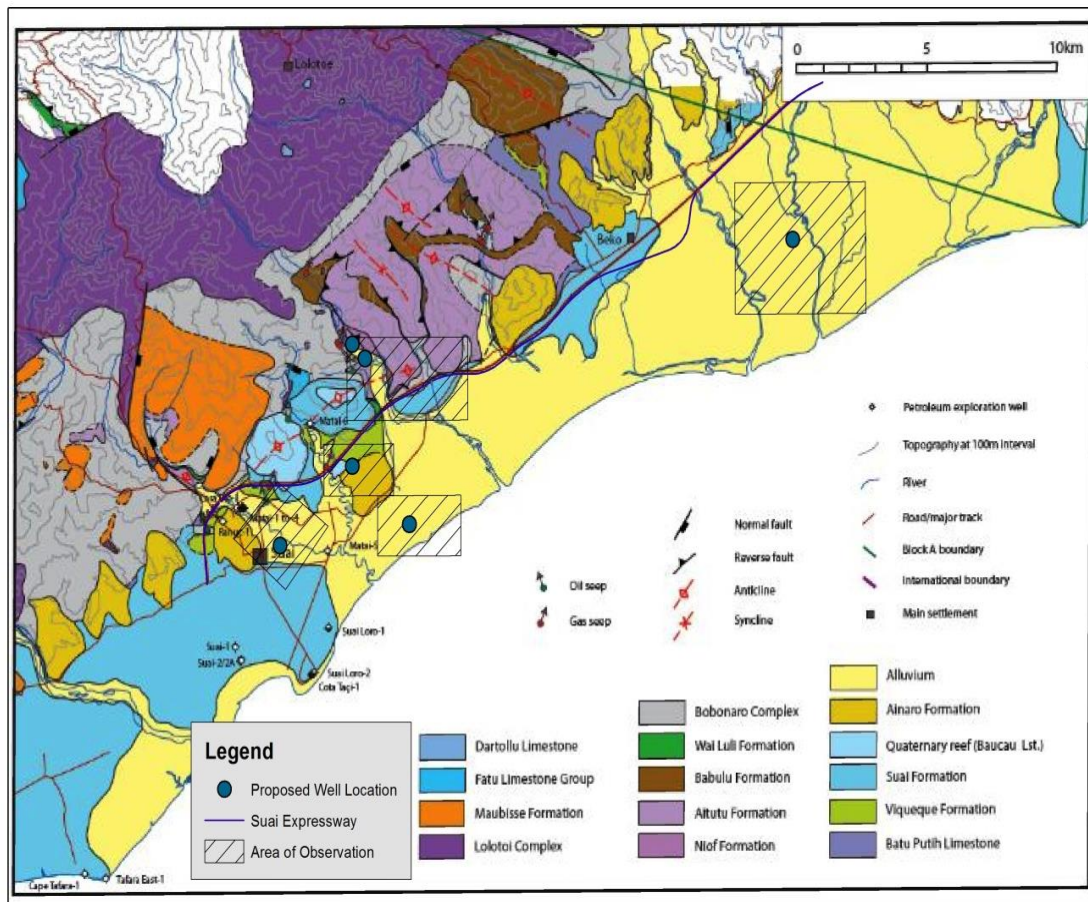


Figure 19. Geological map of Suai Basin taken from (Timor Gap, 2019)

In terms of local geology, Karau, Kumbili and Laisapi are covered on the Surface by recent Alluvium sediments. The main source of sediments in this area is coming from the mountainous region to the north transported by a few braided rivers.

Raiketan well on the other hand is located above the river terrace but Bobonaro Scaly clay outcrops and Aitutu Formation can be seen in the nearby creek across the river of the proposed well location. Further north, the proposed Raiketan well is bounded by a series of reverse fault that thrusting the Babulu formation above the Aitutu Formation (*Figure 12*). In Lafaek Well location, dominant Lithologies are of the Ainaro Formation a poorly sorted pebbles conglomerate and quaternary reef Baucau Limestone.

#### **6.1.3.3 Stratigraphic Description**

The stratigraphic descriptions of common lithology found in the proximity of the proposed well locations are described below:

- **Maubisse Limestone**

Maubisse Formation consist of massive grey limestone weathering dark red, containing plentiful ammonites, crinoids, and other fossils and interbedded with thick basalts and mafic volcanoclastics. Maubisse Formation is mainly Permian in age (Charlton *et al.*, 2002) but a few section was dated to be upper carboniferous (Haig *et al.*, 2013).

- **Atahoc and Cribas Formation**

Atahoc Formation consists of black shales and silty shales containing common ironstone and claystone nodules and occasional siltstones and sandstones. Cribas Formation present similar lithology to Atahoc formation and both are separated by the amygdaloidal basalt in its type of localities.

- **Aitutu Formation**

Aitutu formation is highly folded and interbedded shales in cm scales with occasional limestone. Aitutu formation observed in this area is in contact with the Bobonaro Scaly Clay upstream.

- **Wailuli Formation**

Wailuli Formation consists of Fissile dark-grey shale weathering tan with intermittent siltstones and fine sandstone. Lower contact between Wailuli Formation and older Aitutu Formation is marked by five to ten 5 cm thick grey calcarenites with fine tan shales interbedded.

- **Bobonaro Scaly Clay**

Bobonaro Scaly clay is a tectonic mélange of a poorly sorted block in a clay matrix. Close observation in this area indicates various sizes of the blocks and originate from different stratigraphic unit found in Timor. The clay matrix on the other hand, is sourced mainly from the Wailuli formation (Keep & Haig *et al.*, 2009).

- **Viqueque Formation**

Lower part of Viqueque formation consists mostly of marls, claystone and limestone with two or possibly more tuff beds. Upper part of Viqueque Formation consists of siltstone and sandstones with the presence of graded bedding.

- **Baucau Limestone**

Baucau limestone is a hard, cavernous and massive coral reefs weathered pale grey. The age of Baucau limestone is younger than the late Pliocene folding that affected Viqueque Formation below.

- **Suai Formation**

Mostly unconsolidated sediments mainly of arenites ranging from pebbly gravels to fine silt.

- **Ainaro Formation**

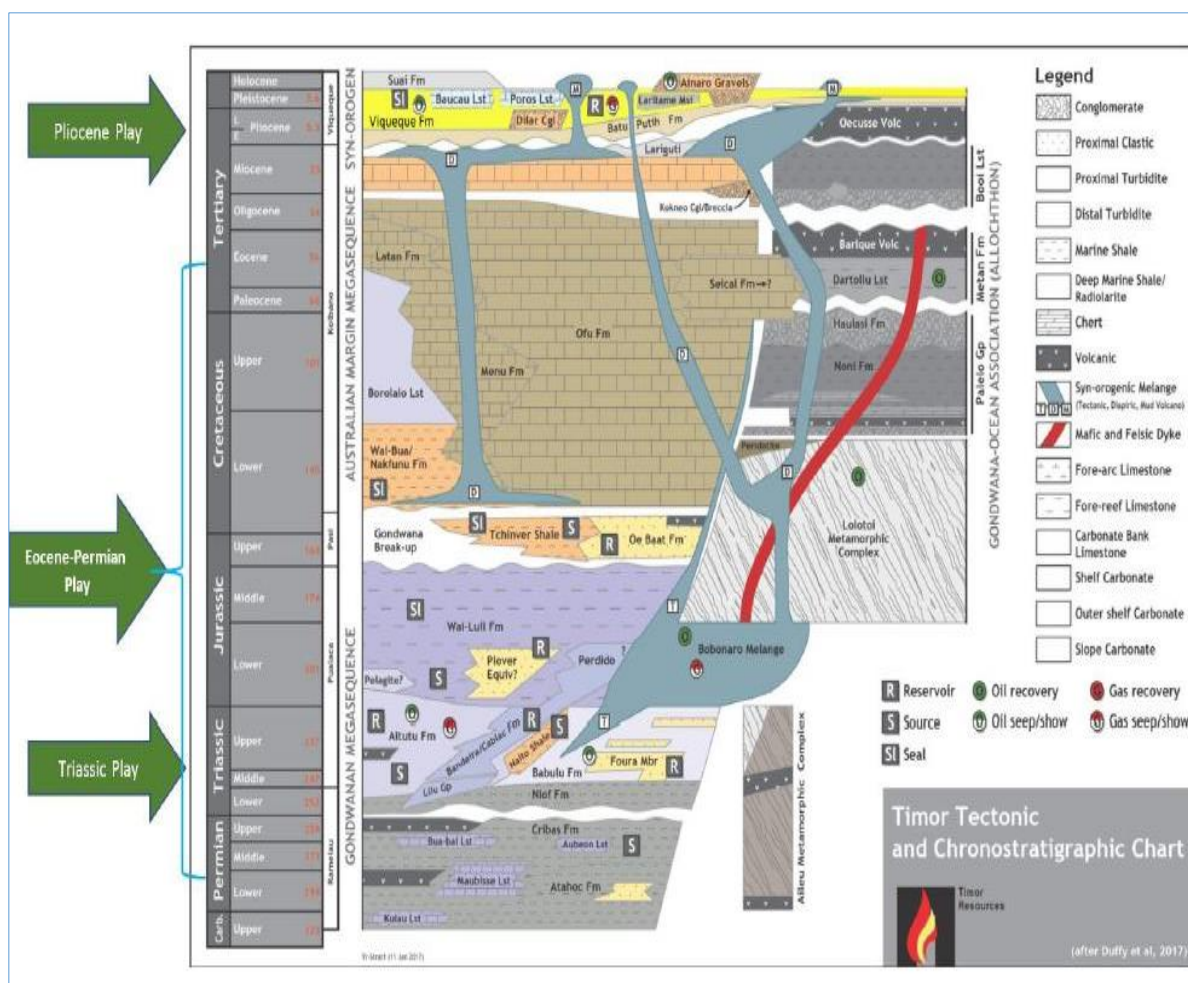
Ainaro gravels rest unconformably on various older formation in Timor. The characteristics of this formation are boulders to pebbles conglomerate, silts and sands with crossbedding structure.

#### **6.1.3.4 Petroleum System to be tested**

The Main objective of this exploratory drilling is to test three type of play:

- a. Pliocene to Pleistocene age Viqueque Formation, Synorogenic basin
- b. Lower allochthon (Permian-Eocene)
- c. Triassic-Jurassic age Babulu/Aitutu and Wailuli Formation located beneath regional overthrust





#### 6.1.4. Air and Noise

The air quality and noise measurement were done to get the status of the air and noise status surrounding the proposed exploratory drilling locations and their nearby important features including anthropogenic activities.

The surveillance was methodologically designed to determine the impacts assessment of the environment air quality. There were considerations giving to determine the air quality sampling and noise measurement locations in order to ensure the surveillance was appropriately conducted and the sample was taken would represent the general environmental features around the well locations. To obtain optimal features of the air quality data around the project sites, the following aspects were considered during the surveillances:

- Topography and micrometeorology of the well locations
- Sampling frequency
- Density of the populations and
- Density of traffics
- Human activities
- Important environmental features such as schools, chapels and health facilities
- Industrial and other domestic activities in relation to the socio-economic conditions.

The air quality and noise data were taken using Air Sampler Impinger, Sound Level Meter (SLM) and Portable Particle Counters. Some of those samples were sent to Global Analytical Laboratory in Indonesia for further testing and analyzing, especially those were taken using the Air Sampler Impinger.

The air quality sampling and noise measurements were done mostly on the well sites and within the radius between 100 and 4000 meters from the well locations. The sampling and monitoring were conducted during daytime between 0600 hours to 1700 hours with sampling frequencies every 3 – 4 hourlies.

The air quality data are collected during daytime around the proposed project studies areas. The data presented solely showing measurement of day light air quality condition; in which then can be used for a direct and immediate data analysis against the identified threshold within this EIS. Unlike the daytime air quality measurement, the air quality for night hours measurement was unable to be collected due to the short timeframes of the survey. Nevertheless, it implies that the measurement of the air quality may have to be reported in the first period of required on 6-monthly EMP report. The monitoring of the air quality during day and night hours carried out during drilling campaign and data will be recorded and analyzed to ensure that the field air data measurement is within the required threshold as per WHO Guidelines.

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#### 6.1.4.1. Air Quality

The air quality in all well sites is relatively varied between PM<sub>10</sub> and PM<sub>2.5</sub>. Number concentration of particles on the daily value of the PM<sub>2.5</sub> concentration varied between 303 µg/m<sup>3</sup> and 572 µm/g<sup>3</sup> and of the PM<sub>10</sub> µm concentration varied 24 µg/m<sup>3</sup> and 36.1 µg/m<sup>3</sup>. The particulate matter between PM<sub>2.5</sub> µm < PM<sub>10</sub> µm. PM<sub>10</sub> µm showed clear patterns with a steady concentration without further changes comparing to PM<sub>2.5</sub> µm which is slightly increased between 07:40 and 14:46 with a minimum concentration as low as 303 µg/m<sup>3</sup> and increased to a maximum concentration of 572 µg/m<sup>3</sup>.

There were two monitoring sites identified within the study areas using Air Sampler Impinger. These were AAQ1 (Kumbili Well) and AAQ2 (Karau Well) as shown in the Table 11 and Table 10.

Gas pollutants for Kumbili and Karau Wells were selectively sampled from densely populated and traffic areas.

**Table 10. Ambient Air Quality Monitored at AAQ2 (Karau Well)**

No	Test description	Sample Result	Time sampled	Regulatory Limit	Unit
	Ambient Air Quality				
1	Sulfur Dioxide (SO <sub>2</sub> )	<47.9	1 hr	900/1 hr	µg/Nm <sup>3</sup>
2	Carbon Monoxide (CO)	<185	1 hr	30000/1 hr	µg/Nm <sup>3</sup>
3	Nitrogen Dioxide (NO <sub>2</sub> )	<26.3	1 hr	400/1 hr	µg/Nm <sup>3</sup>
4	Oxidant (O <sub>3</sub> )	<48.3	1 hr	235/1 hr	µg/Nm <sup>3</sup>
5	Dust, Particulate	74.5	1 hr	-	µg/Nm <sup>3</sup>
6	Lead (Pb)	<0.05	1 hr	-	µg/Nm <sup>3</sup>
7	Hydrocarbon (HC)	<4.27	3 hr	160/3 hr	µg/Nm <sup>3</sup>

**Table 11. Ambient Air Quality Monitored at AAQ1 – Kumbili Well**

No	Test description	Sample Result	Time sampled	Regulatory Limit	Unit
	Ambient Air Quality				
1	Sulfur Dioxide (SO <sub>2</sub> )	<47.9	1 hr	900/1 hr	µg/Nm <sup>3</sup>
2	Carbon Monoxide (CO)	<185	1 hr	30000/1 hr	µg/Nm <sup>3</sup>
3	Nitrogen Dioxide (NO <sub>2</sub> )	<26.3	1 hr	400/1 hr	µg/Nm <sup>3</sup>
4	Oxidant (O <sub>3</sub> )	<48.3	1 hr	235/1 hr	µg/Nm <sup>3</sup>
5	Dust, Particulate	69.7	1 hr	-	µg/Nm <sup>3</sup>
6	Lead (Pb)	<0.05	1 hr	-	µg/Nm <sup>3</sup>
7	Hydrocarbon (HC)	<4.27	3 hr	160/3 hr	µg/Nm <sup>3</sup>

In terms of gas pollutants, air quality in Suai region is generally good. However, the particulate matter (PM<sub>2.5</sub>) in all sampling areas showed a very high PM<sub>2.5</sub> concentration. This is evident could be due to the fact that there are several road constructions going on in Suai region. The description of the ambient air quality per well locations is given below:

#### **6.1.4.1.1. Karau Area**

Air quality samplings around Karau well were conducted between radius 125 and 700 meters from the well site. The location of sampling points selected were due to the mostly anthropogenic activities, topography, traffic, wind speed and community dwellings and other environmental factors around the location.

The measurements were conducted in three sampling area close to the proposed well site (Figure 45). Based on these measurements, PM<sub>2.5</sub> was at the range of 160 µg/m<sup>3</sup> to over 200 µg/m<sup>3</sup> which is higher the standard limit (WHO Guidelines, 2010). Pm<sub>10</sub> on the other hand was still below the standard limit with the result range from 36 µg/m<sup>3</sup> to less than 50 µg/m<sup>3</sup> (Table 4).

Table and graphs underneath showing the trends of the air quality over the sampling time within the Karau well location.

During the EBS the temperatures range between 27.4 °C and 35°C in all sampling point locations. A higher temperature was recorded at sampling points KAN3/AAQ2, which

the temperature reached 38.5°C<sup>1</sup>. This measurement was taken independently by PT Global with different parameters for Particulate Matters therefore the result is not included in **Error! Reference source not found.**

Table 12. Air Quality from Study Area near Karau Well

Karau air qualities measured at three different locations						
Location	Time	PM		Temp. (° C)	Relative Humidity (%)	Wind (m/s)
		2.5	10			
KAQN1	8:25	218	36	27.4	65.8	
	17:04	169	14	35	52.6	0.1-2.9
KAQN2	8:51	275	27	31.2	55.3	
	17:18	232	44	32.3	58.7	0.1-2.0

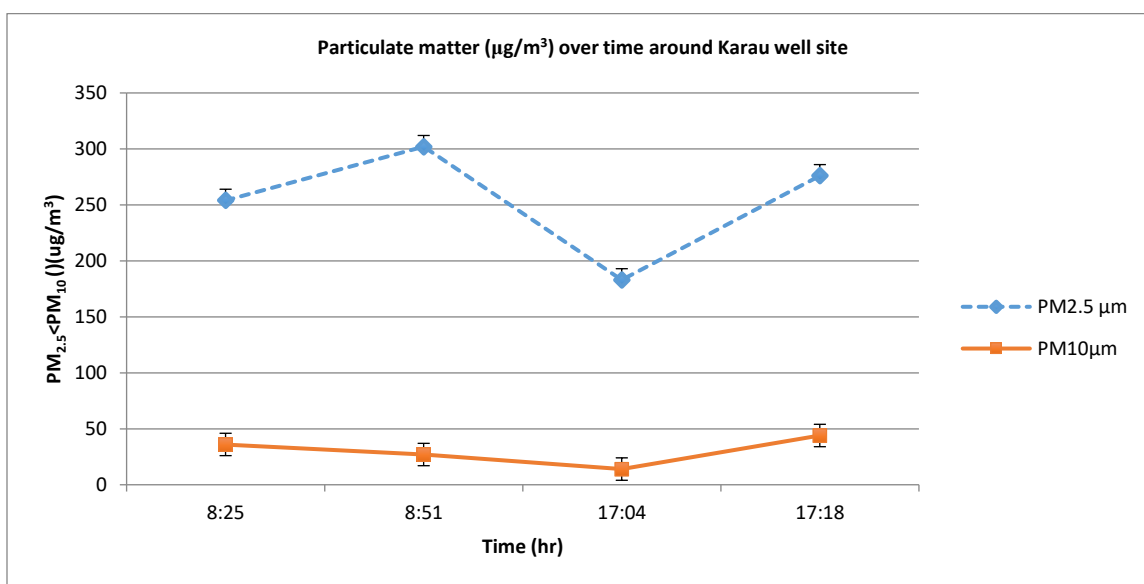


Figure 21. Particulates Matter around the Karau Well

<sup>1</sup> Data from PT Global

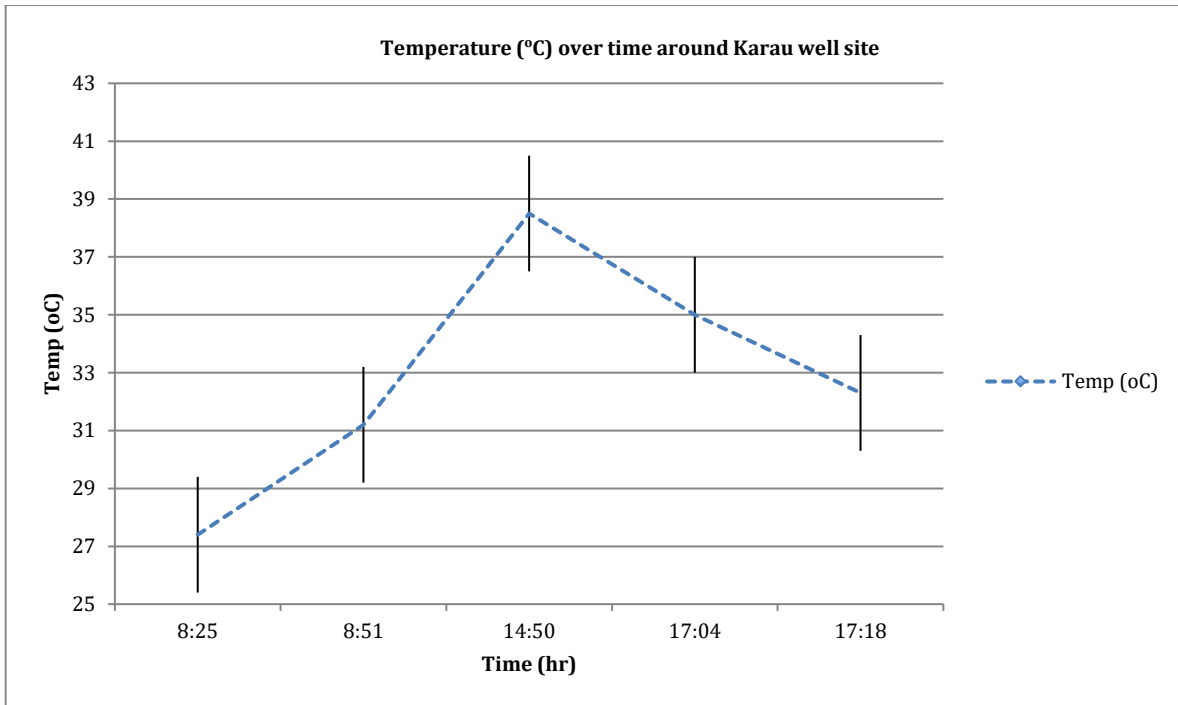


Figure 22. Temperature around the Karau Well

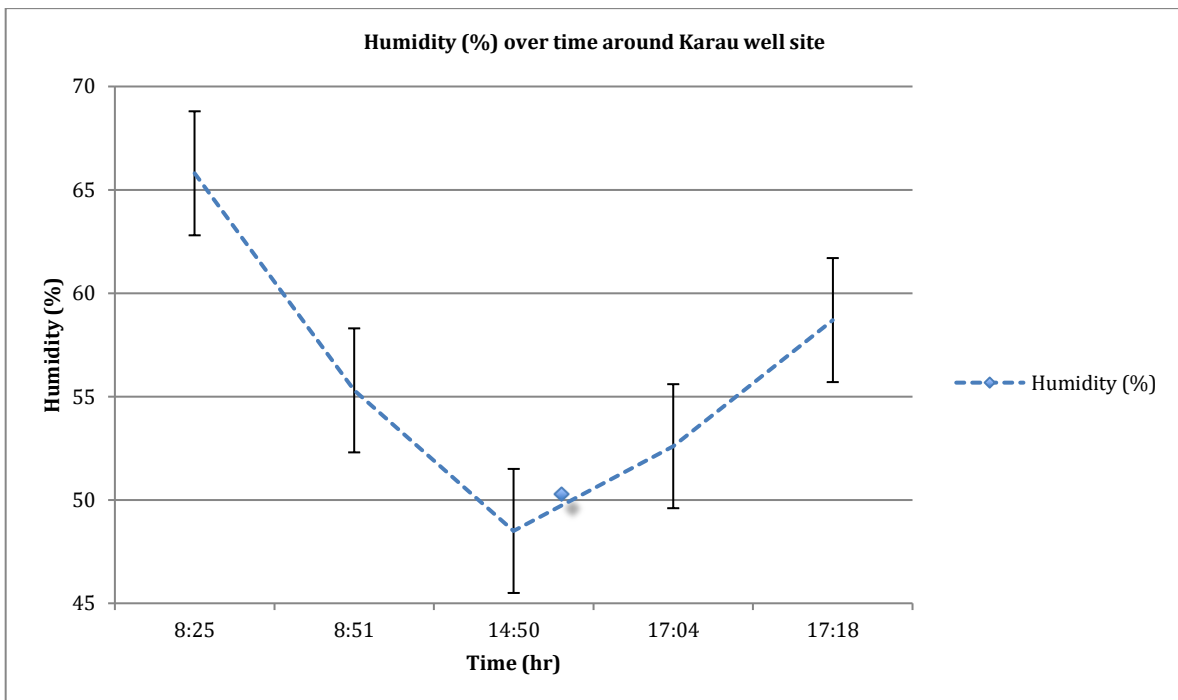


Figure 23. Relative Humidity around the Karau Well

#### 6.1.4.1.2. Kumbili Area

Based on five sampling points close to proposed Kumbili well, PM<sub>2.5</sub> is generally above the standard limit (150 µg/m<sup>3</sup>) in developing country (WHO Guidelines, 2009). PM<sub>10</sub> on the other hand is generally still below the standard limit (WHO Guidelines, 2009). Measured in primary school of Sanfuk about 2.5 Km from the proposed well, baseline particulates of PM<sub>2.5</sub> are at the range of 286 µg/m<sup>3</sup> to 722 µg/m<sup>3</sup> (Table 13). These results indicate higher particulates matter compare to the standard limit. Table and graphs bellow indicate the concentration of the particulate matters, temperature and humidity during the air quality measurements. See Figure 44 for measurement location.

During the EBS the temperatures range between 26.1°C and 35°C almost in all sampling point locations, a higher temperature was recorded at sampling points KmAQN2/AAQ1, which the temperature reached 37.5°C<sup>2</sup>. This measurement was taken independently by PT Global with different parameters for Particulate Matters therefore the result is not included in Table 13

Table 13. Air Quality from the Area around Kumbili Well

Kumbili air qualities measured from five different locations						
Location	Time	PM		Temp. (° C)	Humidity (%)	Wind (m/s)
		2.5	10			
KmAQN1	06:19	497	34	26.1	73	2.3
	10:21	286	24	34.2	49.4	0.0 -0.3
	15:07	255	19	35	52.1	0.0 - 0.5
KmAQN3	06:31	446	42	26.1	73%	0.3-0.5
	10:07	693	127	32.6	53.5	0.0 - 0.3
	14:52	314	39	33.5	57.8	0.0 - 0.7
KmAQN4	10:18	581	68	31.2	61%	0.0-0.3
KmAQN5	12:01	722	101	32.5	61.2	0.0-0.6

<sup>2</sup> Data from PT Global

Graphs below show the number concentration of particles of the  $PM_{2.5\mu m}$  varied between  $69.7 \mu g/m^3$  and  $722 \mu g/m^3$  and of the  $PM_{10\mu m}$  concentration varied between  $24 \mu g/m^3$  and  $127 \mu g/m^3$ . The patterns of particulate matter between  $PM_{2.5\mu m} < PM_{10\mu m}$  showed clear patterns with a very well distinguished peak between 06:19 and 10:07 with a maximum concentration as low as  $34 \mu g/m^3$  and increased to a maximum as higher as  $127 \mu g/m^3$ .

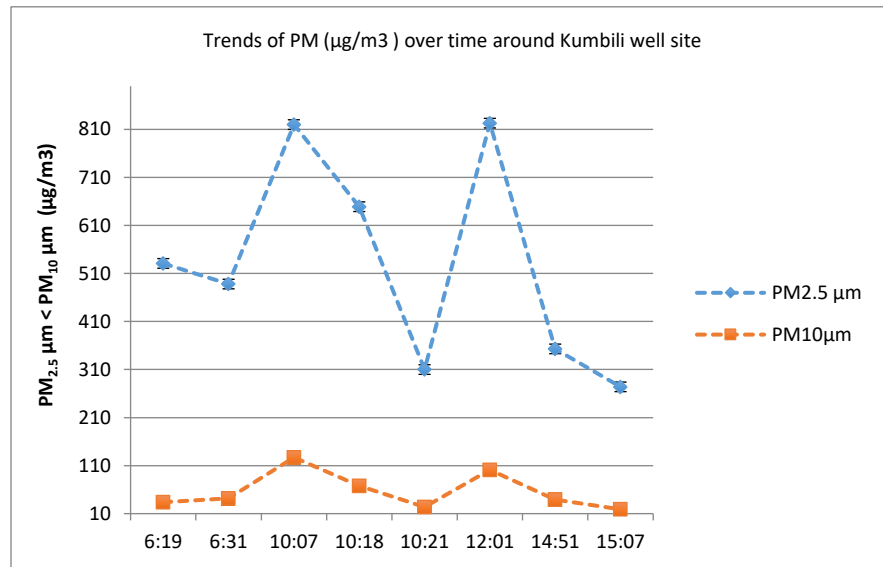


Figure 24. Particulate Matter at and around the Kumbili Well site

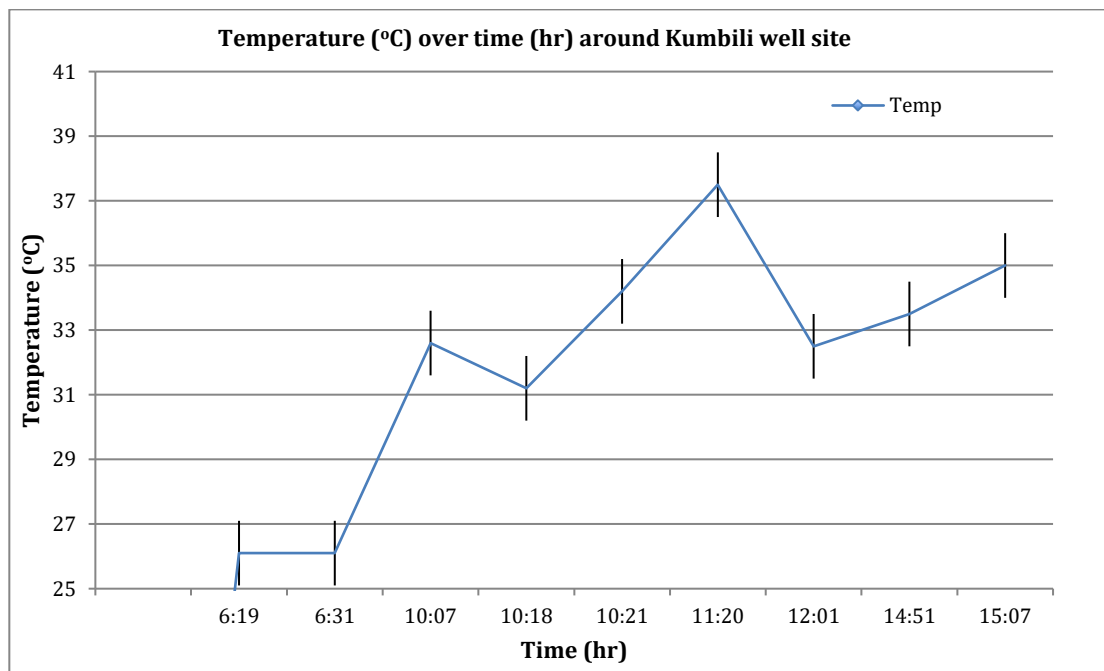




Figure 25. Temperatures at and around the Kumbili Well Site

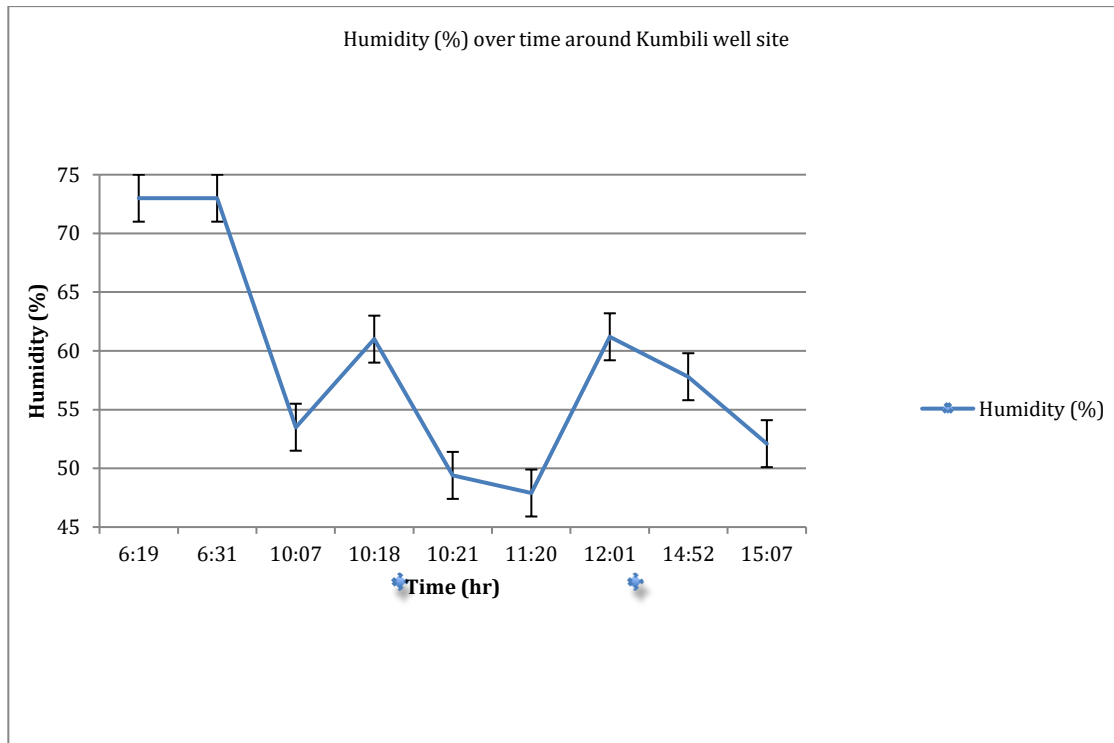


Figure 26. Humidity Percentages at and around the Kumbili Well Site

#### 6.1.4.1.3. Laisapi Area

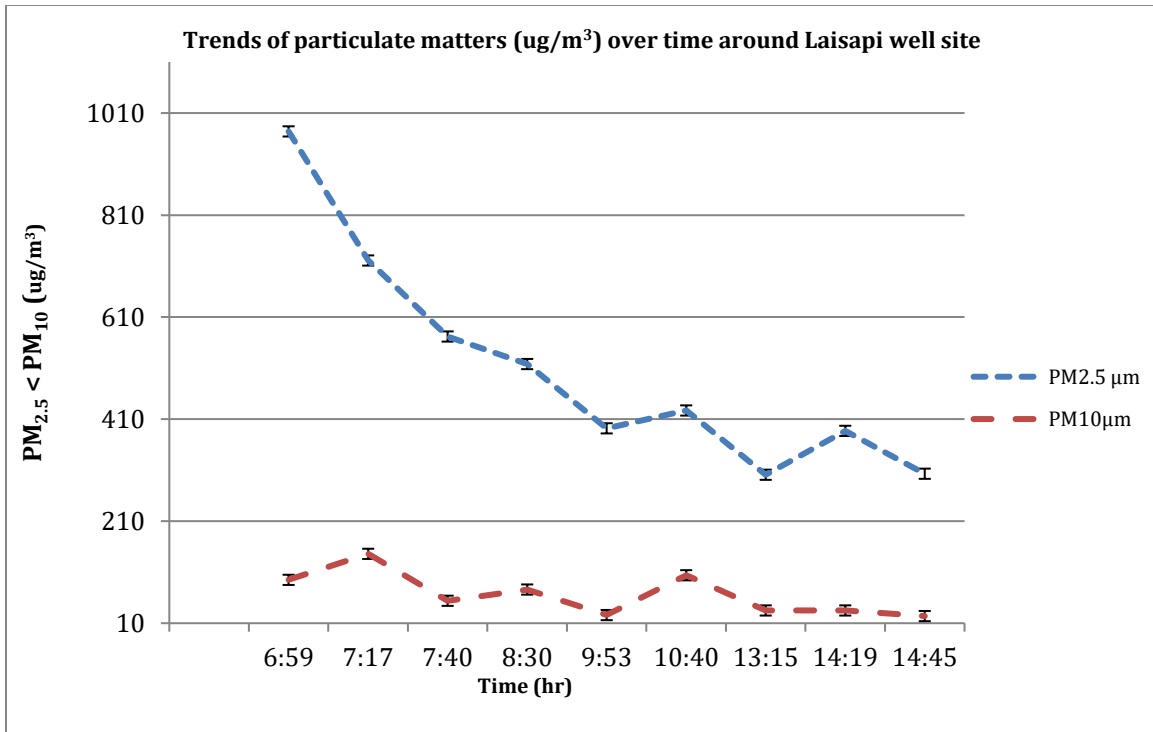
Baseline air quality in Laisapi area was measured in six sampling locations in which one of the sampling point was measured in residential area of Kuluoan and two sampling points were taken in front of the Eskola Basica Central (EBC) Tashilin and EBC Raimea. Three other measurements were taken in central points of the proposed well, end of 1 km transect point and halfway from Kuluoan village and Tashilin. See Figure 47 for measurement location.

Based on these six locations, baseline particulates for PM<sub>2.5</sub> are at the range of 301 µg/m<sup>3</sup> in front of school EBC Tashilin to 974 µg/m<sup>3</sup> at Kuluoan Village (

Table 14). PM<sub>10</sub> on the other hand are at the range of 22 µg/m<sup>3</sup> to 146 µg/m<sup>3</sup>.

**Table 14. Air quality from the Areas close to Laisapi Well**

Laisapi air qualities measured at six different locations						
Location	Time	PM		Temp. (° C)	Relative Humidity (%)	Wind (m/s)
		2.5	10			
AQN1	6:54	974	95	25.8	65.60%	0
	9:53	392	26	33.6	54.30%	0.5-0.7
	14:19	387	35	34.1	53.80%	1-1.8
AQN2	7:17	721	146	28.8	57.3%	0
	14:46	303	24	34.4	50.40%	0.1-2.4
AQN3	7:40	572	54	28.8	56.40%	0
	15:01	382	22	34.4	48.6%	0.1-2.6
AQN4	8:30	518	76	27.5	64.20%	0
AQN5	10:40	427	104	31.4	52.50%	0.1-1.8
AQN6	13:15	301	35	36.1	48.20%	0.1-0.6



**Figure 27. Particulates Matter around the Laisapi Well**

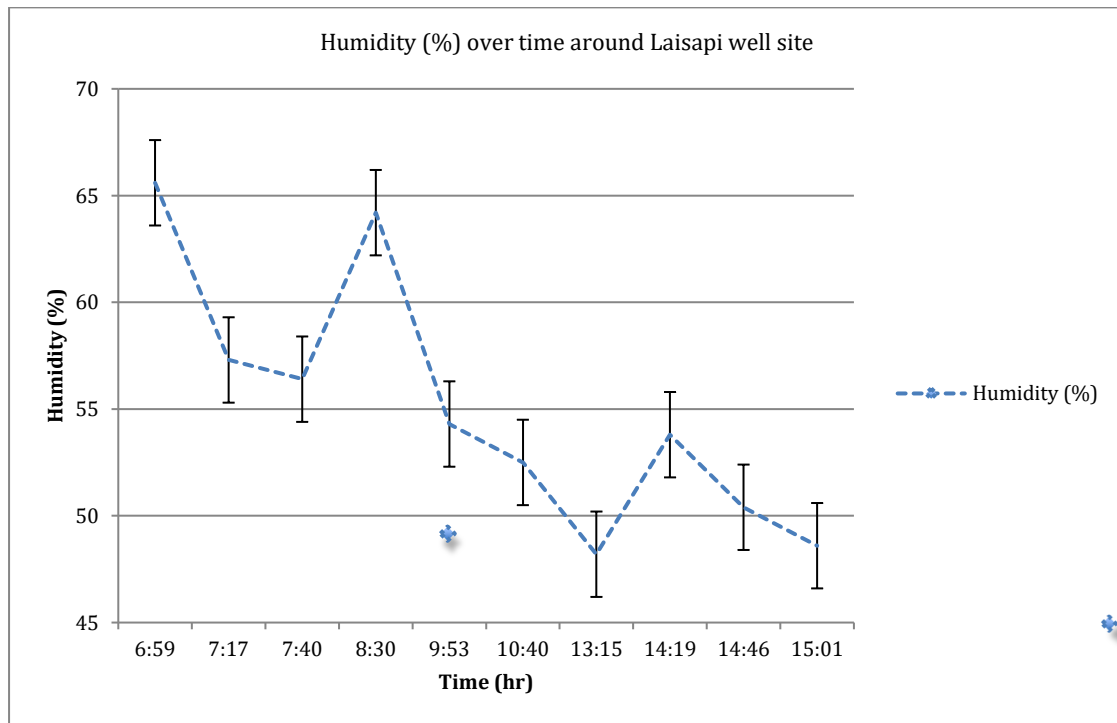


Figure 28. Humidity around the Laisapi Well

#### 6.1.4.1.4. Lafaek Area

Three sampling points were measured for the baseline air quality in this area where two of the measurements were in front of the Holbelis kindergarden and primary school EBF Holbelis and the third one at the central point of the proposed Lafaek area. See Figure 46 for measurement location.

The data shows that at Lafaek studies area the existence of PM<sub>2.5</sub> are much greater than PM<sub>10</sub>. The amount of the PM<sub>2.5</sub> is in the range of 193 µg/m<sup>3</sup> to 327 µg/m<sup>3</sup>, while PM<sub>10</sub> only goes from 19 µg/m<sup>3</sup> to 54 µg/m<sup>3</sup> measured during the 3 hours interval during day light hours. The Lafaek studies area have higher amount of dust fine particles compared to dust coarse particles (Table 15).

Table 15. Air Quality measured around Lafaek Well

Lafaek air qualities measured at three different locations						
Location	Time	PM		Temp. (° C)	Relative Humidity (%)	Wind (m/s)
		2.5	10			
AQN1	9:39	327	54	34.1	49	0.1-1.0
AQN2	9:56	251	43	33.3	50.4	0.1-3.4
AQN3	10:20	193	19	33.7	52.2	0.1-1.8

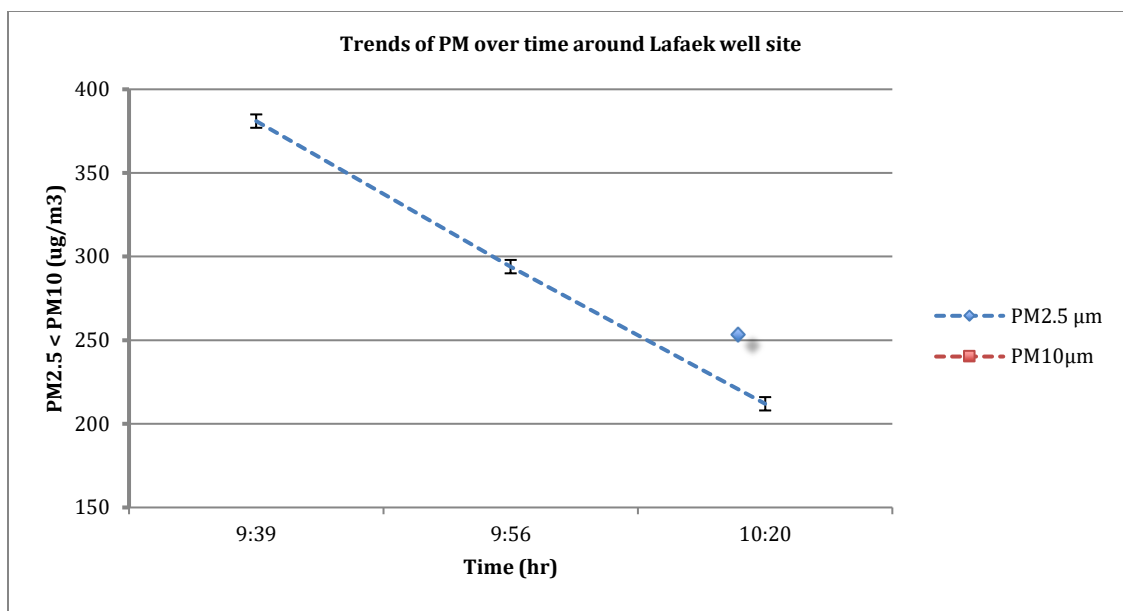


Figure 29.Particulates Matter around the Lafaek Well

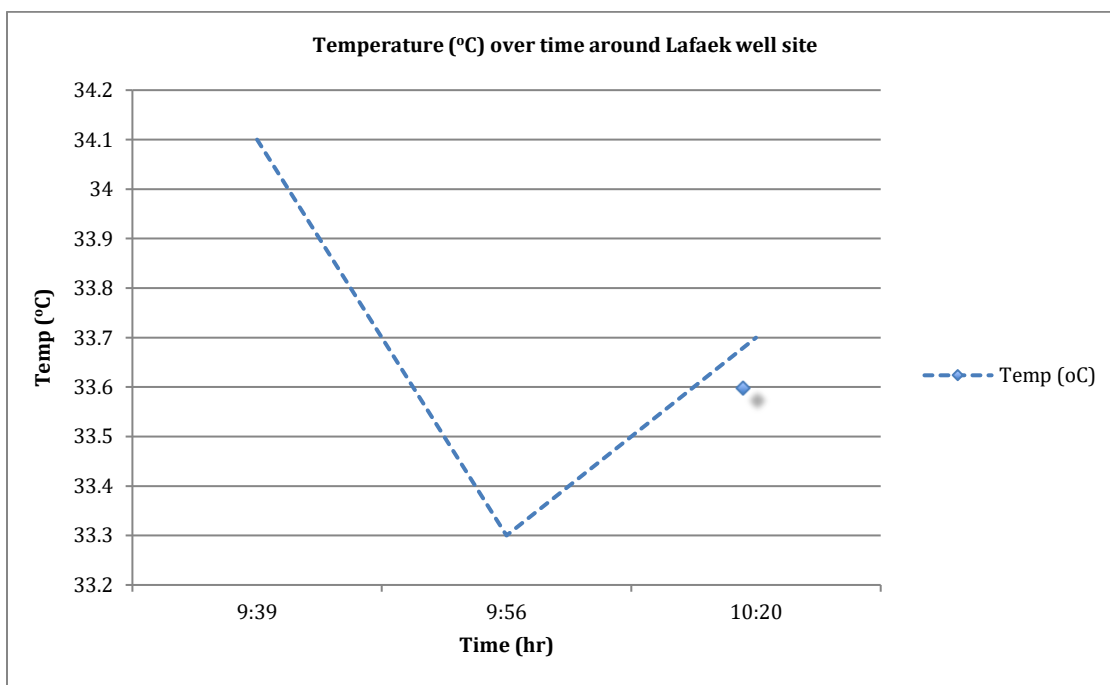


Figure 30.Temperature around the Lafaek Well

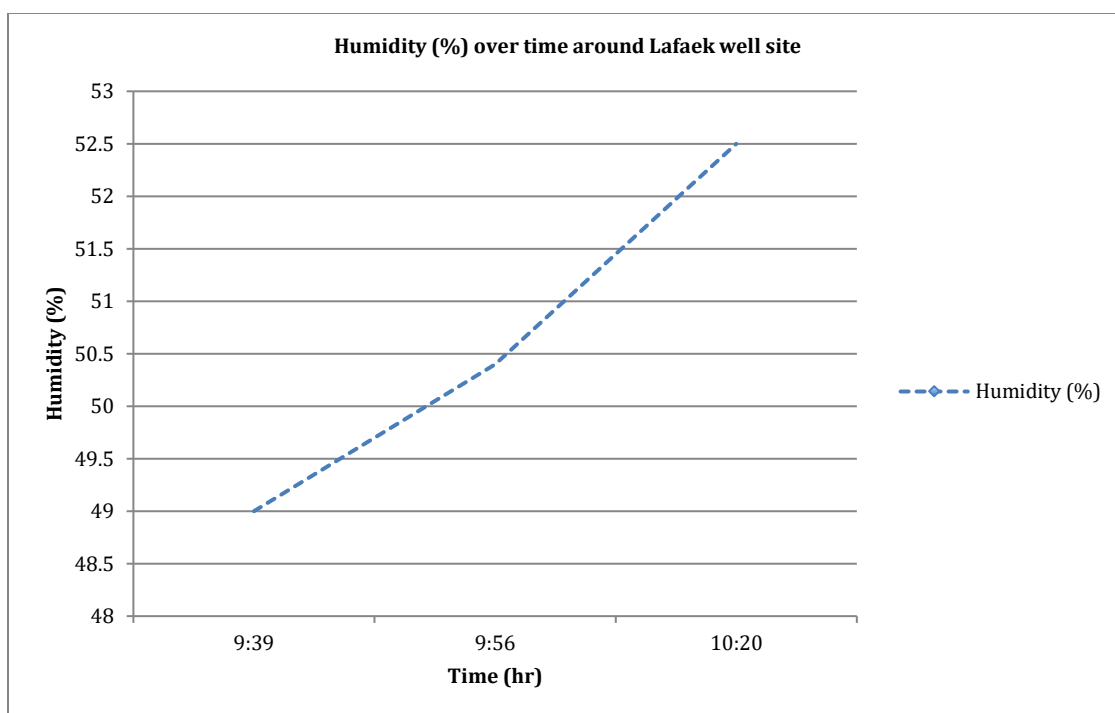


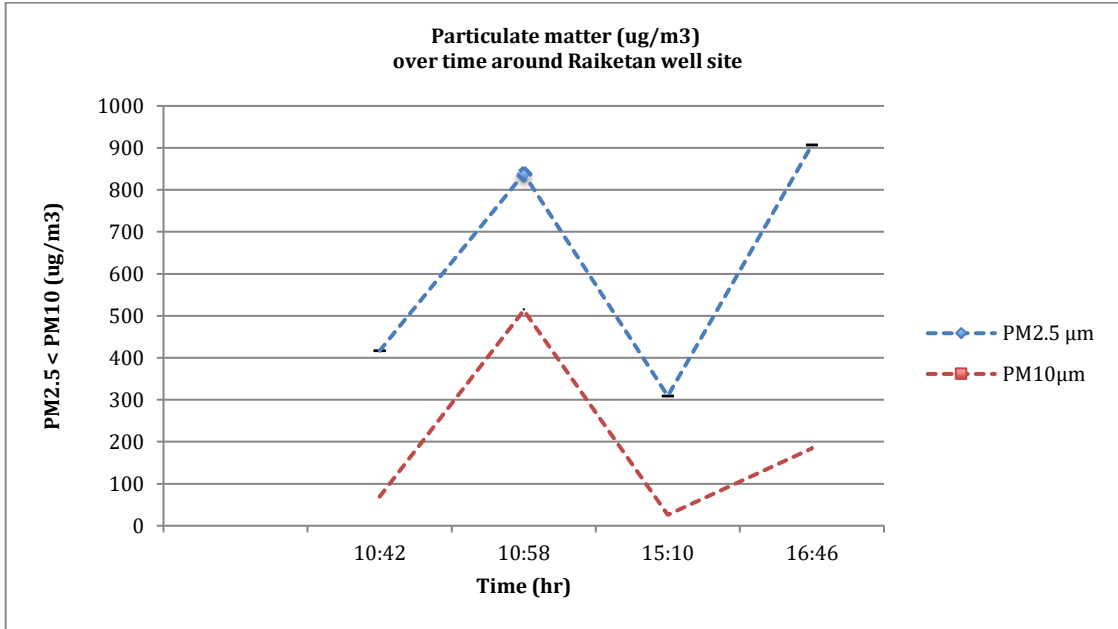
Figure 31. Humidity around the Lafaek Well

#### 6.1.4.1.5. Raiketan

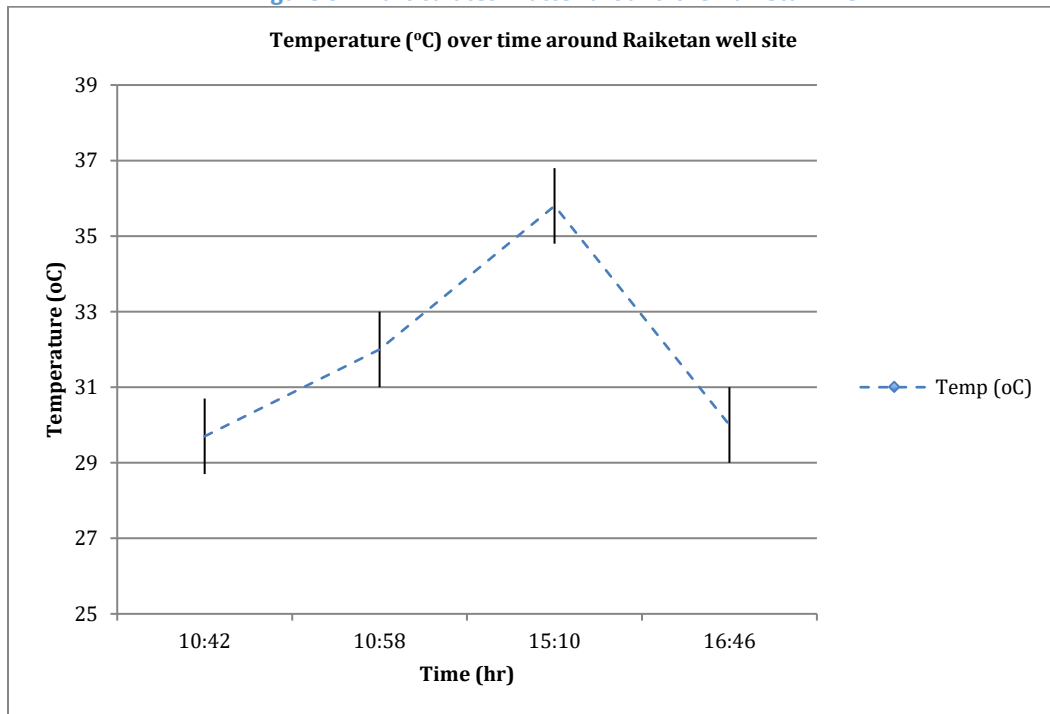
Like other well studies area, Raiketan is also measured for two dust particles which are  $PM_{2.5}$  and  $PM_{10}$ . The data shows that  $PM_{2.5}$  goes between ranges of  $307 \mu g/m^3$  to  $907 \mu g/m^3$  (Table 16); and the  $PM_{10}$  goes from  $26 \mu g/m^3$  to  $513 \mu g/m^3$ . These data are measured on 3 interval hours during day light. The observation of condition of Raiketan studies areas during the survey period are as an area that has various dust which could be induced by construction activities and unpaved road within the area (Figure 48).

Table 16. Air Quality near the proposed Raiketan Well

Raiketan air qualities measured at four different locations						
Location	Time	PM		Temp. (° C)	Relative Humidity (%)	Wind (m/s)
		2.5	10			
RAQN1	10:58	838	513	32	61.4	0
RAQN2	10:42	417	69	29.7	66	0.1-2.0
RAQN3	15:10	309	26	35.8	53.5	0.1
RAQN4	16:46	907	184	30	62.2	1



**Figure 32. Particulates Matter around the Raiketan Well**



**Figure 33. Temperature around the Raiketan Well**



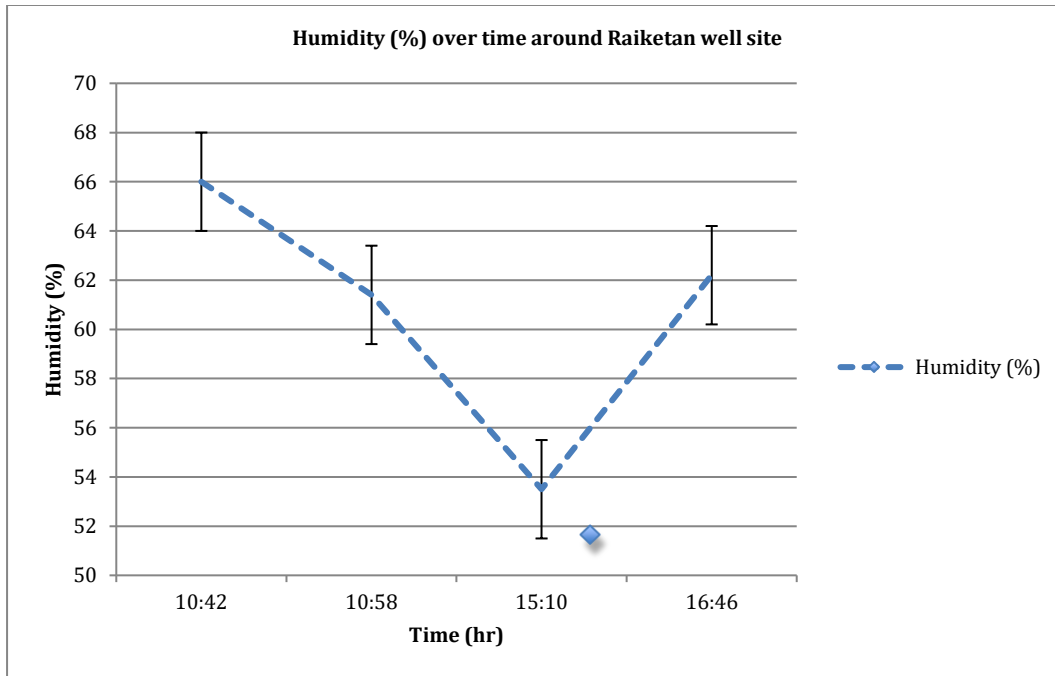


Figure 34. Humidity around the Raiketan Well

#### 6.1.4.2. Noise

Similarly, the noise was measured at time and locations same as air quality measurements. Noise levels in all well locations and its surroundings still within the WHO and any other internationally recognized standards such as NIOHS, ACGIH and OSHA which are highly recommended to be used. Below tables and graphs below show the sound levels or noise propagations at and around the well locations were measured.

Graph below shows the noise levels of different sampling locations around the five proposed wells.

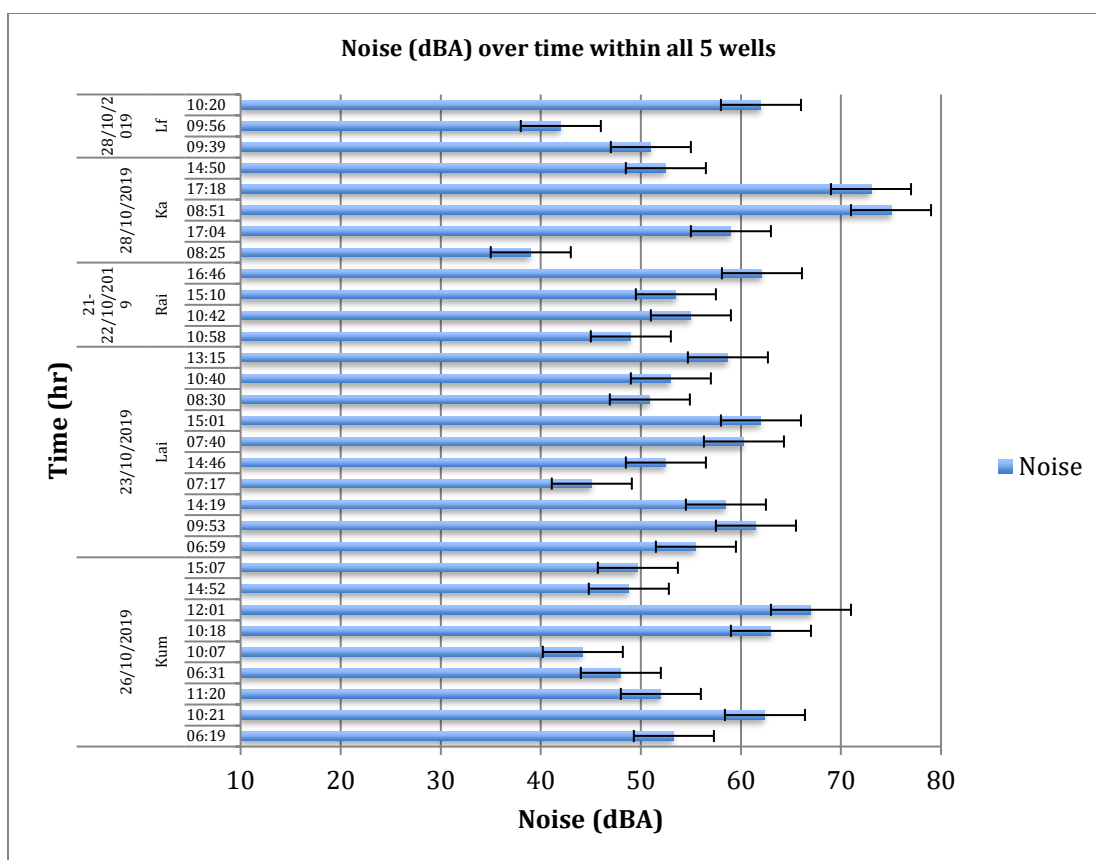


Figure 35.Noise around the proposed Five Wells Locations

#### 6.1.4.2.1. Karau Well

Noise levels at the Karau well site and its nearby locations were taken at the three different locations between radius 125 meters and 700 meters from the well site. Main consideration was given to the density of the population, traffics, topography, vegetation, building and industrial activities nearby the well locations during measurements, therefore noise at the well site or zero point was not taken. Overall, noise levels fall within the standard limits which were between 39 dBA and 75 dBA and Table and graphs below show the noise levels around the well site.

Table 17. Noise levels around the Karau Well

Karau Noise levels		
Location	Time	Noise (dBA)

KAQN1	8:25	39
	17:04	59
KAQN2	8:51	75
	17:18	73
KAQN3/AAQ2	14:50	52.5

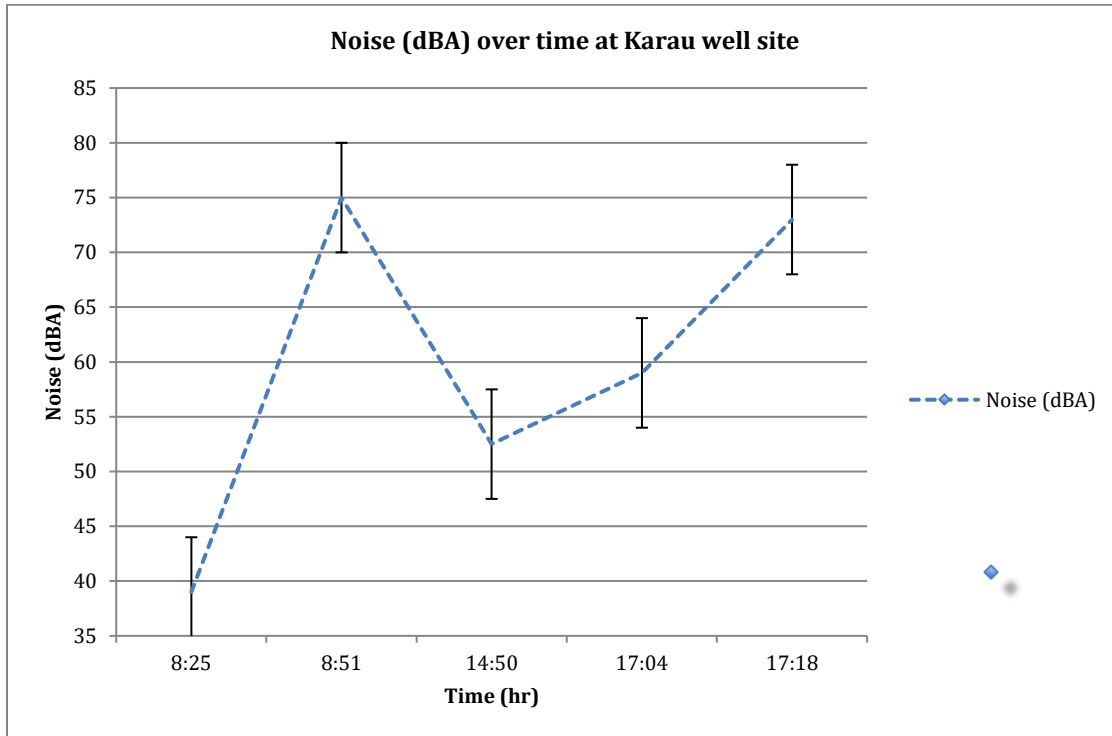


Figure 36. Noise Levels around the Karau Well

#### 6.1.4.2.2. Kumbili Well

Noise levels at the Kumbili well location were measured at five different locations with radius between zero and two kilometers from the well site. The elements or components considered during noise measurement encompassed topography, vegetation, traffics, community's houses and other environmental important features such as schools, chapel and important bird area and other marine and coastal water species. The data was taken during day time between 06:00 hours – 18:00 hours.

The noise levels recorded from the sample points are still within the thresholds of international guidelines for day time, which between 44.2 dBA and 67 dBA. The table shows the time and levels of noise in the Kumbili well areas.

Table 18. Noise levels around the Kumbili Well

Kumbili Noise levels		
Location	Time	Noise (dBA)
KmAQN1	6:19	53.3
	10:21	62.4
KmAQN2/AAQ1	11:20	52
KmAQN3	6:31	48
	10:07	44.2
KmAQN4	10:18	63
KmAQN5	12:01	67

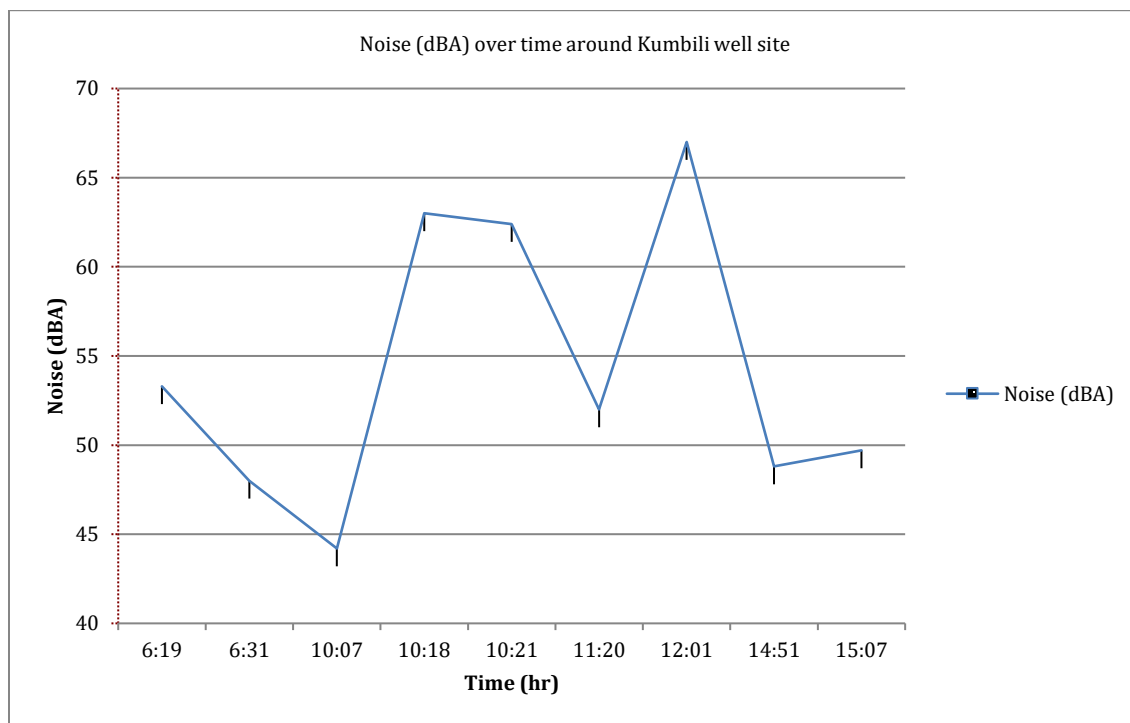


Figure 37. Noise around the Kumbili Well

#### 6.1.4.2.3. Laisapi Well

Similarly, the noise survey at Laisapi well areas were done considering the various environmental aspects such as community area, schools, vegetation and other important species of fauna. The noise levels at and around the Laisapi well generally within the standards set by the WHO and other international recognized bodies. The survey was conducted in the six different locations between the radius zero and four kilometers from the well site.

Table below indicates the noise levels measured at six different locations.

**Table 19. Noise Levels around Laisapi Well**

<b>Laisapi Noise levels</b>		
<b>Location</b>	<b>Time</b>	<b>Noise (dBA)</b>
AQN1	6:59	55.5
	9:53	61.5
	14:19	58.5
AQN2	7:17	45.1
	14:46	52.5
AQN3	7:40	60.3
	14:46	62
AQN4	8:30	50.9
AQN5	10:40	53
AQN6	13:15	58.7

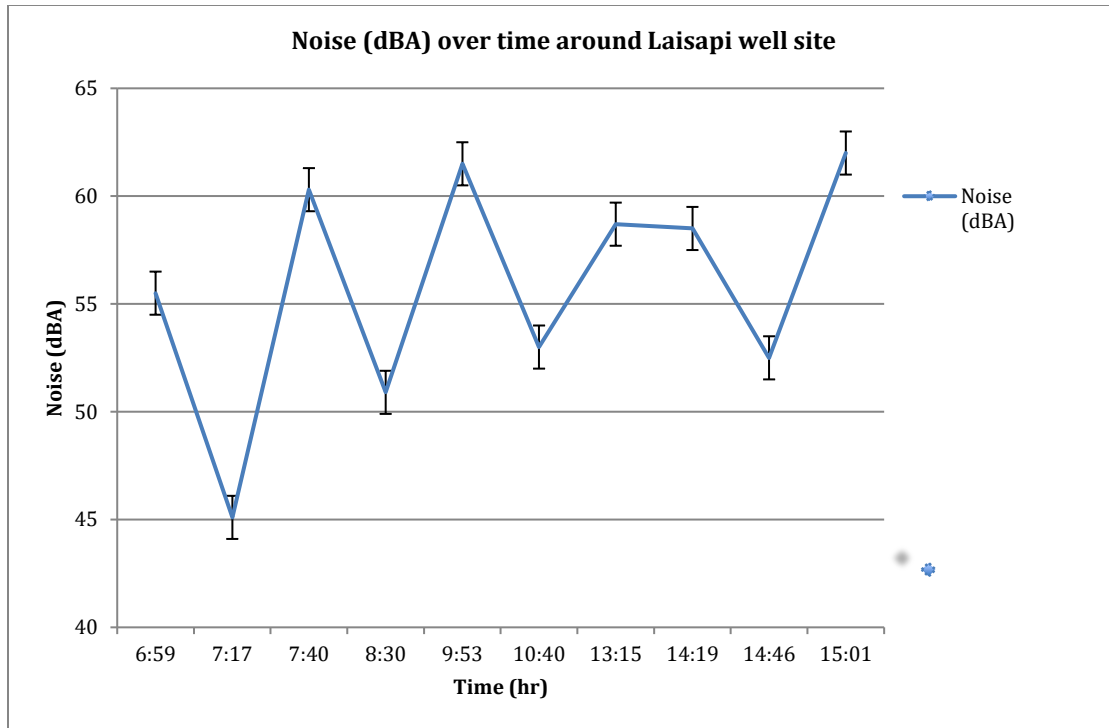


Figure 38. Noise Level around the Laisapi Well

#### 6.1.4.2.4. Lafaek Well

Noise levels at the Lafaek well site and its nearby locations were taken at the three different locations between radius 0 meters and 1,100 meters from the well site. Similarly, consideration was given to the density of the population, traffics, topography, vegetation, building and human activities nearby the well locations during measurements, therefore noise at the well site. Overall, noise levels fall within the standard limits which were between 42 dBA and 62 dBA and Table and graphs below show the noise levels around the well site.

Table below and graph below show the noise levels at the well site and its surroundings were considered to be impacted during the drilling campaign.

Table 20. Noise Levels around the Lafaek Well

Lafaek Noise level		
Location	Time	Noise (dBA)

AQN1	9:39	51
AQN2	9:56	42
AQN3	10:20	62

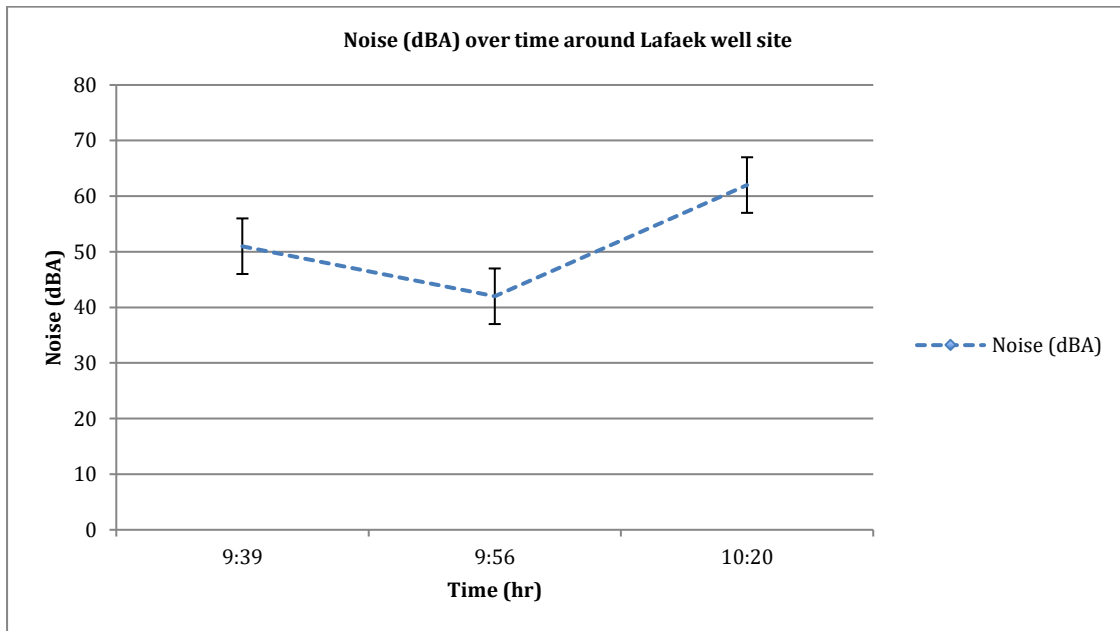


Figure 39. Noise Levels around the Lafaek Well

#### 6.1.4.2.5. Raiketan Well

Noise levels at the Raiketan well location were measured at four different locations with radius between zero and three kilometers from the well site. The elements or components considered during noise measurement encompassed topography, vegetation, traffics, community's houses and other environmental important features such as schools, chapel and important bird area. The data was taken during day time between 06:00 hours – 18:00 hours.

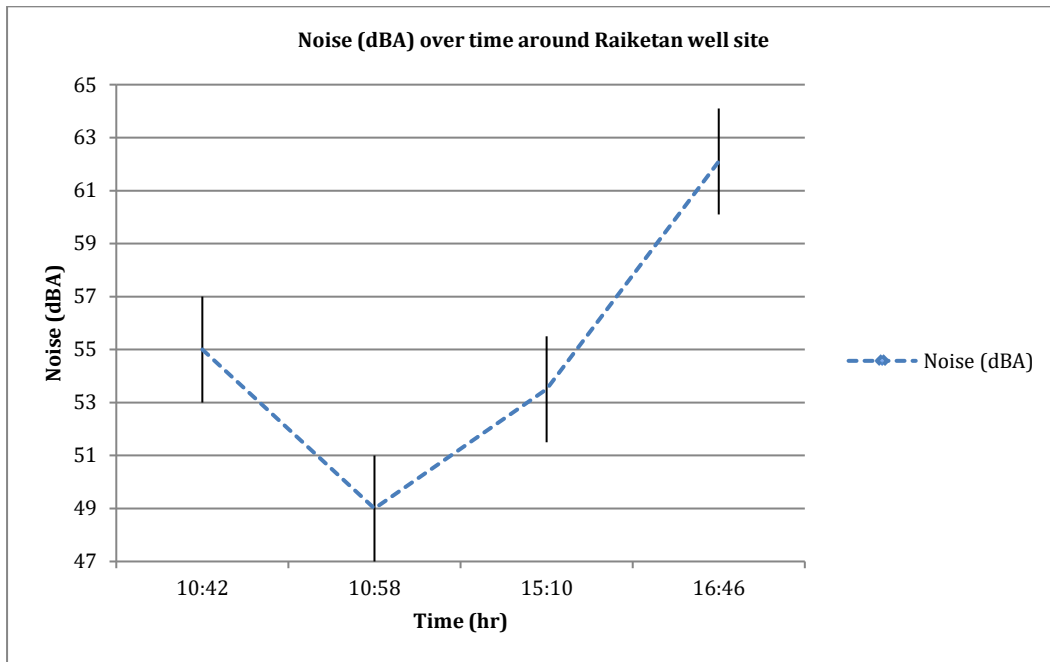
The noise levels recorded from the sample points are still within the thresholds of international guidelines for day time, which between 53.5 dBA and 62.1 dBA. The table shows the time and levels of noise in the Raiketan well areas.

Table 21. Noise Levels around the Raiketan Well

Raiketan Noise level		
Location	Time	Noise (dBA)



RAQN1	10:58	49
RAQN2	10:42	55
RAQN3	15:10	53.5
RAQN4	16:46	62.1



**Figure 40. Noise Levels around the Raiketan Well**

Tables, graphs and maps below are the cumulative air quality and noise measurements for all well locations. The maps showing the sampling points of the air, noise include the transects in all well loctions.

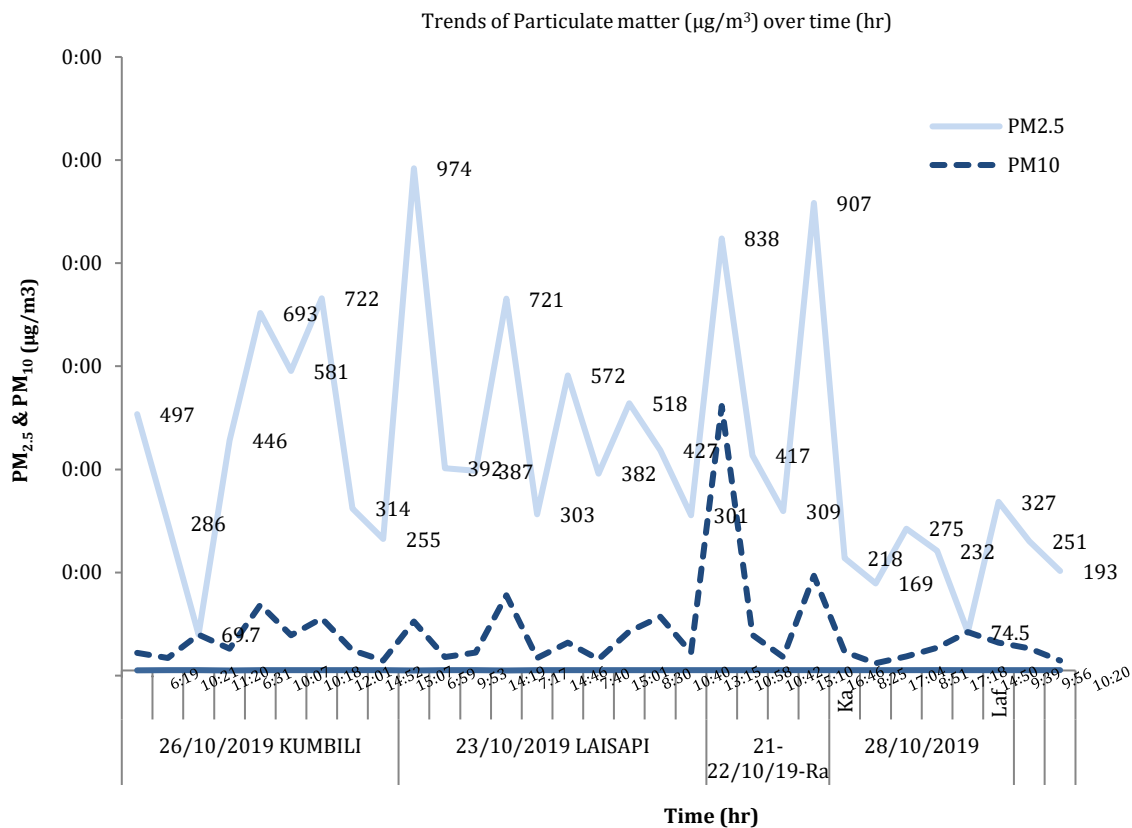


Figure 41. Trends of Particulates Matter around the proposed Well Locations

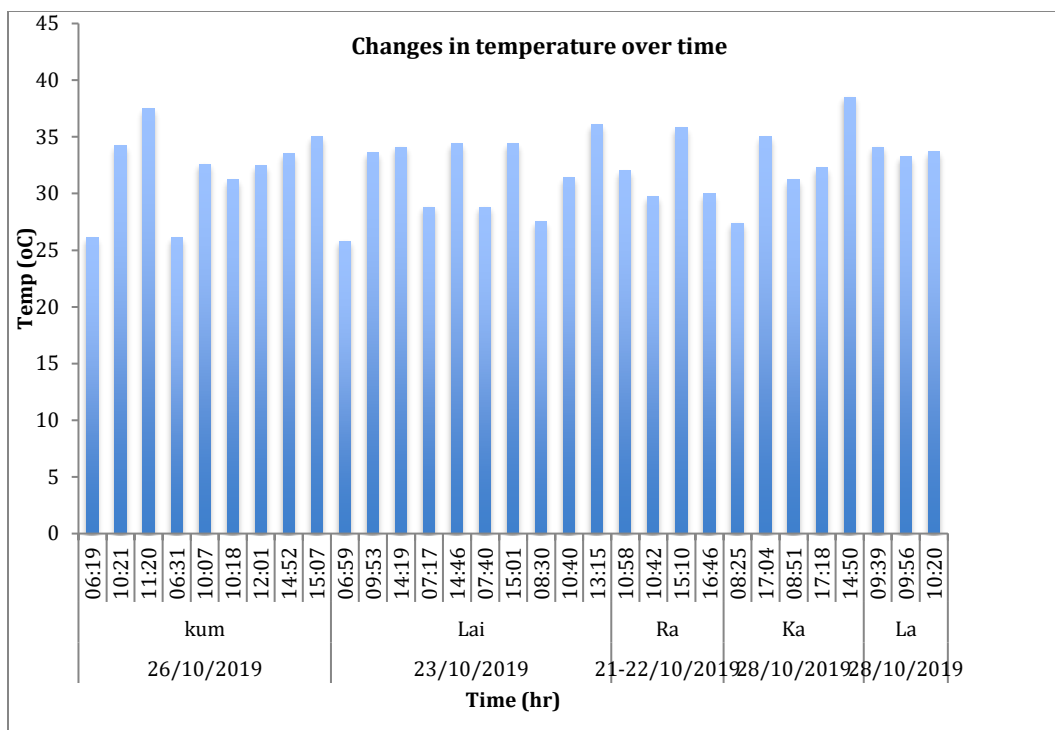


Figure 42. Change in Temperature around the proposed Well Locations

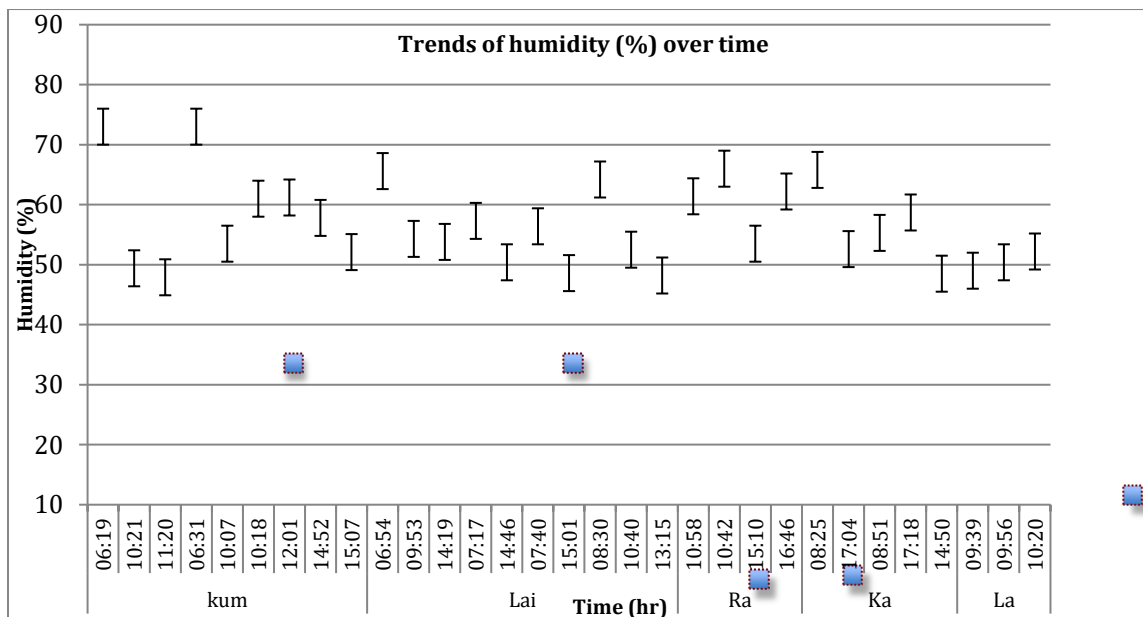


Figure 43. Relative Humidity around the proposed Well Locations

Below figures (44-48) are maps of sampling points of interests taken from all around located and around proposed well locations. These maps indicate the air quality, noise and some transect lines and the locations of the important enviromental features.

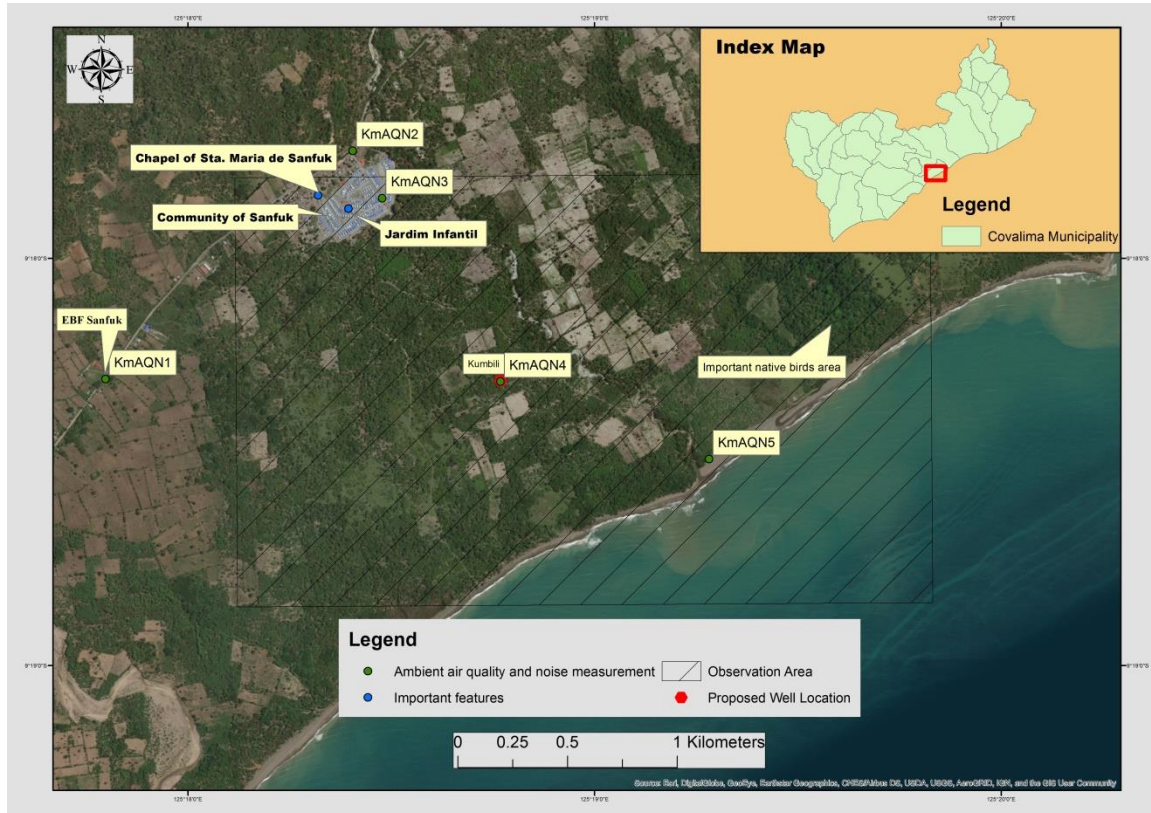


Figure 44. Air Quality and Transect Lines around the Kumbili Well Area

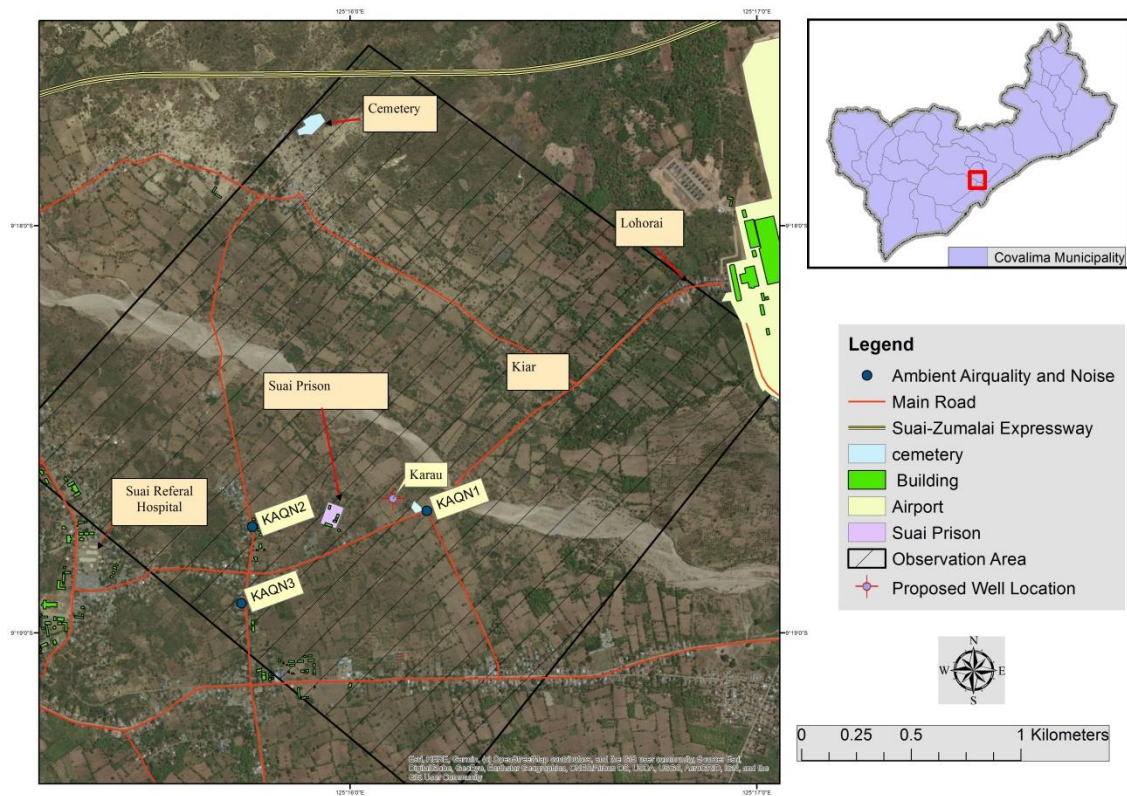


Figure 45. Map Shows the Air Quality and Noise Sampling Points at Karau Well



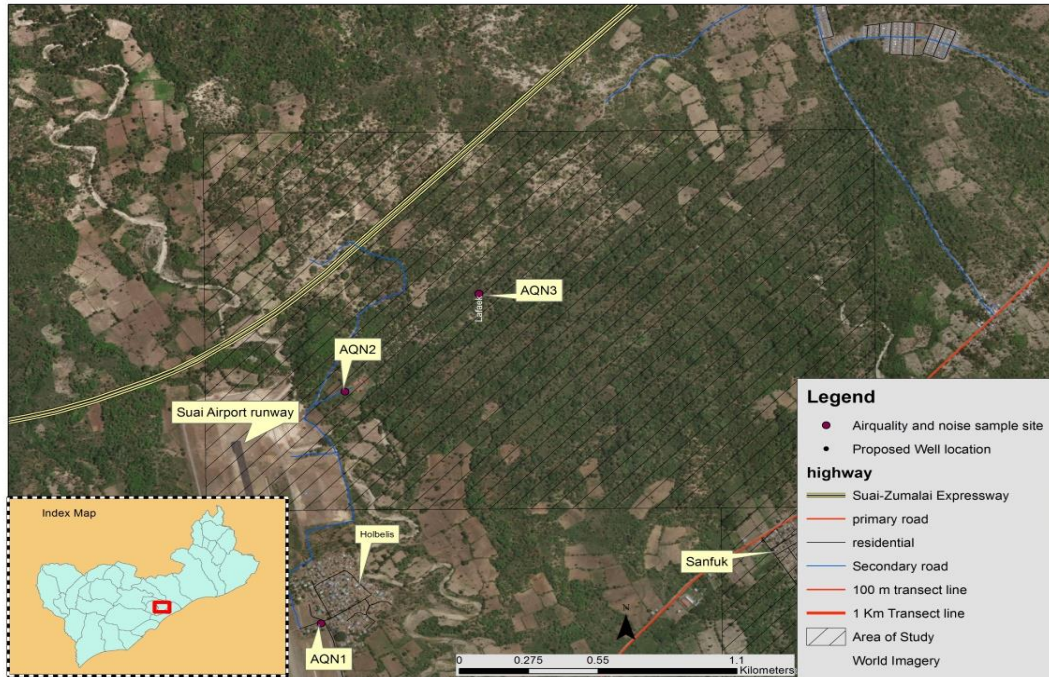


Figure 46. Map Shows the Air Quality and Noise Sampling Points at Lafaek Well

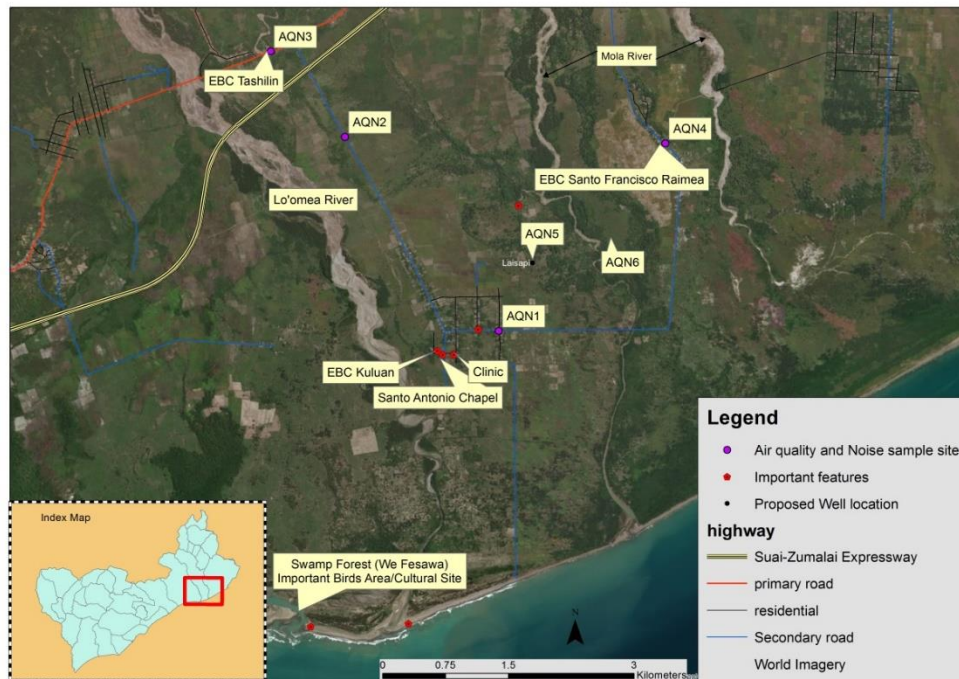


Figure 47. Map Shows the Air Quality and Noise Sampling Points at Laisapi Well

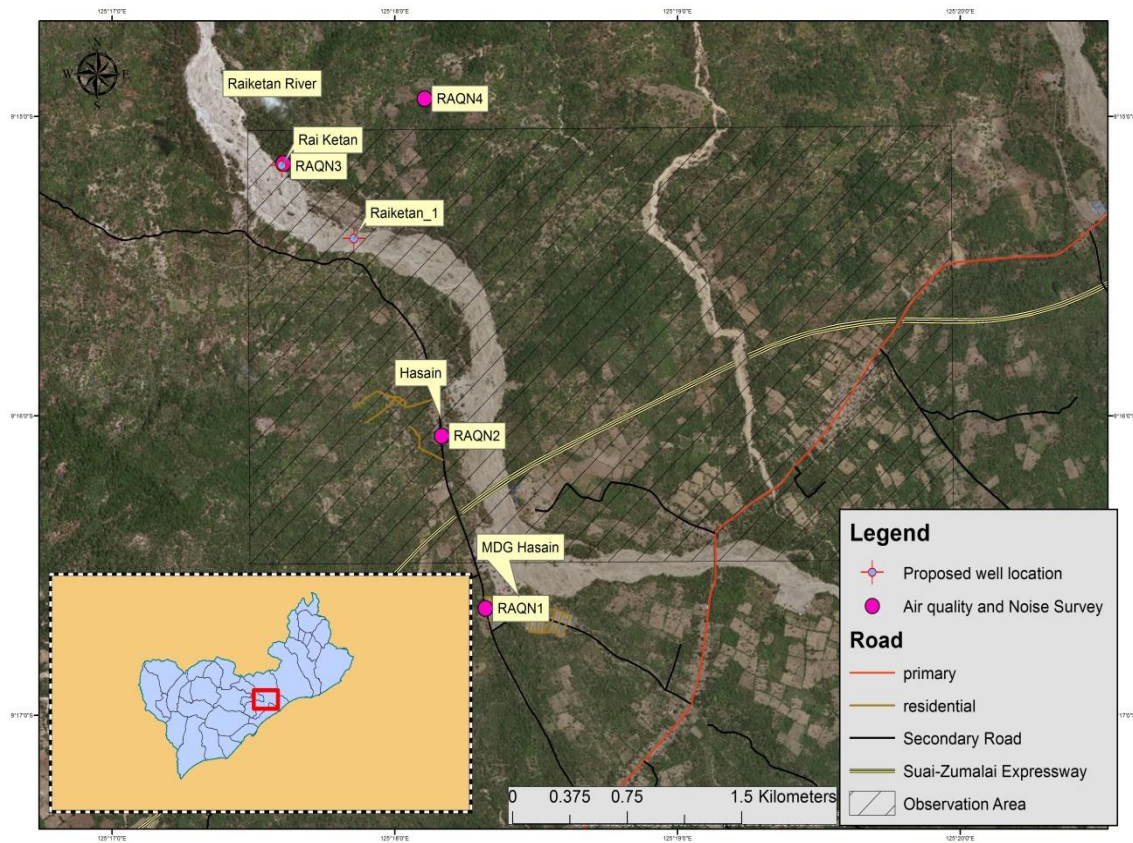


Figure 48. Map Shows the Air Quality and Noise Sampling Points at Raiketan Well



#### 6.1.5. Surface and Ground water

Within the vicinity of the five wells site there number of rivers, water springs and community's ground water. These identified surface and ground water are sampled and tested for its quality of the following parameters, such as physical and chemical as well as bacterial presence.

The surface and ground water are sampled and tested using the following method or equipment, include:

1. Physical Test uses Ph Meter, Conductivity Meter, Gravimetry and Turbidity Meter. These testing equipment are used for testing the physical property level water, such as pH level, Electrical Conductivity, Salinity, temperature, Total Suspended Solid (TSS), Total Dissolved Solid (TDS) and Turbidity level.
2. Chemical Test uses Spectrometer, Comparator and Titration for the following water chemical properties, such as Nitrogen-Ammonia, Nitrate-Nitrogen, Nitrite-Nitrogen, Iron, Manganese, Sulphate, Fluoride, Arsenic, Chlorine, Ca Hardness and Alkalinity.
3. Bacterial Presence Test uses Membrane Filtration method for testing the presence of Coliform and E. Coli in the water; by measuring the Colony Formed Units (CFU) of the bacteria for every 100 ml water sampled.

The following map (Figure 49) shows all the identified surface and ground water within or nearby the five wells site.



Figure 49. Surface and Ground Water Location within or nearby the Five Wells Site

Table 22 shows the UTM 51S coordinates for the location of water quality testing for the identified surface and ground water.

**Table 22. Water Quality testing at Surface and Ground Water Location within or nearby the Five Wells**

Name	Location	Coordinates
<b>Surface Water</b>		
Mola-Ain River	Laisapi Well	9.22969°S - 125.45513°E
Raiketan Has-Ain (Water Spring)	Raiketan Well	9.26313°S - 125.30130°E
Kumbili Samfuk - open well (Water Spring)	Kumbili Well	9.30598°S - 125.31867°E
Ponte Be'e Mos River	Lafaek Well	9.31096°S - 125.29148°E
Karau Ulun Fatunabil River	Karau Well	9.29338°S - 125.23779°E
<b>Ground Water</b>		
Raiketan 2 MDG	Raiketan Well	9.27800°S - 125.30622°E
Kumbili House MDG	Kumbili Well	9.29724°S - 125.30801°E
Bonuk Lafaek	Lafaek Well	9.27794°S - 125.29922°E
Matai Jonize	Karau Well	9.30883°S - 125.26674°E
Kulu Oan	Laisapi Well	9.22920°S - 125.44077°E

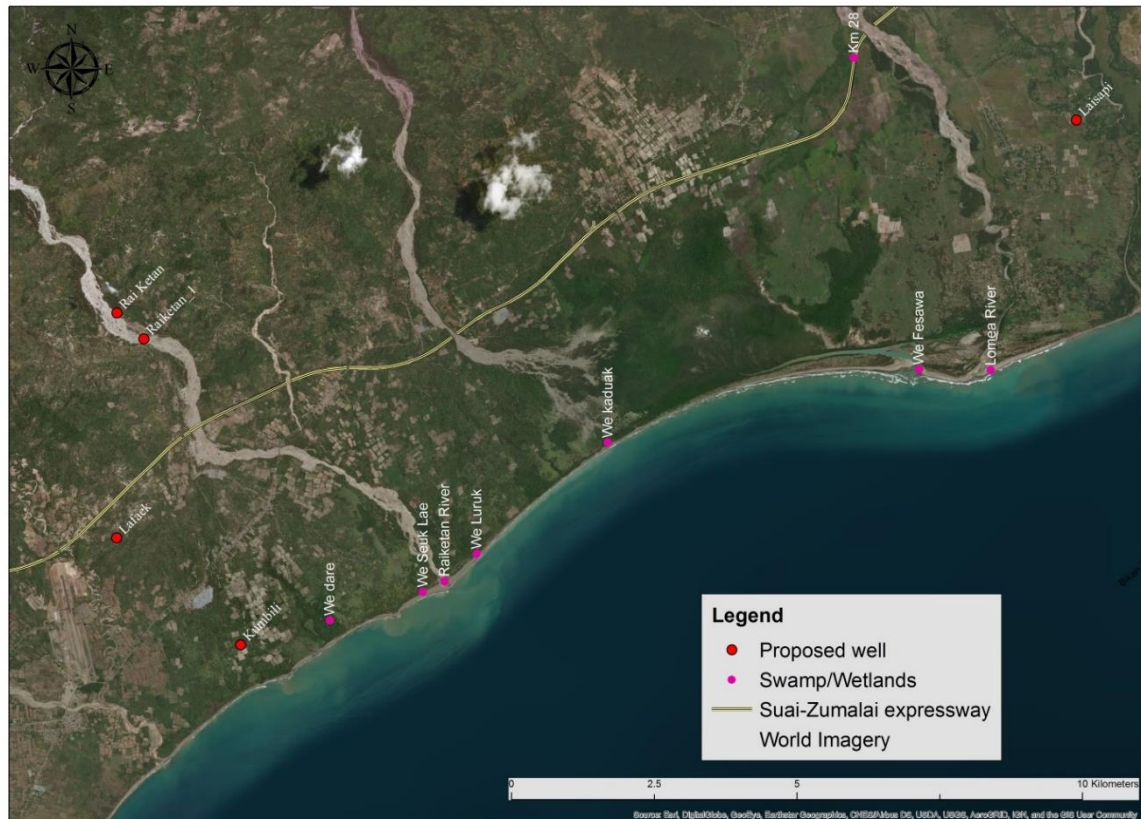
#### 6.1.5.1. Surface Water

The nearest surface water to the well locations are Karau and Raiketan rivers and We Tane Sikun swamp which are located between 100 and 700 meters from Karau, Raiketan and Kumbili well sites. These rivers are seasonal as the water flow mostly during rainy season. Table below shows the distance between the well locations and the surface water sources, which are identified.

**Table 23. Distance between surface water sources to wells locations**

<b>Distance of Rivers the nearest Well</b>	
Raiketan River	0.1 Km to Raiketan 3.6 Km to Kumbili
Lo'omea River	0.225 Km to Karau
Karau River	0.7 Km to Kumbili
Mola Ain River	0.75 Km to Laisapi
<b>Distance of Wetlands the nearest Well</b>	
We Dare	1.6 Km to Kumbili 4 Km to Lafaek
We Tane Sikun	2 Km to Laisapi
We Seuk Lae	3.2 Km to Kumbili
We Fesawa	5 Km to Laisapi
Km 28	4 Km to Laisapi
We Kaduak	7 Km to Kumbili
We Luruk	4.3 Km to Kumbili

The following map (Figure 50) shows all the existing surface water and cultural significance within the wells sites.



**Figure 50. Maps of existing surface water and cultural significance**

The identified Swamps and Cultural sites have been described under Section 6.2.1 and Section 6.5.1. of this document.

In accordance with the above Table (Table 22), Timor Resources carried out survey and sampling for all identified or reachable surface water within or nearby the five wells.

**Table 24. Water Quality Test Results for all Identified Surface Water**

Surface Water - Water Quality Test Results							
Physical Test							
Parameters	Unit	WHO/Timor-Leste Guideline	Mola-Ain	Raiketan Has-Ain	Kumbili Samfuk	Ponte Be'e Mos	Karau Ulun Fatunabil
pH value	pH meter	6.5 - 8.5	7.7	7.2	7.6	7.8	7.3
E. Conductivity	µs/cm	100 µs - 1 ms	4,000	888	899	900	1,478
TSS	mg/L		0.1	0.05	0.04	0.04	0.04
TDS	mg/L	1,000	2,000	444	450	450	739
Salinity	%		2.1	0.4	0.4	0.4	0.7
Temperature	°C		29.2	31.5	31.7	35.2	28.6
Turbidity	NTU	5 (NTU)	17.8	0.5	26	7.9	2.6
Chemical Test							
NH <sub>3</sub> -N	mg/L	1.5	0.0	0.0	0.0	0.0	0.0
NO <sub>3</sub> -N	mg/L	50	0.6	1.0	0.2	0.1	1.2
NO <sub>2</sub> -N	mg/L	3	0.0	0.005	0.007	0.006	0.006
Iron (Fe)	mg/L	0.3	0.1	0.03	0.07	0.06	0.01
Manganese (Mn)	mg/L	0.5	0.1	0.2	0.2	0.3	0.5
Fluoride	mg/L	1.5	0.21	0.20	0.15	0.13	0.2
Free Chlorine	mg/L	0.5	0.0	0.0	0.0	0.0	0.0
Ca Hardness	mg/L	2.5	240.0	200.0	190	140	160
Arsenic	mg/L	0.01	0.0	0.0	0.0	0.0	0.0
Total Hardness	mg/L	200	300.0	225.0	210	200	220
Total Alkalinity	mg/L	500	310.0	230.0	310	215	265
Sulphate (SO <sub>4</sub> 2)	mg/L	250	99.0	27.0	99	65	42
Bacterial Test							
Total Coliform	CFU/100ml	0	TNC	0	TNC	TNC	TNC
E.Coli	CFU/100ml	0	TNC	0	TNC	TNC	TNC

For salinity, as WHO guidelines do not have specific standard value, thus it is recommended to use Australian-EPA salinity level in In-Land water, which is ranges from Fresh to Hyper-Saline water type, as follows, see

Table 25 below

**Table 25. Australian-EPA standard value for Salinity**

In-Land water Category	Salinity (mg/L)
Fresh Water	up to 1,000
Fresh to brackish	1,000 to 3,000
Brackish	3,000 to 5,000
Saline	5,000 to 35,000
Hyper-saline	35,000 and above

Even though the likelihood impacts to the surface water around the well locations are considered low, TR has conducted numbers of the surface water testing physically, chemically and bacteriologically in accordance with the WHO water quality guidelines. The tests were performed by SAS Laboratory in Dili which is required to identify and know actual surface water quality within the well locations, also ensuring that any water sources will not be contaminated by the drilling activities for the duration of the drilling project campaign.

Based on the Laboratory testing results that the selected surface water sources had been tested already had been contaminated by E.Coli, Total Hardness and some of them contained heavy metals. Therefore, TR has fully committed to prevent any further contamination caused by its drilling activities to any water source in Covalima. See Test result above on Table 24

#### **6.1.5.2. Ground Water**

Mostly people in Covalima municipality use groundwater water as their main water sources. The groundwater depth is varying within 15 meter to 82 meter depth. There are some well locations, especially Karau and Laisapi wells are located mostly close to the community's houses, therefore some surface and ground waters around the five well locations have been tested to ensure the water quality before the drilling is commenced.

Table 26. Water Quality Test for all identified Ground Water

			Ground Water				
Physical Test							
Parameters	Unit	WHO/Timor-Leste Guideline	Raiketan 2 MDG	Kumbili House MDG	Bonuk Lafaek	Matai Jonize	Kulu Oan Well
pH value	pH meter	6.5 - 8.5	7.5	7.5	7.3	7.7	7.1
E. Conductivity	µs/cm	100 µs - 1 ms	782	912	1,954	787	6,730
TSS	mg/L		0.05	0.04	0.1	0.03	0.1
TDS	mg/L	1,000	391	456	977	792	3,370
Salinity	%		0.40	0.4	1	0.4	3.7
Temperature	°C		31.4	30.8	29.7	30	28.4
Turbidity	NTU	5 (NTU)	0.80	1.6	293	1.2	71.4
Chemical Test							
NH3-N	mg/L	1.5	0.0	0.0	0.0	0.0	0.0
NO3-N	mg/L	50	0.1	0.1	0.1	0.6	0.2
NO2-N	mg/L	3	0.004	0.004	0.026	0.003	0.011
Iron (Fe)	mg/L	0.3	0.03	0.02	0.5	0.01	0.03
Manganese (Mn)	mg/L	0.5	0.2	0.2	0.8	0.5	0.3
Fluoride	mg/L	1.5	0.21	0.25	0.21	0.20	0.39
Free Chlorine	mg/L	0.5	0.0	0.0	0.0	0.0	0.0
Ca Hardness	mg/L	2.5	205	210	220	130	650
Arsenic	mg/L	0.01	0.0	0.0	0.0	0.0	0.0
Total Hardness	mg/L	200	225	220	280	190	710
Total Alkalinity	mg/L	500	230	225	300	200	720
Sulphate (SO42)	mg/L	250	97	99	88	56	105
Bacterial Test							
Total Coliform	CFU/100ml	0	0	0	TNC	0	0
E.Coli	CFU/100ml	0	0	0	TNC	0	0

Similarly, the following salinity threshold is also taking from Australian-EPA standard for drinking water. See

Table 27 below.



**Table 27. Australian-EPA standard value for Salinity for Drinking Water**

Drinking Water - quality category	Salinity (mg/L)
Good	0 - 600
Fair	600 - 900
Poor	900 - 1,200
Unacceptable (unplatable)	> 1,200

Groundwater is the main water source for Covalima's people. Generally, the water wells are dug between 12 and 82 meters depth. There is no groundwater situated within the 100 meters radius at any well site, similarly TR has identified and tested numbers of groundwater wells around the well sites in accordance with the WHO Drinking Water Guidelines. These tests were conducted to identify water quality within the well sites and make sure the groundwater quality is maintained and not contaminated during drilling campaign. The groundwater samples were both tested in situ and at the SAS laboratory in Dili. There were a total of Five (5) groundwater wells were tested and the results showed only Jonize's groundwater, approximately 500 meters from the Karau well which is met the WHO Drinking Water Guidelines. Similarly, other six groundwater wells have been contaminated by E. Coli, Total Hadrness and some even contained heavy metal substances. See Table 26.

#### 6.1.6 Coastal and Sea Water

There are few coastal waters were identified during the baseline survey such as swamps and estuaries, namely We Tane Sikun, We Luruk, We Seuk Lae, We Fesawa, We Kaduak etc (refer to section 6.1.5 above). These swamps and estuaries are located in Suco Kamanasa, Labarai, Tasilin and Raimea. We Dare and We Fesawa swamps are used by some locals for their cultural ceremonies as well as serving as habitats for certain flora and fauna species such as *Cacatua sulphurea*, *Corypha elata*, *Casuarina* sp, *Excocaria* sp and *Pandanus* sp etc.

Table 28. Distance of coastal water to wells locations

Distance of Wetlands to the nearest Well	
We Dare	1.6 Km to Kumbili 4 Km to Lafaek
We Tane Sikun	2 Km to Laisapi
We Seuk Lae	3.2 Km to Kumbili
We Fesawa	5 Km to Laisapi
We Kaduak	7 Km to Kumbili
We Luruk	4.3 Km to Kumbili

The characteristic of the above coastal waters nearby the wells site are described below.

**a. We Dare**

We dare is a coastal wetlands forest with no surface water present on the surface. We categorize it as wetlands due to the fact that the soil in this area is constantly wet. It located about 1.3 Km from the proposed Kumbili well site. The area consists mainly of *Canarium* sp (Kiar) which is a critical habitat for the critically endangered species *Cacatua sulphurea* and near threatened species *Ducula rosacea*. The area also possesses a cultural significance to the local community along the coast.

**b. We Seuk Lae**

We Seuk lae is a swamp and coastal forest with the water regime highly dependent on rainy season. Visited during the dry season, the water was not present and only muddy soil can be found in this area. Plants found in this area include *Corypha elata*, *Casuarina* sp, *Ecocaria* sp, *Hibiscus* sp and *Pandanus* sp. The observation was carried out at noon and only one species of birds; *Saxicola gutturalis* managed to be observed.

**c. We Fesawa Lagoon**

We Fesawa is a wetlands lagoon and coastal forest with a permanent water regime located about 5 Km from the proposed Laisapi Well. The forest is one of the critical habitats for critically endangered species *Cacatua sulphurea* and one of the important cultural sites for the local community close to this area.

#### **d. We Kaduak**

We Kaduak is a wetland swamp forest with permanent water regime. The source of water in this forest is highly dependent on the interaction between the sea water during high tide and the freshwater from Raiketan River. Dominant species in this forest include *Avicenna* sp, *Pandanus* sp and *Exordia* sp.

#### **e. We Luruk**

Located at the flood plain or known locally as Haemanu River with water inexistent during dry period. We Luruk is an important area for flora such as *Corypha elata*, *Metroxylum* sp, *Casuarina* sp, *Excocaria* sp, *Hibiscus* sp and *Pandanus* sp. In terms of fauna, several species was observed during the fieldwork include: *Meliphaga reticulata*, *Philemon inornatus*, *Turacoena modesta*, *Rhipidura rufifrons*, *Rhipidura rufiventris*, *Padion haliaetus* (raptor species).

#### **f. Lo'omea River Estuary**

Located about 1 Km from We Fesawa, it is one of the wetlands coastal forest area near the proposed Laisapi well. Source of water regime in this area consist of salt water from the sea during the high tide and from the Loomea River. Important flora species identified in this area include *Corypha elata*, *Casuarina* sp, *Excocaria* sp and *Pandanus* sp.

#### **g. Raiketan River Estuary**

It is located at the flood plain of the river with the water regime highly dependent on the water from the river during raining period. In terms of flora, the estuary consist mainly of *Corypha elata*, *Casuarina* sp and *Pandanus* sp. Birds observed during the fieldwork in this estuary include *Egretta sacra* and *Egretta novaehollandiae*.

#### **6.1.7. Soil**

In general, Suai soil characteristics are mostly entisols with fluvents sub-order classification (S.J. Thompson, 2011). The soil map shown below represents the soil classification of Timor-Leste in according to the soil order and sub-order.

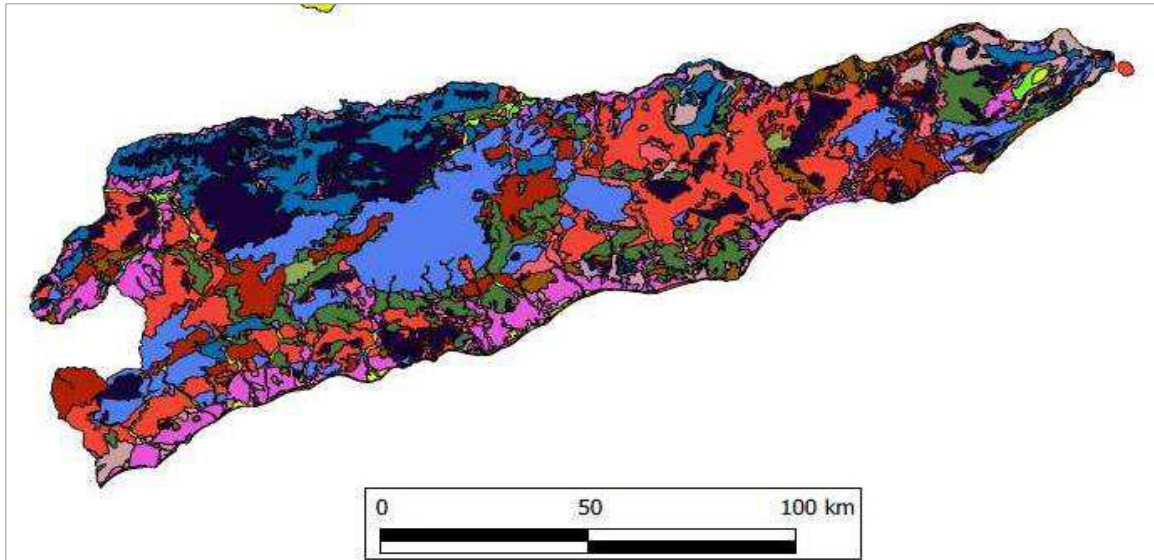


Figure 51. Map of Soil classification in Timor-Leste

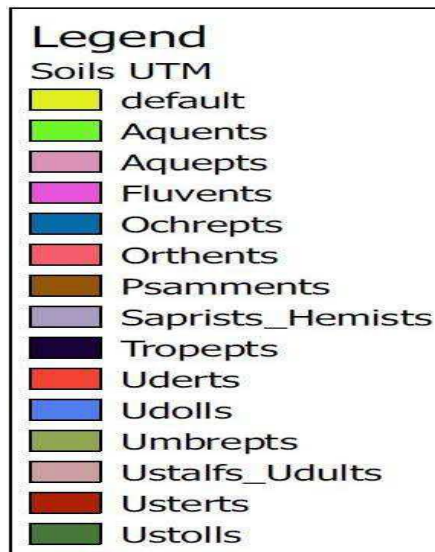


Figure 52. Legend: Soil Sub-Order

Furtheromere, TR has conducted soil analysis around the proposed well locations and the soil tests were conducted by Geotehcnik Lda for geotechnical investigation and Geo Inti Sinergi (GIS) for analysing soil chemical properties. These tests are aimed to identify type of soils, property index, grain size and the chemical properties of the soils around the well locations before the drilling is commenced. Generally, the soil types in all well locations are mostly silty clay and sandy clay.

## 6.2. Ecological components

### 6.2.1. Wetland

Wetlands can be defined generally as land area that is covered with water all year or during at least part of the year. In general, wetlands can be classified broadly as fresh water wetlands and coastal water wetlands. At least 3 groups of swamps were identified during the study period. First group of swamp are We dare, We seuk Lae, Raiketan River, and We Kaduak. Second group are Bei Luruk, We Fesawa and Lo'omea River. The third group is Km28 in reference to Suai-Zumalai freeway. These swamps are grouped due to their connectivity to each other. The details of these wetlands' types have been described in Section 6.1.6. of this document.

### 6.2.2 Mangroves

Mangroves forests are very important ecosystem in Timor-Leste that provide various services and functions. It is common to see local dwellers searching for crabs, fish and cockles around the mangroves forest. In south coast, mangrove species such as *Sonneratia* and *Acrostichum* were consumed as fruits and vegetables (Alongi, 2014).

The present day mangroves forest cover about 1300 ha area and consist of 19 identified species (Alongi, 2014). Most of it located in North coast of Timor whilst in south coast it inhabits the sand dominated deposits in small lagoons. Records indicate that nearly 90% of original mangroves forest has been greatly exploited for the last 80 years for agriculture, timber and settlements (Alongi, 2014). Most of the exploitation was recorded in north coast and in south cost it is particularly ocured in Viqueque and Covalima municipalities. In Covalima municipality, most of mangroves forest has been converted into rain-fed rice field or logged for timber and firewood (DNMG, 2017).

Within the study area, no mangroves forest identified during the fieldwork except one small forest in We Fesawa area. However, mangrove forest is not being studied in this report due to great distance from the proposed well location.

### 6.2.3 Corals

All proposed well locations are located between 700 and 7000 meters (Kumbili and Laisapi) from the beach, so there are no corals identified around the well locations.

### 6.2.4 Fisheries

Timor-Leste fisheries sector is made up of subsistence, artisanal, semi industrial and industrial fishing. Timorese fisheries activities mostly subsistence and artisanal, the semi industrial sector is mostly dominant by foreign origins. The fisheries activities in the country are generally use small scale boats which are mostly non-motorized. These fishing boats normally utilize low technology fishing gears such as gill nets, hook and lines to catch sardines, mackerel and flying fish (Angarita *et al*, 2019). Table below indicates the fishing fleets are used according to each fishery sector.

**Table 29. Fishermen Fishing Gears and Fish Production**

Fleet	Max Vessel Length (m)	Engine	Equipment	Fishing Gear	No. of Licenses	No. Active Boats	Production (2017)
Artisanal	10	Manual to <100CV	None Specified	Gill nets, hand lines, beach draggers, small trawls	1, 330 <sup>3</sup>	2,237	1, 963 t
Semi Industrial	>8-10<20	Mechanical propulsion	Thermally isolated fishholds, refrigeration, rest room, flush deck, specified electronics, (all must comply with offshore safety requirements)	N/A	0	0	N/A
Industrial	>20	>1,500CV for trawlers	Same as semi industrial plus processing capacity	Bottom set gill nets for deployment at~30–40 m, pelagic gill nets, demersal fish traps	18	18	379.1t

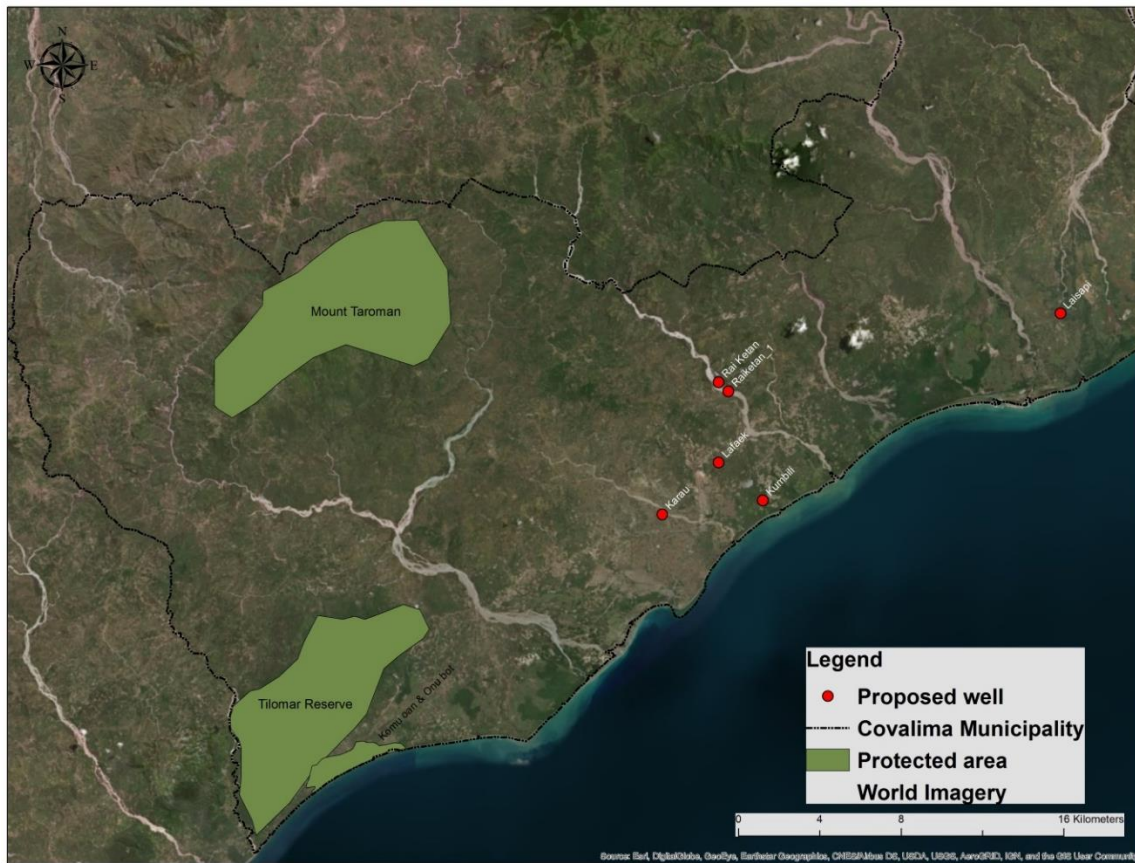
<sup>3</sup> Data from Needham et al. 2013. Only for boats with engine. A licensing system for the artisanal fishing fleet is due to be established soon, according to the MAF.



#### 6.2.5 Protected Areas and National Parks

There are several protected areas and one National park recognized in Timor-Leste. Within Covalima Municipality, there are three protected areas such as Tilomar reserves, Mount Taroman, and Komuoan / Onu bot (

Table 29). Location of all three protected area are far from the proposed drilling location and the impact will be unlikely.



**Figure 53. Protected Area in Covalima Municipality**

#### 6.2.6 Flora and Fauna

The area surrounding the well site at Raiketan, Laisapi, Kumbili and Lafaek are ecologically referred as primary forest, thin forest or secondary forest, savanna and wetland which mostly dominated by trees/vegetation from species of Sheoak/Ironwood trees (*Casuarina* sp), Tamarind trees (*Tamarindus Indicus*), Jujube trees (*Ziziphus* sp), Acacia trees (*Acacia* sp), Ceylon Oak tree (*Schleichera Oleosa*), Palm trees (*Corypha Elata*), Screw pine (*Pandanus* sp) and Bamboo (*Bambusa* sp). Karau well site is located within agricultural area and survey was carried out with census method for Teak trees (*Tectona* sp), Mahogany trees (*Swietenia* sp), Coconut (*Cocos* sp), Moringa (*Moringa* sp) and horticulture plants such as Papaya (*Carica* sp), Banana (*Musa* sp), Cassava (*Manihot* sp), Agati trees (*Sesbania* sp) and a farmer's hut. The biological survey activities were carried

out with Tracking Method to identify the ecosystem, habitat, species and cultural sites which are located in the well site area.

The ecosystem diversity which were identified within and outside of well sites area are Primary forest, Secondary forest, Swamp forest, Coastal forest, Savanna, Mangroves, Teak tree plantation and both fresh water and salt water wetland. Certain part of these forests play important roles for living organism and people for living, sheltering or hiding and for food supply.

Fauna species which were identified in well site area and plotted (from tracking activities) areas are birds and mammals. Some of those identified species have been listed and in the category of rare species or in near extinction. Identified bird species around well sites which are critical worldwide (CR) according to IUCN list are Cockatoo Sulphurea, Five endangered bird species (NT), Ten bird species of limited geographical expansion (rr) and migratory species such as *Actitis hypoleucos* no *Sula leucogaster*. Mammal species which were identified alongside tracking areas are endangered *Cervus Timorensis* and *Phalanger Orientalis*. See table below for the overall summary of the importance of biodiversity.

**Table 30 Overall Summary in the Importance of Biodiversity**

<b>Biodiversity Flora</b>	<ol style="list-style-type: none"> <li>1. The diversity of ecosystem in well site area are include Secondary Forest, agricultural production area, private plantation and horticulture</li> <li>2. The existing natural resources in particular at well sites have no critical habitat according to national legislation and as per Ramsar Site international agreement.</li> <li>3. Tree species observed in well site areas are not on global level in the category of threatening species or species with limited geographical expansion in accordance with IUCN International Agreement.</li> <li>4. Tree species observed in the well site areas such as Ceylon Oak tree (<i>Schleichera</i> sp), Sheoak/Ironwood trees (<i>Casuarina</i> sp), Jujube trees (<i>Ziziphus</i> sp), Acacia trees (<i>Acacia</i> sp), Palm trees (<i>Corypha Elata</i>), Bamboo (<i>Bambusa</i> sp) and Teak trees (<i>Tectona grandis</i>), White Teak trees (<i>Gmelina</i> sp), Manggo (<i>Mangifera</i> sp), Coconut (<i>Cocos</i> sp), Moringa trees (<i>Moringa</i> sp) and include horticulture plantation such as Papaya (<i>Carica Papaya</i>) and Banana (<i>Musa</i> sp).</li> <li>5. The ecosystem diversity or natural habitat registered outside the well site area includes Tropical Deciduous Forest, Secondary Forest, Swamp Forest, Coastal Forest, savanna, agricultural production area and state and privately owned teak plantation.</li> <li>6. Certain parts of some forest and wetlands outside the well site have very important function to living organisms and the population for</li> </ol>
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	<p>survival and shelter in various phases of life, food and they provide good conditions in order to reproduce.</p> <ol style="list-style-type: none"> <li>7. The Tropical deciduous forest ecosystem in plot V, Tracking I on the eastern part of the Raiketan well site, is observed as natural habitat which is important to bird species such as <i>Turacoena modesta</i> and plant species such as <i>Pterocarpus Indicus</i>, a species threatened from extinctions based on international agreements list.</li> <li>8. Secondary Forest ecosystem at plot III and IV, east of Tracking I at Laisapi well site, is observed as natural habitat which is important for bird species such as <i>Aprosmictus Jonquillaceus</i> no mammal species such as <i>Cervus Timorensis</i> which is endangered on global level as per international agreement list.</li> <li>9. Coastal Forest ecosystem at plot IV and at of We Tane Sikun wetland forest, east side of Tracking I for Kumbili well site is observed as important natural habitat for bird species namely <i>Ducula rosacea</i> which is globally considered endangered as per international agreement list.</li> <li>10. The We Tane Sikun is considered as important natural habitat for aquatic species namely <i>Crocodile</i> sp for living, food supply and for reproduction.</li> <li>11. The ecosystem of <b>We Dare</b> coastal forest and <b>Fesawa</b> wetland forest are observed as specific area necessary for bird species namely <i>Cacatua Sulphurea</i> which is globally considered endangered can survive and have good living condition in all stages of life. Apart from that, forest within both places are being recognized and respected as sacred sites by local community.</li> </ol>
<b>Biodiversity Fauna</b>	<ol style="list-style-type: none"> <li>1. Overall, the bird species observed within well sites and outside well sites are: <ol style="list-style-type: none"> <li>a. One (1) <i>Cacatua Sulphurea</i> which is critically endangered bird species (CR).</li> <li>b. Five (5) bird species which are under threat of extinction (NT).</li> <li>c. Ten (10) bird species which are limited in geographical expansion (rr) and</li> <li>d. Five (5) coastal bird species.</li> </ol> </li> <li>2. Mammal species observed outside well sites are <i>Cervus timorensis</i> (NT) and <i>Phalanger orientalis</i>.</li> <li>3. Threatened bird species (rare species) observed around well sites area are: <ol style="list-style-type: none"> <li>a. <i>Philemon inornatus</i> (NT/rr) and <i>Saxicola Gutturalis</i> (NT/rr)</li> <li>b. <i>Gerygona inornata</i> (rr), <i>Zoothera peronei</i> (rr), <i>Oriolus melanotis</i> (rr) and <i>Meliphaga reticulate</i> (rr).</li> </ol> </li> <li>4. In particular, the <i>Meliphaga Reticulata</i> (rr) species and <i>Rhipidura Rufiventris</i> were identified within Raiketan well site.</li> </ol>

<b>Conclusion</b>	<ol style="list-style-type: none"> <li>1. The oil well drilling activities will not cause significant negative impact to identified bird species within well sites because distribution of those bird species are categorized widespread residence, which means they can live, hide and feed in types of places such as tropical forest, woods, plantations and among community residence. Therefore those bird species can move out to above mentioned when drilling activities are being carried out.</li> <li>2. Timor Resources and Direção Geral das Florestas Cafe e Plantas Industriais need to work together to find a solution for government's Teak tree plantation which are being affected by drilling activities.</li> <li>3. Timor Resources and Direção Geral das Florestas Cafe e Plantas Industriais need to work together to find a solution for deforestation to grow plants in area affected by drilling activities.</li> <li>4. The affected communities' property to be solved in accordance with existing laws.</li> </ol>
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*Notes: Conservation Status:*

*Vulnerable (VU)*

*Near Threatened (NT)*

*Endangered (EN)*

*Critically Endangered (CR)*

*Restricted range (rr)*

### 6.2.6.1 Raiketan Well

#### Flora

Flora Type of forest identified at Raiketan well site (Central Point) is considered as secondary forest which is dominated by tree species namely Sheoak/Ironwood trees, Screw pine, Tamarind trees and Palm trees however they are not in the category of protected species according to IUCN international agreement list. Area plot I Tracking I, east side with distance of 200 meters from spud area contains privately owned Teak plantation. Area plot V Tracking I with distance of 1000 meters from spud area contains Pterocarpus Indicus which is considered Near Threatened (NT) in accordance with IUCN International agreement list and type of deciduous primary forest which serves as an important habitat for wild life.

#### Fauna

Bird Species which are Near Threatened (NT) worldwide according to IUCN International Agreement List were identified in well site areas namely Philemon Inornatus and Saxicola gutturalis and 6 (six) bird species of limited geographical expansion (rr). There are two (2) bird species namely Meliphaga Reticulata and Rhipidura Rufiventris which were identified to be within well site areas.

Certain part of forest in plot V Tracking I area serves as an important habitat for Turacoena

Modesta bird which is considered as Near Threatened (NT) and four (4) bird species with limited geographical expansion (rr) for living and food supply. Below is the list of birds identified at Raiketan well site central point (RKCP) and Raiketan Tracking Line (RKP):

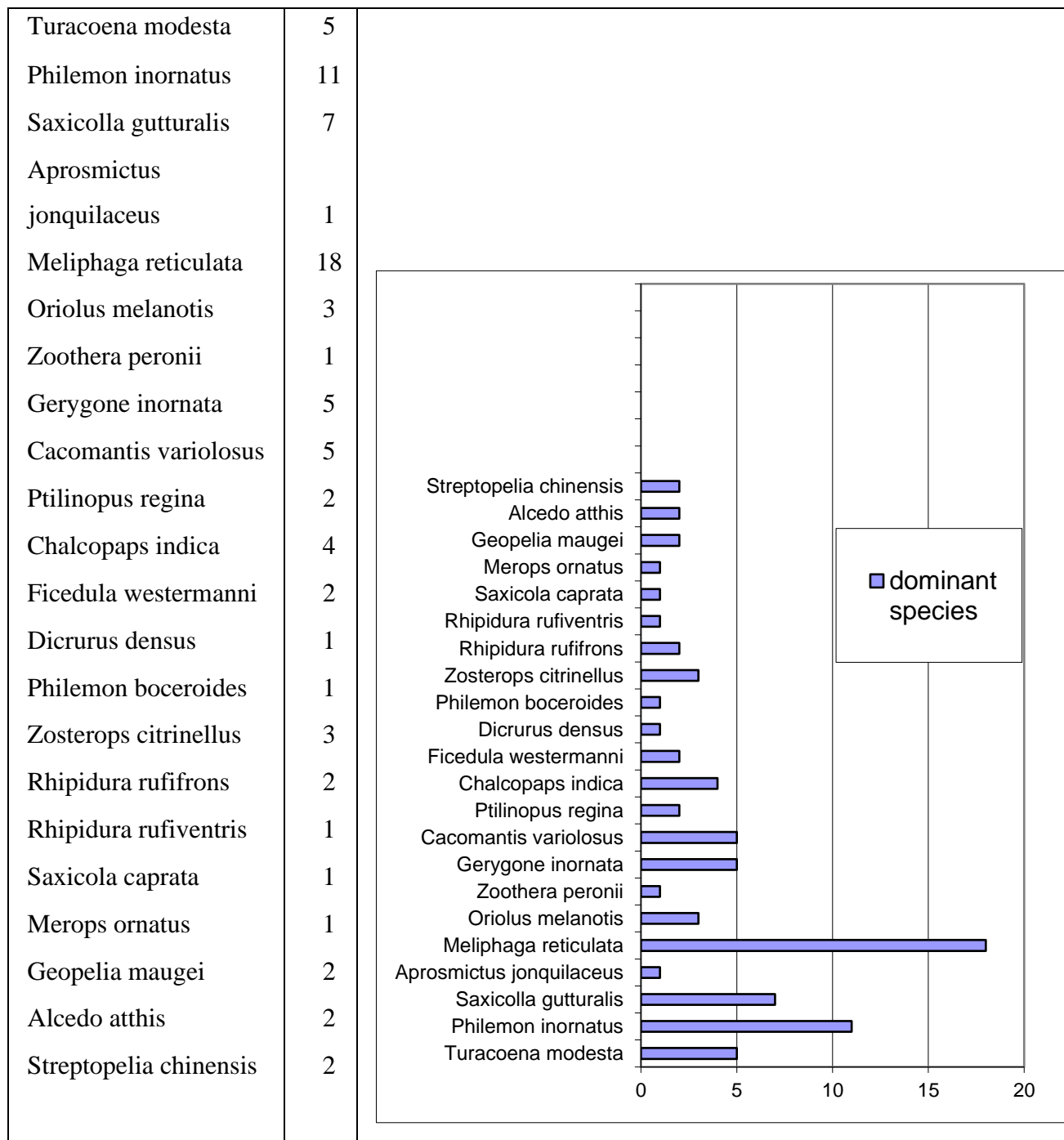
**Table 31 List of birds at Raiketan well site Central Point (RKCP)**

<b>No.</b>	<b>English Name</b>	<b>Species</b>	<b>Status</b>
1	Timor Friarbird	Philemon inornatus	NT rr
2	White-bellied Bush-chat	Saxicola gutturalis	NT rr
3	Streak-breasted Honeyeater	Meliphaga reticulata	rr
4	Olive-brown Oriole	Oriolus melanotis	rr
5	Orange-sided Thrush	Zoothera peronii	rr
6	Plain Fairy Warbler	Gerygone inornata	rr
7	Wallacean Drongo	Dicrurus densus	
8	Helmeted Friarbird	Philemon boceroides	
9	Zosterops citrinellus	Zosterops citrinellus	
10	Rufous Fantail	Rhipidura rufifrons	
11	Northern Fantail	Rhipidura rufifentris	
12	Pied Bush-chat	Saxicola caprata	
13	Rainbow Bee-eater	Merops ornatus	

**Table 32. List of birds at Raiketan well site (along Tracking Line/RKP)**

<b>No.</b>	<b>English Name</b>	<b>Species</b>	<b>Status</b>	
1	Timor black pigeon	<i>Turacoena modesta</i>	NT	rr
2	Timor Friarbird	<i>Philemon inornatus</i>	NT	rr
3	White-bellied Bush-chat	<i>Saxicola gutturalis</i>	NT	rr
4	Olive-shouldered Parrot	<i>Aprosmictus jonquilaceus</i>	NT	rr
5	Streak-breasted Honeyeater	<i>Meliphaga reticulata</i>		rr
6	Olive-brown Oriole	<i>Oriolus melanotis</i>		rr
7	Orange-sided Thrush	<i>Zoothera peronii</i>		rr
8	Plain Fairy Warbler	<i>Gerygone inornata</i>		rr
9	Brush cuckoo	<i>Cacomantis variolosus</i>		
10	Rose-crowned fruit dove	<i>Ptilinopus regina</i>		
11	Emerald dove	<i>Chalcopaps indica</i>		
12	Little Pied Flycatcher	<i>Ficedula westermanni</i>		
13	Wallacean Drongo	<i>Dicrurus densus</i>		
14	Helmeted Friarbird	<i>Philemon boceroides</i>		
15	Ashy-bellied White -eye	<i>Zosterops citrinellus</i>		
16	Rufous Fantail	<i>Rhipidura rufifrons</i>		
17	Northern Fantail	<i>Rhipidura rufiventris</i>		
18	Pied Bush-chat	<i>Saxicola caprata</i>		
19	Rainbow Bee-eater	<i>Merops ornatus</i>		
20	Barred dove	<i>Geopelia maugei</i>		
21	Common kingfisher	<i>Alcedo atthis</i>		
22	Spotet dove	<i>Streptopelia chinensis</i>		

### Birds Frequency Tracking Line





### 6.2.6.2 Laisapi Well

#### Flora

The types of floral identified within the central point of the well site of Laisapi were secondary flora and savanna, specially overgrown by species such as Australian Pine, Indian Jujube Tree, Macasar Oil Tree and Palm Tree. However, part of the area specifically area II and IV Taisa I with the distance of 600 to 800 meters predominately overgrown with Palm Tree and Australian Pine as wild's food.

#### Fauna

There are identified species globally endangered birds (NT) within the the well site such as Philemon Inornatus and Saxicola Gutturalis including limited species of geographical expansion birds (rr).

The secondary segregation forest registered within the parcel (a portion part of the área) of III and IV posses significant function for Aprosmictus Jonguilaceus birds, an endangered species (NT) and for limited species of geographical expansion birds (rr) as breeding and feeding sites.

List of birds registered within the drilling site or Laisapi Central Point (LCP) and Tracking Line (LTP) is described in following table.

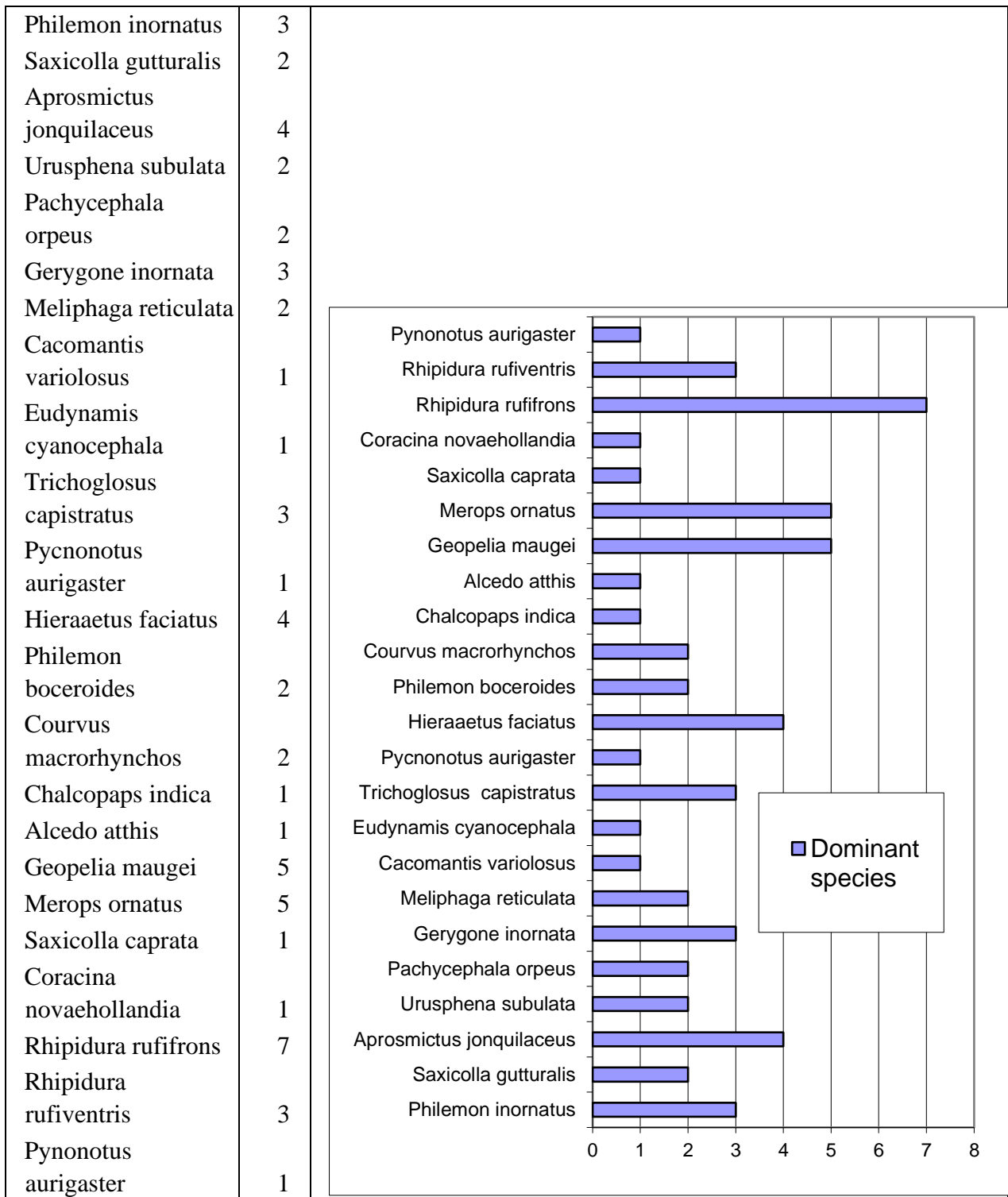
**Table 33. List of Birds surrounding Well Site or Laisapi Central Point (LCP)**

No.	English Name	Species	Status
1	Timor Friarbird	Philemon inornatus	NT rr
2	White-bellied Bush-chat	Saxicola gutturalis	NT rr
3	Streak-breasted Honeyeater	Meliphaga reticulata	rr
4	Rainbow Bee-eater	Merops ornatus	
5	Pied Bush-chat	Saxicola caprata	
6	Black-faced Cuckoo-shrike	Coracina novaehollandia	
7	Rufous Fantail	Rhipidura rufifrons	
8	Sooty-headed Bulbul	Pynonotus aurigaster	

**Table 34. List of Birds of Laisapi Tracking Line (LTP)**

<b>No.</b>	<b>English Name</b>	<b>Species</b>	<b>Status</b>	
1	Timor Friarbird	Philemon inornatus	NT	rr
2	White-bellied Bush-chat	Saxicola gutturalis	NT	rr
3	Olive-shouldered Parrot	Aprosmictus jonquilaceus	NT	rr
4	Timor stubtail	Uruphena subulata		rr
5	Fawn-breasted Whistler	Pachycephala orpeus		rr
6	Plain Fairy Warbler	Gerygone inornata		rr
7	Streak-breasted Honeyeater	Meliphaga reticulata		rr
8	Brush cuckoo	Cacomantis variolosus		
9	Australian Koel	Eudynamis cyanocephala		
10	Marigold (Rainbow) Lorikeet	Trichoglossus capistratus		
11	Sooty-headed Bulbul	Pycnonotus aurigaster		
12	Bonellis Eagle	Hieraaetus faciatu		
13	Helmeted Friarbird	Philemon boceroides		
14	Large-billed Crow	Courvus macrorhynchos		
15	Emerald dove	Chalcopaps indica		
16	Common kingfisher	Alcedo atthis		
17	Barred dove	Geopelia maugei		
18	Rainbow Bee-eater	Merops ornatus		
19	Pied Bush-chat	Saxicola caprata		
20	Black-faced Cuckoo-shrike	Coracina novaehollandia		
21	Rufous Fantail	Rhipidura rufifrons		
22	Northern Fantail	Rhipidura rufiventris		
23	Sooty-headed Bulbul	Pynonotus aurigaster		

### Birds Frequency Tracking Line



### 6.2.6.3 Kumbili Well

#### Flora

The secondary floral type registered within the drilling site (Central Point) overgrown by species of palm tree and non-internationally registered species. Part of the area of III with the distance of 600 meter from the well site overgrown by Teak Tree which is belong to the state. The plot (portion of the area) of IV, Tracking I with the distance of 800 meter of the well site registered with costal forest while the portion part of the area of V Tracking 1 with the distance of 1000 meter of the well site (the east part) registered with wetland pond as wild habitat and as wet zone.

#### Fauna

There are identified species globally endangered birds (NT) within the the well site such as Philemon Inornatus and Saxicola Gutturalis including limited species of geographical expansion birds (rr).

The segregation costal forest in the área of the portion of IV and wetland pond in the portion of V, Taisa I east part of the site is very importante for species globally endangered birds (NT) of Ducula Rosasea, Turacoena modesta, Sula leucogaster and for limited species of geographical expansion birds (rr) as their habitat.

List of birds registered within the drilling site of Kumbili Central Point and Kumbili Tracking Line (LTP) is described in following table.

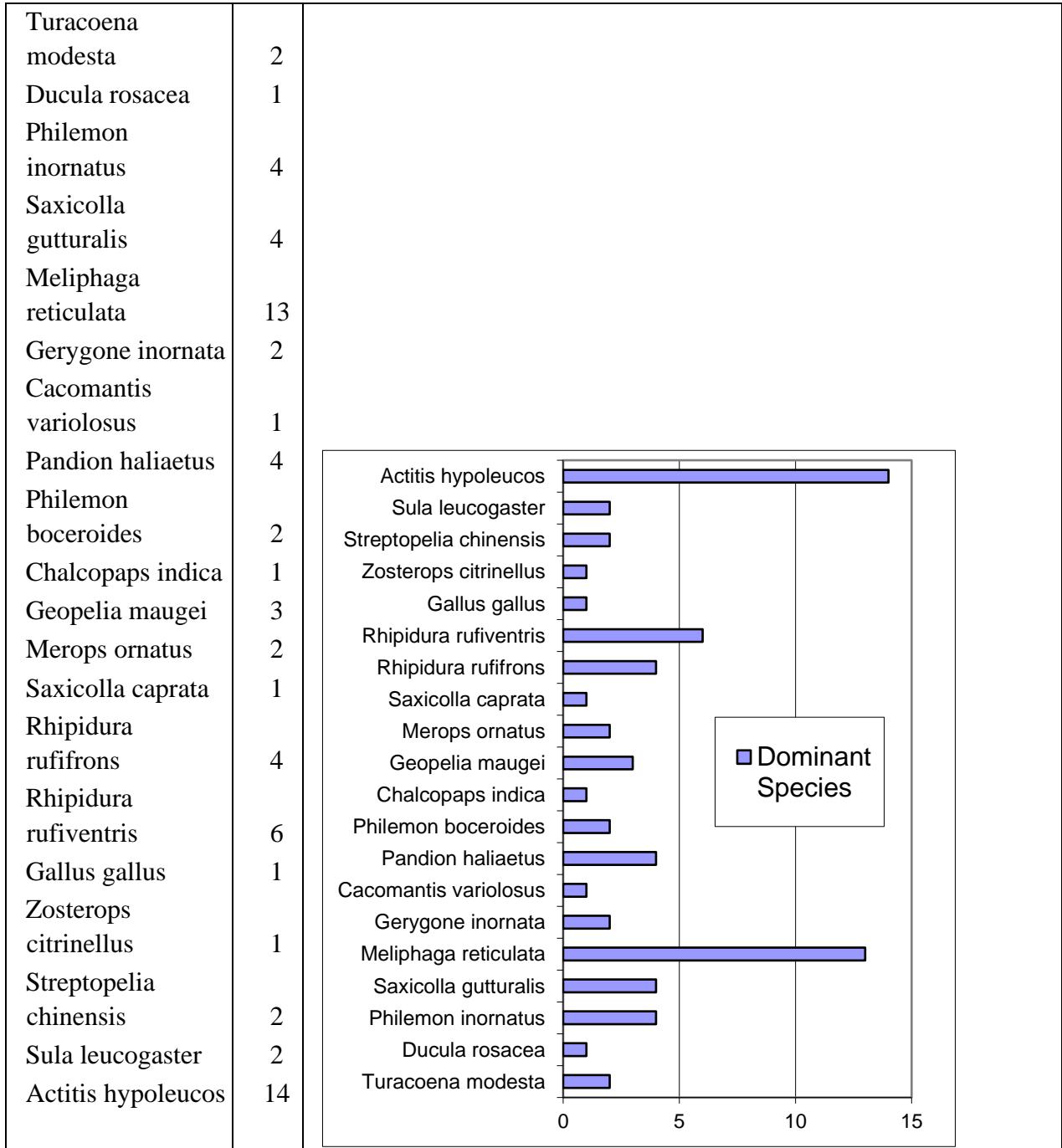
**Table 35. List of Birds of Well Site or Kumbili Central Point (KCP)**

No.	English Name	Species	Status	
1	Timor Friarbird	Philemon inornatus	NT	rr
2	White-bellied Bush-chat	Saxicola gutturalis	NT	rr
3	Helmeted Friarbird	Philemon boceroides		
4	Rainbow Bee-eater	Merops ornatus		
5	Pied Bush-chat	Saxicola caprata		
6	Black-faced Cuckoo-shrike	Coracina novaehollandia		
7	Rufous Fantail	Rhipidura rufifrons		
8	Northern Fantail	Rhipidura rufiventris		

**Table 36. List of Birds Kumbili Tracking Line (KTP)**

<b>No.</b>	<b>English Name</b>	<b>Species</b>	<b>Status</b>
1	Timor black pigeon	<i>Turacoena modesta</i>	NT rr
2	Pink-headed Imperial Pigeon	<i>Ducula rosacea</i>	NT rr
3	Timor Friarbird	<i>Philemon inornatus</i>	NT rr
4	White-bellied Bush-chat	<i>Saxicola gutturalis</i>	NT rr
5	Streak-breasted Honeyeater	<i>Meliphaga reticulata</i>	rr
6	Plain Fairy Warbler	<i>Gerygone inornata</i>	rr
7	Brush cuckoo	<i>Cacomantis variolosus</i>	
8	Osprey	<i>Pandion haliaetus</i>	
9	Helmeted Friarbird	<i>Philemon boceroides</i>	
10	Emerald dove	<i>Chalcopaps indica</i>	
11	Barred dove	<i>Geopelia maugei</i>	
12	Rainbow Bee-eater	<i>Merops ornatus</i>	
13	Pied Bush-chat	<i>Saxicola caprata</i>	
14	Rufous Fantail	<i>Rhipidura rufifrons</i>	
15	Northern Fantail	<i>Rhipidura rufiventris</i>	
16	Red-backed Buttonquail	<i>Gallus gallus</i>	
17	Ashy-bellied White -eye	<i>Zosterops citrinellus</i>	
18	Spotet dove	<i>Streptopelia chinensis</i>	
19	Brown booby	<i>Sula leucogaster</i>	
20	Common sandpiper	<i>Actitis hypoleucos</i>	

### Birds Frequency Tracking Line



#### 6.2.6.4 Karau Well

##### Flora

The Karau Well Site is located in agricultural areas, and survey activities were carried out with census method for teak, mahogany, coconut, moringa plantations and horticultural plantations such as papaya, banana and cassava including farm houses. The census activities were implemented in areas with the distances of 100 meters to the east, 100 meters to the west, and 100 meters to the north and 100 meters to the south from the location of drill well (Central Point). The survey results with data collection of Teak plantations and horticultural crops can be seen in the following table:

**Table 37. List of Plantations**

No.	Plantations, Horticulture and Infrastructures	Total
1.	Teak trees	172 trees
2.	Mahogany	1 tree
3.	Gmelina	4 hun
4.	Ai turi	48 hun
5.	Coconut trees	11 trees
6.	Moringa	31 trees
7.	Papaya	26 trees
8.	Bananas	41 trees
9.	Farm houses	2 units
10	Garden fence	150 meters x 60 meters

##### Fauna

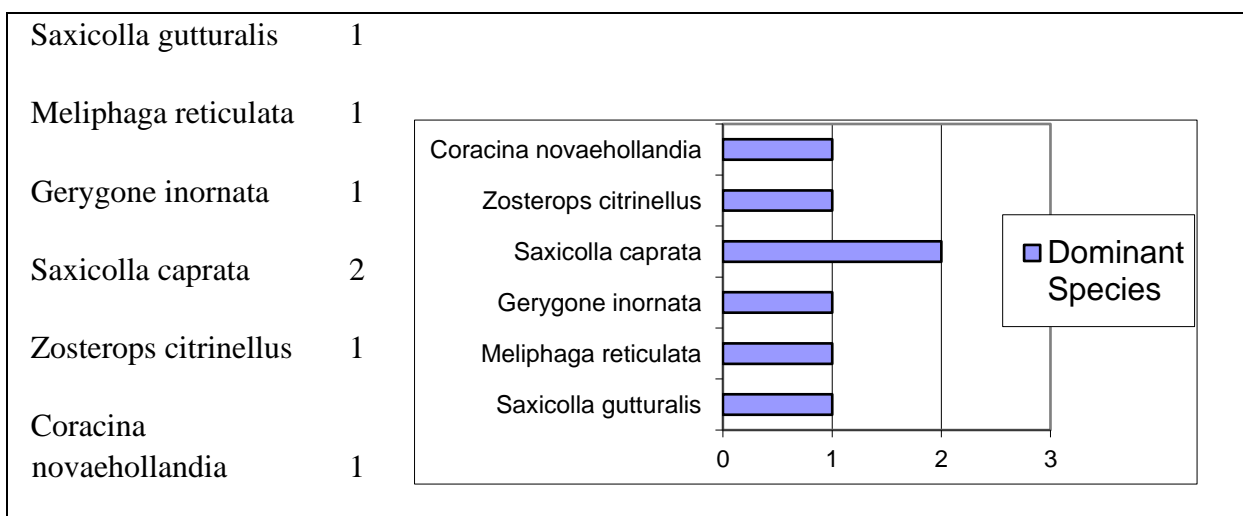
Bird's species are generally threatened with extinction and expansion geographic limited register in the well site area, such as *Saxicola Gutturalis* and *Meliphaga Reticulata*. List of birds are shown in the table below:



**Table 38. List of Birds at Well Site Karau Central Point (KRCP)**

No.	English Name	Species	Status
1	White-bellied Bush-chat	<i>Saxicola gutturalis</i>	NT rr
2	Streak-breasted Honeyeater	<i>Meliphaga reticulata</i>	NT rr
3	Plain Gerygone	<i>Gerygone inornata</i>	
4	Pied Bush-chat	<i>Saxicola caprata</i>	
5	Ashy-bellied White-eye	<i>Zosterops citrinellus</i>	
6	Black-faced Cuckoo-shrike	<i>Coracina novaehollandia</i>	

***Birds Frequency Central Point Census***



### 6.2.6.5 Lafaek Well

#### Flora

The Lafaek Well Site is located in an abandoned agricultural area that has been transformed into a secondary forest with dominant of species such as lontar palm, bamboo, tamarind tree, devil tree (dita bark), teak and coconut plantations. The identification activities for the distribution potential in area that cover 100 meters in the east side and 100 meters in the west side of perforation (central point). The identification results for the plantations are in the table below:

Table 39. List of Plantations

No.	Plantations /Horticultura	Total (tree)
1.	Teak Plantation	20 trees
2.	Coconuts	6 trees

#### Fauna

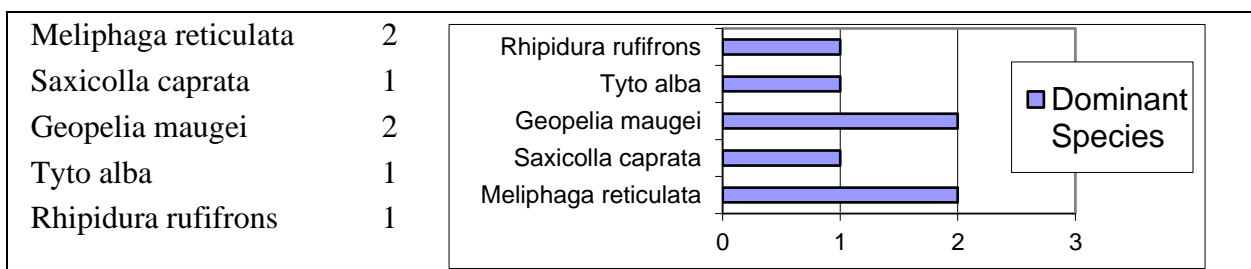
Birds species are generally expansion geographic limited which is identified as *Meliphaga reticulata* and *Tyto alba* registered in the Lafaek site. The complete list of birds are shown in the table below.

Table 40. List of birds in the Well Site ou Lafaek Central Point (LFCP)

No.	English Name	Species	Status
1	Streak-breasted Honeyeater	<i>Meliphaga reticulata</i>	rr
2	Pied Bush-chat	<i>Saxicola caprata</i>	
3	Barred dove	<i>Geopelia maugei</i>	
4	Barn Owl	<i>Tyto alba</i>	
5	Rufous Fantail	<i>Rhipidura rufifrons</i>	

#### *Birds Frequency Central Point Sencus*

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#### 6.2.6.6 Ecosystem and the Value of Biodiversification

Identification of terrestrial and aquatic resources and its environmental components (ecosystems) at outside of well site areas as place or type of place that essential for live, protection and food areas of the organism or population. The result of the survey registered the diversification of ecosystem and habitat as a type of swamp forest, costal forest, secondary forest, mangrove and wetland (humid zone).

**Table 41. Type of Ecosystem and the value of Biodiversity**

No.	Location (Site)	Type of Ecosystem	Valor Biodiversification	
			Flora	Fauna
1.	We Dare	Costal Forest	1. Law land evergreen forest that domine by species of white beech (Canarium sp) tree as a critical habitat for globally species of birds (critically endangered species) 2. Forest that recognized and respect by the local communities as a sacred place (cultural heritage)	Registered the species of birds that have high conservation value (high conservation values) such as: 1. Cacatua sulphurea (critically endangered species) 2. Ducula rosacea (Near Treated species)
2.	Lake Fesawa	Swamp Forest	1. Registered type of swamp forest, mangrove, and costal forest as a critical habitat for generally species for birds	Registered the species of birds that have high conservation value (high conservation values) such as

			(critical endangered species) 2. Forest that recognized and respect by the local communities as a sacred place	Cacatua sulphurea (critically endangered species)
3.	Lake We Kaduak	Swamp Forest	The species of plant that registered include Avicenia sp, Pandanus sp no Exocaria sp,	
4.	Estuary Mota Rai Ketan	Costal Forest	The species plant that registered include Corypha elata, Casuarina sp, Pandanus sp and other	The species of birds that registered such as 1. Egretta sacra 2. Egretta novaehollandiae
5.	Lake Seuk Lae	Costal Forest	The species plant that registered include Corypha elata, Casuarina sp, Ecocaria sp, Hibiscus sp, Pandanus sp and other	The species of birds that registered such as Saxicola gutturalis
6.	Lake We Luruk	Swamp Forest	The species plant that registered include Corypha elata, Metroxylum sp, Casuarina sp, Excocaria sp, Hibiscus sp, Pandanus sp and other	The species of birds that registered such as: 1. Meliphaga reticulata 2. Philemon inornatus 3. Turacoena modesta 4. Rhipidura rufifrons 5. Rhipidura rufiventris 6. Padion haliaetus (raptor species)
7.	Lake Lomea	Costal Forest	The species plant that registered include Corypha elata, Casuarina sp, Excocaria sp, Pandanus sp	
8.	Highway km 27 up to km 28	Swamp Forest	The species plant that registered include (antocephalos cadamba) Casuarina sp, Pandanus sp	The species of birds that registered such as Todoramphus chloris

### 6.2.7 Forests

Forested areas were estimated to cover 742,000 hectares in 2010, a reduction of 224,000 hectares since 1990 (Forestry Department 2010). Deforestation is attributable to socio-

economic pressures, years of conflict, unsustainable agricultural practices and rapid population increases (RDTL 2011). Many communities are reliant on wood for fuel in cooking and heating (GEF 2012).

Originally, Timor-Leste was covered by a closed canopy of sub-tropical forest (GEF 2012) but by 2001 only 16% of the country had a cover of dense forest and 65 % was completely bare (GEF 2012). Block A contains two types of forest; Lowland Forest and Wetland Forest (swamp) (RDTL 2011a). Covalima Municipality is covered by 76.2 % forested land (RDTL, 2011a).

Ecologically the five well sites are covered with diverse forest ecosystems and vegetation. In most of the study areas of the wells site have majority of primary forest, secondary forest, savanna, swamp forest, coastal forest and tropical deciduous forest in addition to the wild forest scattered outside the wells site areas. Within most of these forests, especially primary and secondary forest, there are plantations of teaks and horticulture plantation of papayas and bananas cultivated by the local communities (private) and public (by the government).

The main vegetation forest plants identified within the wells sites are pine trees, tamarind, moringa, acacia, umbrella trees, bamboos and palm trees. The local community and government are mainly cultivated teaks plantations with only two varieties of horticulture, which are papayas and bananas. Those trees found at the wells site areas are not categorized as critical vegetation species under the IUCN list. However, the forest as whole actually constitute to an important function of forest ecosystem, especially in providing foods and shelters for the nearby populations and other terrestrial organisms, including those listed as endangered, near threatened or geographic range limit species under the IUCN list – see Section 6.2.6 for detail of flora and fauna exist in each identified well site areas.

#### 6.2.8 Coasta Resources

The costal resources and its environmental components (ecosystems) were identified are outside of well site areas, the nearest costal resource to the well site are We Tane Sikun and We Dare. These places are located between 700 and 800 meters from the Kumbili well site. These resources are essential for some species to live, protection and food areas of their organism or population. The result of the survey registered the diversification of ecosystem and habitat as a type of swamp forest, costal forest, secondary forest, mangrove and wetland (humid zone).

The coastal resources include swamps and coastal forests are identified and their importances for the flora and fauna species have been mentioned in the Section 6.2.6.3.

### 6.3. Economic Components

According to the socio-economic census (2015) by the Ministry of Finance, four out 10 people (or 42%) of population in Covalima earn less than \$40.45 per month based on the national price index of 2014, which accordingly they are considered to be living under the international based poverty line. On the other hand, this indicates that about 58% of the

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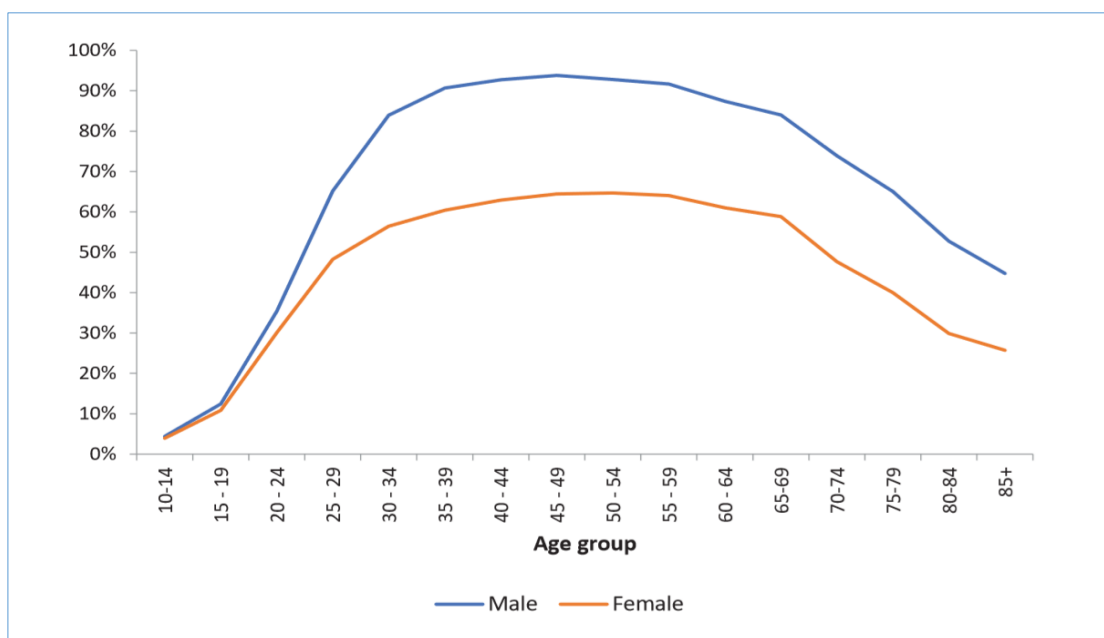
Covalima population is classified as living a condition above international based poverty line with indicator reference to the national price index 2014. Overall, the population in Covalima municipality are quite developed with improvement in a quality of their living conditions. Many of the population as of the census 2015 reported, they are able to access clean water, energy, adequate health facilities, hygienic amenities and capable of providing themselves a tertiary needs.

For the purpose of the this Timor Resources drilling activity project EIS document, the economic component that would described within include employment sector, public infrastructure, land use, use of forest and other natural resources, fisheries, agriculture, tourism and other industries.

#### 6.3.1. Employment Sector

The overall employment rate at the national level recorded in the census 2015 is 53.4% about four percent higher than the rate recorded in the census 2010, which was 49.4%. The labour force participation rate of the working age population of 15 years old and over is also increased from 54.7% recorded in the census 2010 to 56.1% in 2015. The employment rate of Timor-Leste, though remains low compared to other neighboring countries, such Indonesia, Philippines and Thailand. In general, a high employment-to-population rate shall be above 70 percent of the working age population and a rate below 50% is considered to be low (GDS, 2015).

The census 2015 further indicated that the employment rate in Timor-Leste is higher among men than women at all age group. Figure 54 shows the employment rate between male and female working age population from the age spans from 10 – 14 years old until over 85 years old.

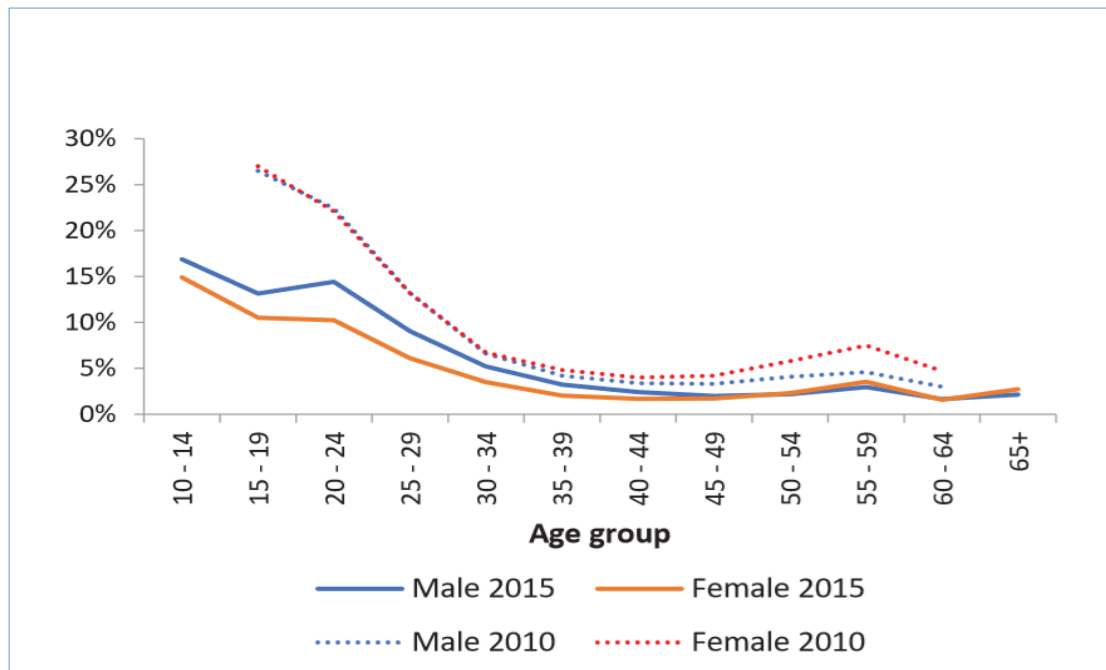


**Figure 54. Employment Rate between Male and Female Working Age Population Group (GDS Census, 2015)**

The source of employment in Timor-Leste as of 2015 were mostly from self-employment (own-account employment), services and sales, while agriculture employment has been declined during the five years period from 2010 through to 2015 and industrial employment remains the same throughout the period.



Conversely, the unemployment rate in Timor-Leste during the five years period, from 2010 – 2015 is decreased to 4.8% from 7.8% recorded in the ILO Labour Force Survey (LFS) survey 2010. Similarly, the unemployment rate is higher among men than women, especially at the working age population 10 – 14 and 40 – 44 years old; whereas over 40 years old the number are slightly different or equal. Figure 55 shows the unemployment rate between male and female for the trend recorded in census 2010 and 2015 for working age population 10 – 14 years old until over 65 years old.

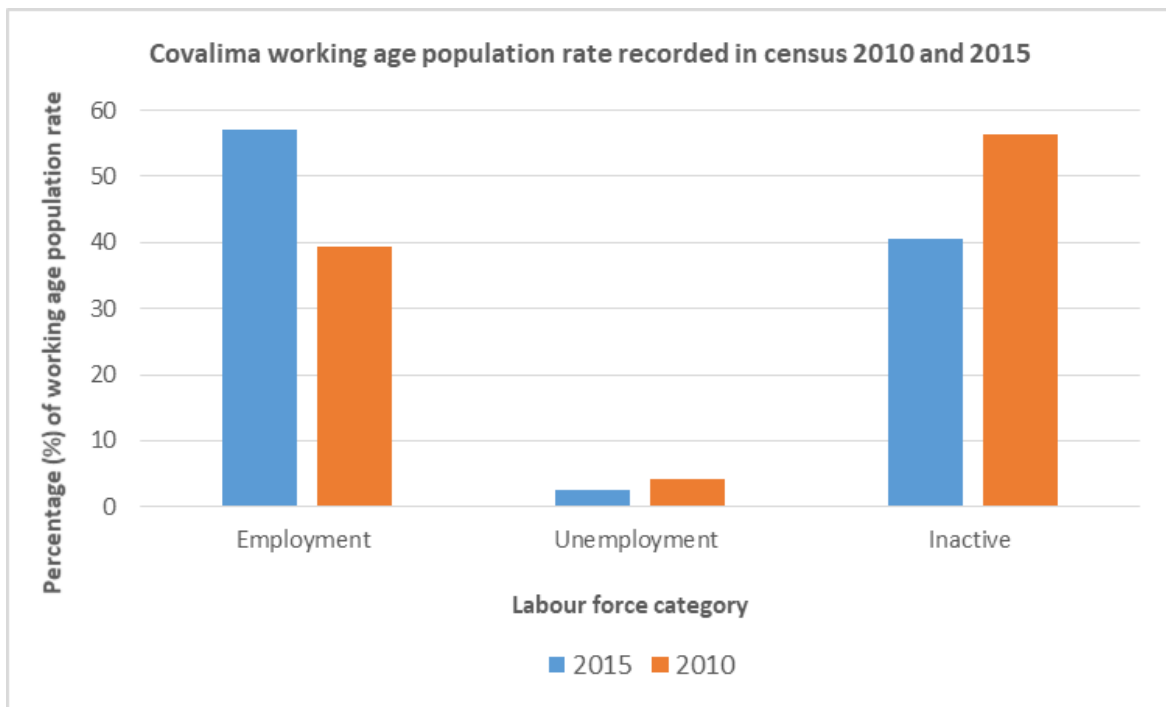


**Figure 55. Unemployment rate between male and female working age population group (GDS census, 2015)**

The employment rate in Covalima as of census 2015 is about 56.97%, which is higher than the rate at the national level mentioned above. The percentage of working age population 10 – 14, 15 – 59 and over 60 years old are in order of 51.28%, 38.37% and 10.35% respectively; and these percentages are equally distributed among men and women in Covalima.

Likewise, the unemployment rate also decreased for Covalima, the rate was slightly decreased from 2.9% in 2010 to 2.46% in 2015. In addition to the employment and unemployment rate, there is an inactive group identified within the census. The inactive group refers to those population outside the labour force (neither employed nor unemployed) or being absence from the labour activity due to either one or all of the

following reasons, namely academically active, household family (stay at home and usually women), pensioner, retired, elderly persons, ill, disabled or others. The inactive group account for 40.58%. Figure 56 shows the census 2010 and 2015 census on percentage for the three variable of labour force in Covalima. Though the employment rate is decrease, the inactive group is almost the same as the employment rate.



**Figure 56. The recorded percentage of working age population rate for labor force category**

### 6.3.2. Public Infrastructure

Timor-Leste public infrastructure is considered slowly developed even though there have been some progresses in the public infrastructure development, especially development of the roads, bridges and electricity in the country.

In the proposed project studied areas of the five wells there are quite of public infrastructures that scattered throughout the areas. The public infrastructures and community housings, unpaved local roads or pathways, community private garden, agricultural farms, horticultures and plantations are not located or built orderly rather randomly within those identified areas. The existing public infrastructures that are randomly scattered in between the community private housings and roads are schools, chapels, infantile park, road, highway, bridge, power lines and airport.

### 6.3.3. Land Use

In general Timor-Leste has fixed land use pattern throughout the country. A common land use pattern in the country is based on the topography or landscape of an area, geological origin, weather conditions and human impact. There are six land areas category exist in the country, these are mountainous areas, highland plains, moist lowlands (along the southern coast), arid low land (along the northern coast), marine and coastal and urban areas (Henriques, Narciso & Branco, 2011). Table 42 list out the overall land use and land cover surveyed in 2012 in all thirteen districts in the country, the surveyed was conducted by the Ministry of Agriculture and Fisheries.

**Table 42. Land Use and Land Cover in 2012**

Category	Land use/cover	Area (km <sup>2</sup> )	Percent
Forest land	Dense forest	3,129.31	21.20%
	Sparse forest	556,199.74	37.70%
	Very sparse forest	631.73	4.30%
Grassland	Grassland/Shrubs	4,033.24	27.40%
Crop land	Rice field	413.87	2.80%
	Dry farm	221.53	1.50%
Settlement	Settlement	29.89	0.20%
Other lands	Water body	228.77	1.60%
	Bare land	487.17	3.30%

The 2012 data for the land use and land cover is the latest and used up this date (LDN Country Report, 2017). There is no survey yet conducted after 2012 in identifying the country land use and land cover for specific purposes. In general, though the land use pattern is the same across the country, the scale and level of exploiting the land is different from one region to another.

Most of the population in Timor-Leste, especially those in the rural areas use their land for subsistence agriculture. Other use are for settlement, housing, basic infrastructure, sacred houses (altars), housing (urban and rural houses) and industrial and commercial activities (Henriques, Narciso & Branco, 2011).

The following Table below shows the percentage of land use by Covalima population in general (TR-SEIS, 2018).

**Table 43. Percentage of land use in Covalima**

<b>Land use pattern</b>	<b>Land use coverage (%)</b>
Forest land	76.2%
Agricultural land	16.7%
Unused dry land	4.1%
Settlement	-
Water coverage	-

#### 6.3.4. Use of Forest and Other Natural Resources

Most of the Covalima population use the forest for agriculture subsistence, especially for those who do not own adequate and proper land size for agriculture practices; they in turn transform the primary forest into secondary forest for this purposes. In addition, most of the forest are accessed for timber, hunting of wild animals for daily subsistence (wild boars) or sale (exotic animals that have a high economic value in the market) , collecting fire wood and bigger scale of planting activity, such as teaks plantation and horticulture for mass production of papayas, bananas, coconuts, beans coffee and others. Also, most of the population use savanna forest for animals or livestock grazing, such as pigs, cows, goats and horses.

Other natural resources are the use of lagoons for leisure activities and marine resources for subsistence fishing, include catching molluscs and seaweed; small scale commercial fishing; and local community marine recreational activities, such as diving, swimming and recreational fishing.

#### 6.3.5. Fishing

In Covalima, there are four major post-administrative that have their communities individually or in group carry out fisheries activities for both subsistence and commercial (small scale fishing commercial activity) purposes. These four post-administrative are, Suai, Tilomar, Maucatar and Zumalai; in which three are part of the proposed project areas

(Suai, Maucatar and Zumalai). Nonetheless, as it is mentioned in the previous section (Section 6.2.6 – Coastal Resources) that the propose project will have no impacts on marine or coastal water.

According to the latest census (2017), there has been fluctuation in number of individual or group fishing communities and the units of their boat fishing facility. The 2017 data was compared with the past two years, which are 2015 and 2016 fishing. Most of the communities use medium size non-wooden fishing boat; then follow by wooden engine boat; and only a small number of community use quite sophisticated fishing boat, such as a Johnson boat or a motorized boat with internal engine.

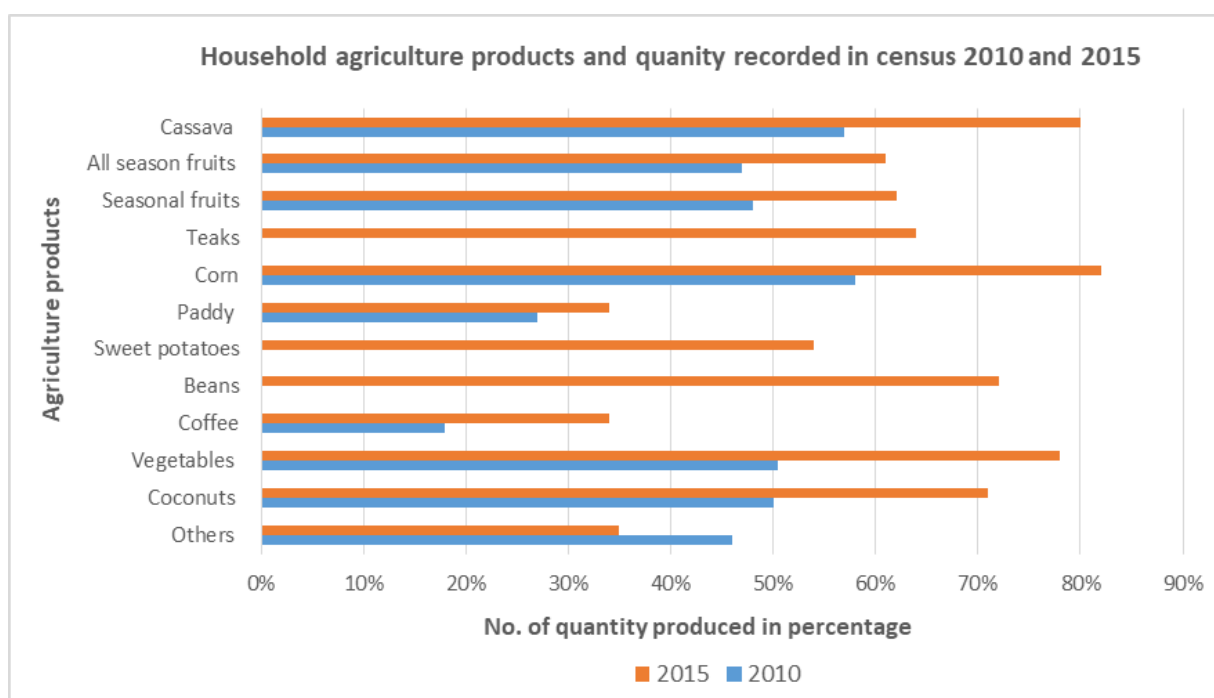
**Table 44. List out the four post-administrative and the number of fishing communities (both individual or in group) from 2015 to 2017.**

Post-Administrative	2015		2016		2017	
	Total Fisheries community in Group and Individual					
	In Group	Individual	In Group	Individual	In Group	Individual
Suai	23	269	16	229	56	260
Tilomar	5	56	3	70	7	47
Maucatar	2	25	2	46	0	0
Zumalai	1	25	2	24	6	32
Total	31	375	23	369	69	339

### 6.3.6. Agriculture

Though agriculture employment overall decreased in the country, agriculture practice still dominant in all municipalities. The Covalima population have increased in their agriculture diversity, they are expanding from individual for daily subsistence to collective agriculture for market mass production. They have also increased agriculture and horticulture products, from common seasonal to all season fruits and vegetables; and quantity of products during the five year periods, 2010 – 2015.

Figure 49 below illustrates development of household agriculture products and quantity during the five years period, 2010 – 2015 census.



**Figure 57. Household agriculture products and quantity produced over the five years period, 2010 – 2015 census**

In 2015 census recorded that most of the household or about 66.7% practice agriculture for their daily subsistence instead of selling them in the market; 31.3% of the population practice small scale agriculture individually in their individual farms; and only 2% of farmers collectively sale their products in the market.

Table 26 list the household agriculture products and quantity produced both individually and collectively for their purposes as listed in the level of agriculture activity.



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Table 45. List of household products and quantity identified in the census 2015.

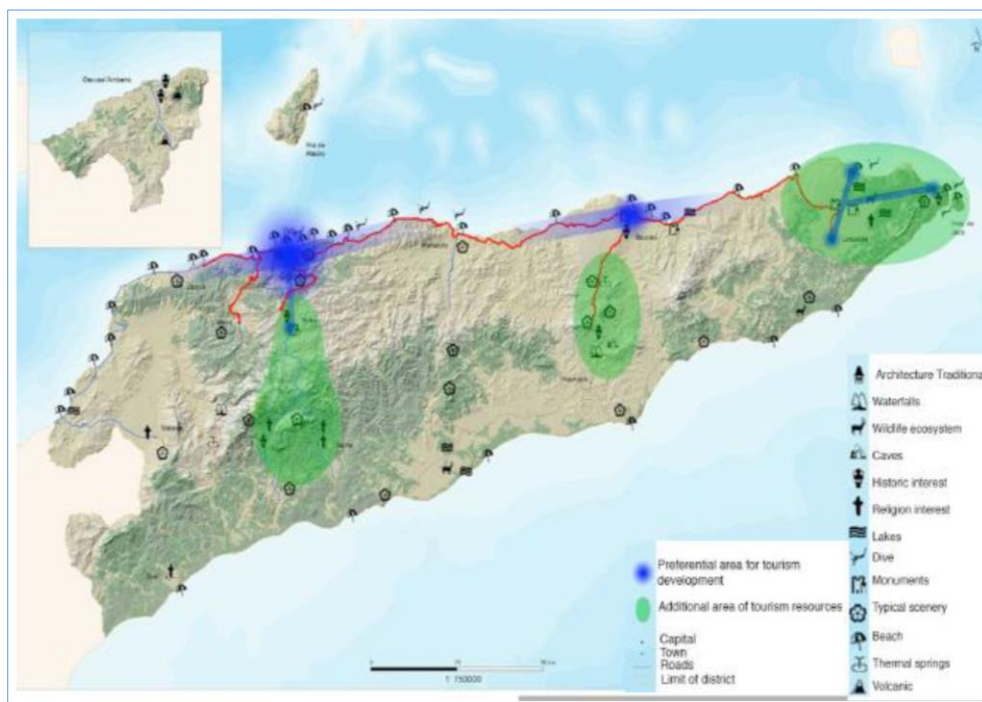
Geographic location	Level of agriculture activity	Quantity produced											
		Paddy	Corn	Cassava	Sweet potatoes	Vegetables	Beans	Coffee	Coconuts	All season fruits and vegetables	Seasonal fruits and vegetables	Teaks	Others
Covalima	Small scale agriculture (individual practice agriculture)	1,197	3,107	2,997	2,010	2,934	2,677	1,315	2,731	2,307	2,315	2,457	1,328
	Agriculture practice majority for daily subsistence	2,796	7,019	6,842	4,646	6,595	6,348	2,857	6,088	5,188	5,331	5,478	2,880
	Collective agriculture for market mass production	106	209	210	146	192	193	99	192	175	179	187	102

## 6.3.7. Tourism

Development of the tourism sectors in Timor Leste still minimal even though tourism industry is one of the three main industries for the country's economic development as defined in the Country National Strategic Development Plan (PEDN).

There are no current tourism data is made available publicly, so the data is used in this report is based on the *Timor Leste Tourism Research and Development, June 2014* that total arrivals in Timor Leste in 2012 were 147, 410 and 3, 253 were entering the country via Salele, Tilomar. Those people entered Timor Leste for all reasons including returning residents.

Nonetheless, Covalima, is also identified as one of the destination for ecotourism developments, which is studied and mapped by GERTiL; a Portuguese group who have been working with Ministry of Tourism, Trade and Industry to develop a sustainable tourism development and planning. Figure 19 shows the mapped of future ecotourism development areas created by GERTiL. In Timor-Leste, though currently there is no legislation or law setup to regulate the planning and development of tourism industry in the country, the Ministry of Tourism, Trade and Industry under the IV constitutional government program (2007-2012) considers to create a specific legislation for tourism industry and officially adopt the National Tourism Strategic Plan (Edyvane et al., 2012).



**Figure 58. Potential tourism destination identified throughout the 13 Municipalities of Timor-Leste**

The map further indicates that the North coast is much richer in Sun, Sand and Sea (3-S) areas compared to south coast, which is found to be unsuitable for the specific development of 3-S areas due to the turbulent waves that makes it difficult for snorkeling or any water-based activities; the presence of crocodiles in the water (Edyvane et al., 2012).

There are few hotels, guest houses and restaurants are available in Suai, however based on the observations those facilities are mostly used by the government, non-governmental organizations (NGOs) and private company's employees during their official visits.

On the other hand as the actual tourism data is hardly found on the public web domain, the total visitors entering Suai cannot be defined clearly. Those visiting could be tourists, workers or visiting family and relatives. Overall, no tourism areas and activities found adjacent to the proposed well locations.

#### 6.3.8. Other Industries

There are some small medium enterprises (SMEs) business run by locals and expatriates in Covalima, especially Suai. These SMEs are mostly providing goods and services such as hotels, guest houses, restaurants and shops. There are also number of local industries currently running in the municipality such as local wood crafts; plantation of timber trees, such as teaks, gmelina and mahogany; fish ponds, silo, and local textile (weaving) production (Tais cloth).

In addition to these local productions there are also other national and international organizations or none governmental organizations (NGOs) that work together with the local community in other type of business industries, for instance coffee production and shops, coconut oil productions, palm liquor productions and local timber productions.

#### 6.4. Social Component

A survey with the local communities within the seven Sucos of the five well sites was conducted to obtain the local information and data for the following social components, which included population and communities; health profiles; existing institutions, schools and health facilities; community and family structure; and land and property owners and other common or individual rights of natural resources.

##### 6.4.1. Population and Communities

Timor-Leste has quite diverse of cultures and languages of its population living across the country. The area of the country is 14,954.44 km<sup>2</sup>, which has a total population of 1, 241, 506 recorded in census 2017 (Ministry of Finance); with a population density of 83 per km<sup>2</sup>. The country has thirteen districts or currently is known as municipalities that have Post administrative, Sucos and Aldeias. Table 46 list out the 13 municipalities, post administrative, Sucos, aldeias and their area size.

**Table 46. List of the 13 Municipalities of Timor-Leste**

Municipal	Post Administrative	Sucos	Aldeias	Areas in sq.km
Aileu	4	33	139	676.02
Ainaro	4	21	131	869.80
Baucau	6	59	281	1,507.96
Bobonaro	6	50	194	1,380.82
Covalima	7	30	148	1,206.66
Dili	6	35	241	368.12
Ermera	5	52	277	770.83
Lautem	5	34	151	1,813.11
Liquica	3	23	134	550.95
Manatuto	6	31	103	1,785.96
Manufahi	4	29	137	1,326.60
Oecusse	4	18	63	817.23
Viqueque	5	36	234	1,880.39
<b>Total</b>	<b>65</b>	<b>451</b>	<b>2,233</b>	<b>14,954.45</b>

As listed above, the overall area of Covalima municipality is 1,206.66 km<sup>2</sup>; and it has a projected total population of 67, 495 with population density of 55.9 per km<sup>2</sup>.

Table 47 list out the number of Sucos, aldeias and the area size (in percentage) for each one of the post administrative in Covalima.

**Table 47. List of Covalima Post Administrative and their Sucos and Aldeias**

Post Administrative	Sucos		Aldeias		Area size (%)
	No. of Sucos	Name	No. of Aldeias	Name	
Fatululic	2	Fatululic, Taroman	8	Aitoun, Beco, Beidaci, Fatuloro, Lia Nain, Macous, Taroman	3.79%
Fatumea	3	Be lulic leten, Fatumea, Nanu	12	Baleo quic, belulic kraik, Clau Halec, Mane Quic, Fatumea, Lebo, Mota Ulun, Rai Oan, Halic Nai, Macocon, Nanu, Tradu Cama	10.99%
Fohorem	4	Dato-Rua, Dato-Tolu, Fohorem, Lactos	15	Aitos, Fatulidun, Hali-Laran, Fatuc Cabuar Craic, Fatuc Cabuar leten, Natardic, Fatuc Bitic Laran, Fatuc Laran, Lo'o Hali, Loroquida, Sadahur , Au-Lulic, Cacaut, Calobor, Fatuc Laran	11.01%
Maucatar	4	Belecassac, Holpilat, Matai, Ogues	22	Busadao, Dais, Du'Ut, GAZolo, Ila, Loloba, Lolowa, Fatuc oan, Hatu, Iela, Leogore, Manulor, Nainare, Lohorai, Maior/Cunain, Matai, Quiar, Baulela, Fohor Rua, Ogues, Orun, Soga	9.50%
Suai	5	Beco, Camenaca, debos, Labarai, Suai Loro	34	Aidantuic, Beco, Bibiatan, Haemanu, Halic, Holbolu, Leowalu, Maucola, teda, Tobur, Zuwac, Ailloc Laran, Fatuisin, Manequin, Sanfuc, Ahinarai, Asumetan, Asurai, Busacucun, Lacoban babu, Laconac Besic, Io'oque, Lontale, Tabacolot, Bonuc, Holba, Meop, Mucbelis, Roec, Acar Laran, Lo'o, Mane Iacun, Sucabe Laran, Suco Loro	25.08%
Tilomar	4	Beiseuc, Cassabau, Lalawa, Maudemo	23	Baer, Fatuc Metan, Foholulic, Maubesi, Niquir, Wala, Wetaba, Cawa Uman, Coloama, Tabolo, Ai-oan, Bitis, Halemea, Kota Foun, Salele Bot, Tulaeduc, Ai-Taman, Besac Oan, Caicoli, Coitau, Fau-Laran, Sadahur	16.13%
Zumalai	8	Fatuleto, Lepo, Lour, Mape, Raimea, Tashilin, Ucecai, Zulo	34	Biata, Colu, Fatulelo Canua, Nalaop, Zobete, Aisai Leuc, Baulolo, Biatuma, Horba, Lepo Canua, LAe Gatal, Pelet, Ritoluli, Salsa, Somo Kanua, Tilis, Uluc Lolo, Daro, Mape Canua, Polo, Beilaco, Baura Iacun, Culu Oan, Galitaz, Leudula, Reaçu, Iale, Leogol, Obuc Mil, Zulo Tas	23.51%
<b>Total</b>	<b>30</b>		<b>148</b>		<b>100%</b>

Furthermore, within the projected total population, Covalima has about almost equal number of populations for male and females. The male population is 34,314, which is slightly higher the number of female populations, which is about 33,181 in total. Table 48 and

Figure 59 (Pyramid projection) provide detail numbers of Covalima projected total population by age group and gender.

**Table 48. List of Covalima projected total population by age group and gender**

Grupo de Idade	Total	Mane	Feto
0-4	8,851	4,597	4,255
5-9	8,132	4,226	3,906
10-14	8,890	4,630	4,260
15 - 19	8,431	4,412	4,019
20 - 24	5,619	2,870	2,749
25 - 29	4,200	1,993	2,208
30 - 34	4,152	1,982	2,170
35 - 39	2,982	1,416	1,566
40 - 44	2,869	1,404	1,465
45 - 49	3,113	1,625	1,488
50 - 54	2,361	1,235	1,126
55 - 59	1,736	928	809
60 - 64	1,556	755	801
65 - 69	1,649	770	879
70 - 74	1,448	724	724
75 - 79	870	462	409
80 +	636	288	348
<b>Total</b>	<b>67,495</b>	<b>34,314</b>	<b>33,181</b>

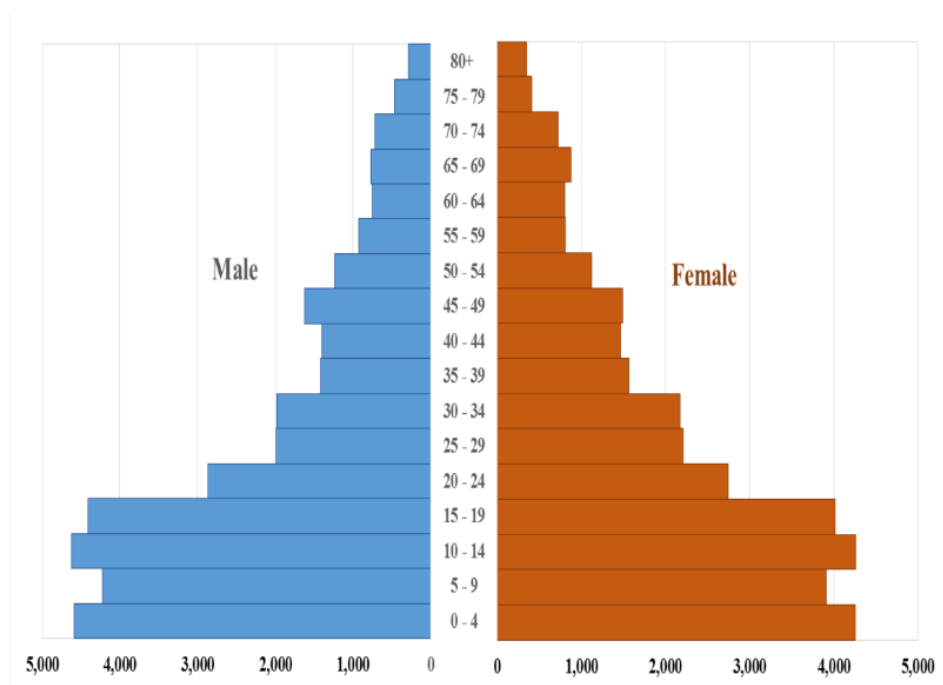


Figure 59. Pyramid projection of Covalima total population by age group and gender



The recent projected total population in Covalima is increased by 1% with a reference back to the 2016 population census data, with an average age of 19 years old. The birth rate in Covalima as of 2017 is 28.4% and mortality rate of 11.1%. The birth rate is declined compared to the data recorded in 2016 census, which was 29%; likewise the mortality rate is also slightly decreased by 0.2% (from 11.3% in 2016 to 11.1% in 2017).

Based on the Table 48 the most of Covalima community is constitute of younger (teen agers) population between the ages of 10 to 19 years old than older generation, and in which they are dominated by male teen agers than female.

### **Language**

In general, Covalima population speaks four languages include tetum prasa, the mother tongue of Timor-Leste; and the other three languages that belong to the area are Bunak, Tetum Terik and kemak. Majority of the population or approximately 31,296 population speaks Bunak, then follows by Tetum Terik, which is spoken by about 25,925 population. The other two languages that are spoken by small number of population are Tetum Prasa and Kemak, these numbers are in order of 4,290 and 3,241 respectively.

### **Education and Literacy**

Although literacy in Timor-Leste is considered to be one of a major challenges, census 2015 indicates that it actually increases from 79.1% in 2010 to 84.02% in 2015 for population age 15 to 24 years old. At municipality level of Covalima the percentage of literacy is even higher, the literacy recorded in 2010 was actually 81.1% and increased to 87.67% in 2015. The literacy rate for population over 15 years old in Covalima require more development, as of 2015 census the percentage of literacy for these age range is 63.5%.

Figure 60 below shows the total literacy of both male and female and the rate for each category for the age 15 to 24 years old in Covalima.

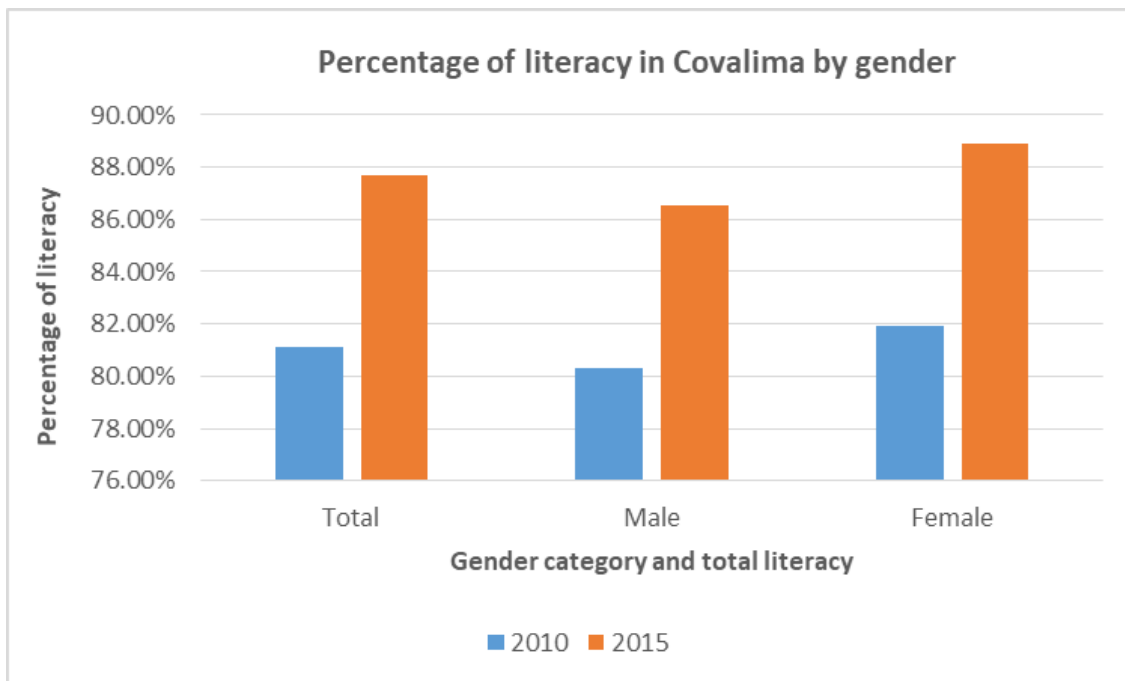


Figure 60. Percentage of literacy for population age 24 to 24 years old for male and female in Covalima.

Furthermore, in Covalima most of the population over 3 years old have no education background or the highest education level is basic primary school certificate (census 2015). Most of them are either never attended school or dropped out from the education system. The education level currently exist in Covalima is only up to secondary school or Senior High School level, which divides into two categories, these are general secondary and vocational school levels certificate. Figure 61 below indicates the number of students at the highest education level or the secondary school level for both general and vocational categories in Covalima recorded in census 2017.

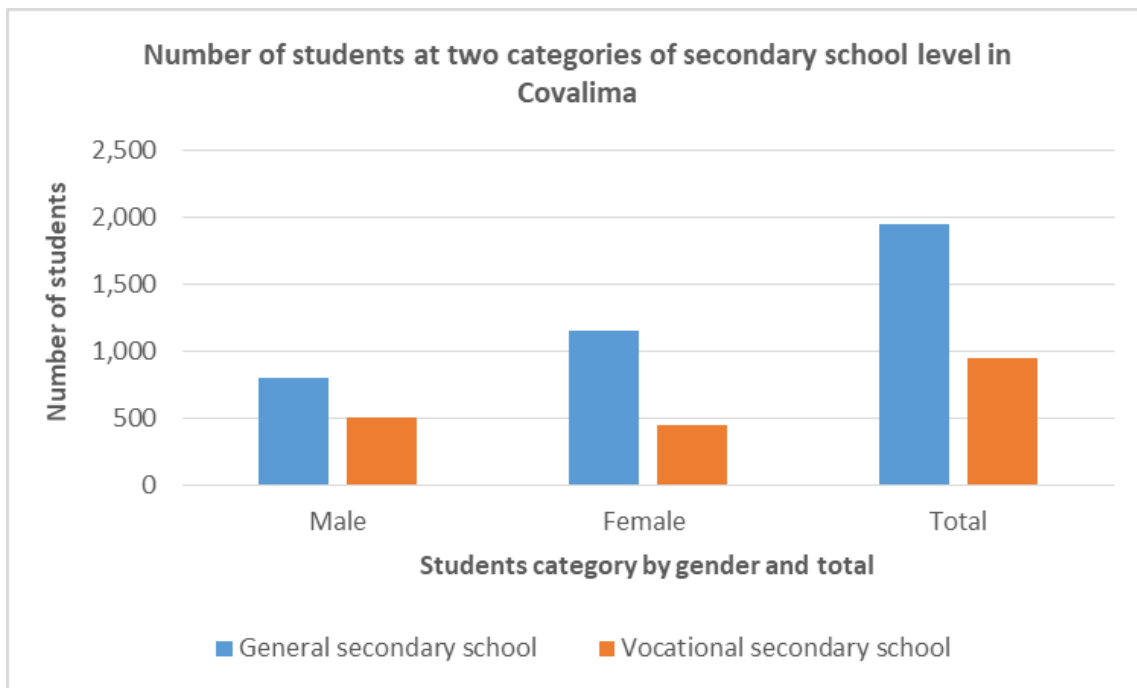


Figure 61. Number of students by gender at two categories school levels in Covalima

In the latest census 2017, it also portrays the number of student at dropped out of the school at the basic primary and secondary school levels - see Figure 62 for information.

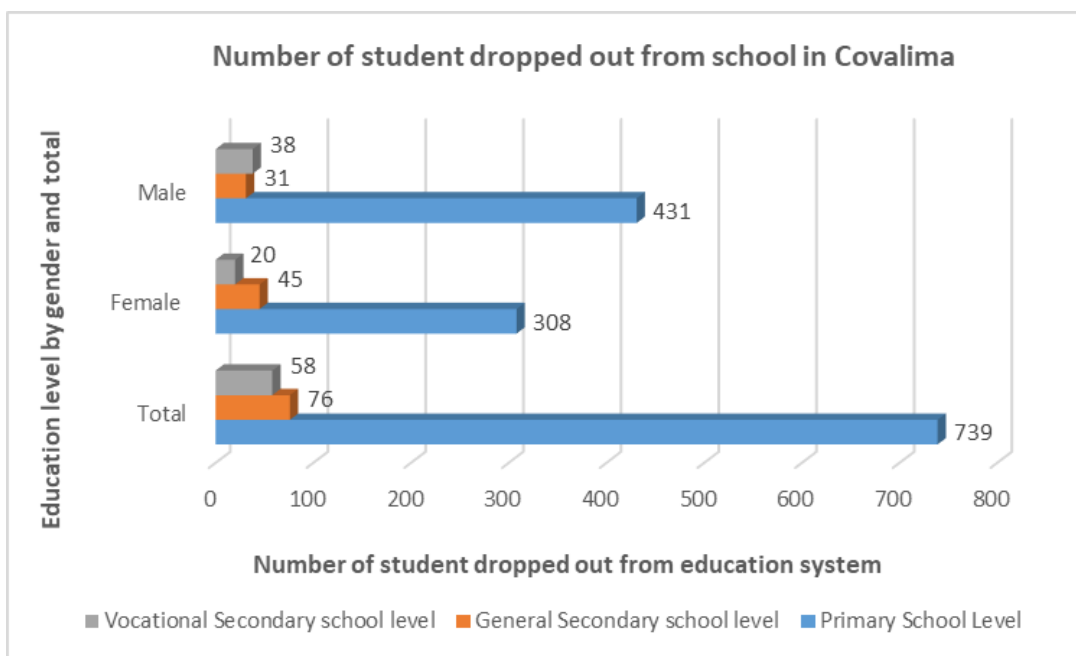


Figure 62. The number of student dropped out of the school system in Covalima

General cases in Timor-Leste many population in other municipalities would send their children to Dili (the capital) for higher education level, particularly before or after secondary school (Senior High School) level.

#### 6.4.2. Health Profiles of the Communities

Based on the data provide in Census 2017, there has been an increase in most of main the diseases identified in Covalima with a reference back to 2016 census data.

See Table 49 for recorded case type and number of diseases back in 2016 and 2017 census.

**Table 49. List of disease and recorded case number in 2016 and 2017**

<b>Diseases</b>	<b>2016</b>	<b>2017</b>
Upper respiratory tract infections	31,746	32,018
Acute watery diarrhea	8,310	12,090
Pneumonia	2,566	2,756
Scabies	820	1,917
Malaria	1	2
Bloody Diarrhea	213	154
Leprosy	1	3
HIV / AIDS	4	2

The latest health profile was taken in 2018 for a duration period of 12 months. The profile recorded the common diseases or illnesses in age group category over the seven post administrative of Covalima municipalities. As per Ministry of Health cases recorded, it shows that in past year of 2018, there were about 17,864 health consulted cases for female communities from infants of less than 1 year old to over 15 years old; and 13,251 cases for male communities for the same age category. Figure 63 below shows the number of recorded consulted health cases in Covalima in 2018 for male and female communities between the ages of <1 year old – to – >15 years old. The recorded cases were for tropical type of diseases or illnesses that are prevalent or common in the country. These include, acute diarrhea, cholera, Immunization of School Pupils Act (ISPA/URTI)), pneumonia, Meningitis, HIV/AIDS, uretral discharge, scabies, ulcer genital, anthrax, rabies, traffic accident, other accident and other diseases.

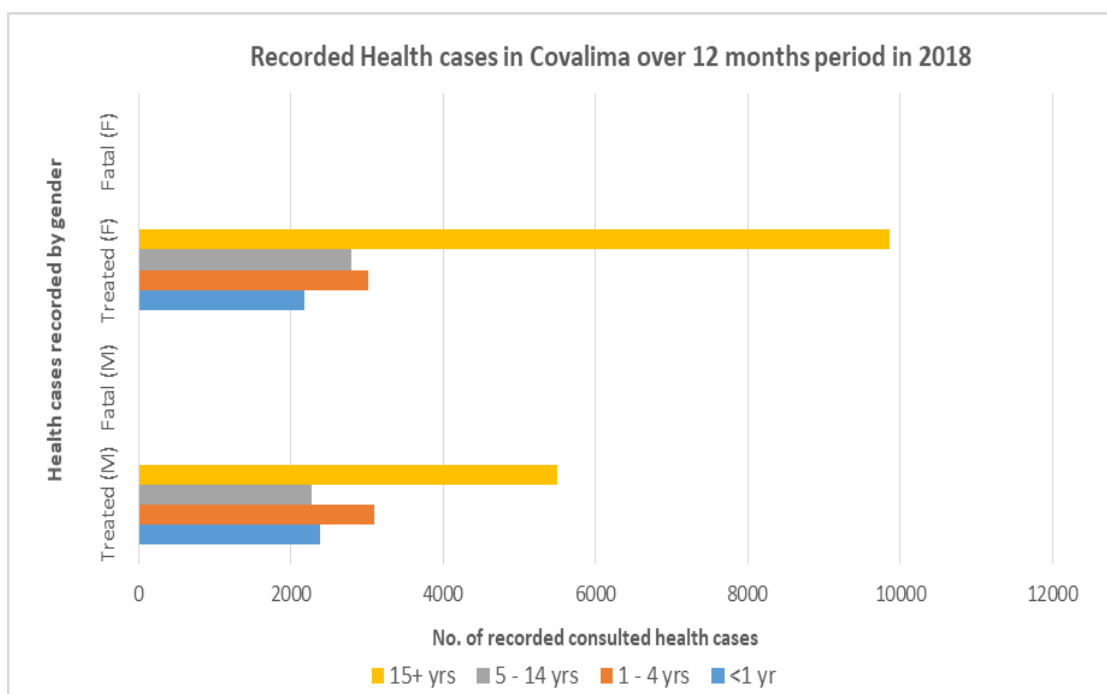


Figure 63. Number of diseases cases consulted at the health care facilities in Covalima

In addition to this general age category, Covalima municipality also has a particular record of health cases for infants from the ages of 2 months old-to-five years old.

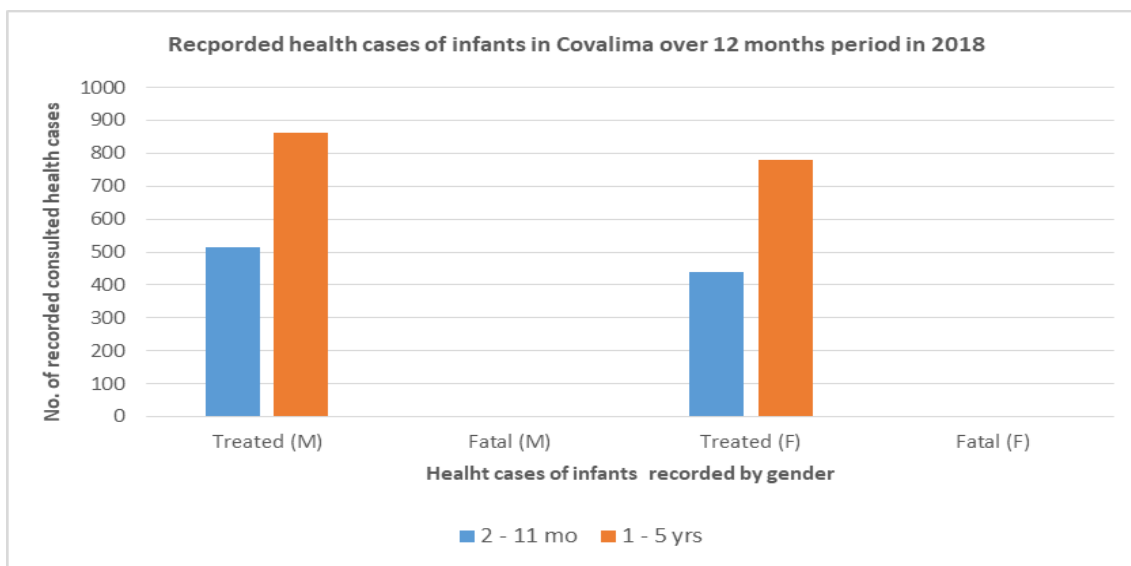


Figure 64. Number diseases consulted cases for children under five years old in Covalima

The following Tables (**Error! Reference source not found.** and Table 51) are details of the 2018 date for consulted disease among children under five years old and adults over 15 years old. **Error! R**

**eference source not found.** indicates that there has been a substantial improvement in Covalima's child survival ability. The IMCI (Integrated Management Child Illnesses) data shows zero mortality of children under 5 years old for the past 12 months of 2018 recorded in Covalima.

**Table 50. Recorded number of consulted prevalence diseases of children under five years old in Covalima**

No.	Classification of Illness based on IMCL (Integrated Management Child Illnesses)	Number of patient visited health care facility					Number of child mortality <sup>1</sup>				
		2-11 months old		1 - 5 years old		Total	2-11 months old		1 - 5 years old		Total
		M	F	M	F		M	F	M	F	
1	Very Severe Disease	1	0	0	0	<b>1</b>	0	0	0	0	<b>0</b>
2	Severe Pneumonia	0	3	0	0	<b>3</b>	0	0	0	0	<b>0</b>
3	Pneumonia	68	64	99	84	<b>315</b>	0	0	0	0	<b>0</b>
4	Cough or Cold	165	149	296	321	<b>931</b>	0	0	0	0	<b>0</b>
5	Diarrhoea	96	60	149	97	<b>402</b>	0	0	0	0	<b>0</b>
6	Dysentery	4	3	5	6	<b>18</b>	0	0	0	0	<b>0</b>
7	Very Severe Febrile Disease	1	1	2	1	<b>5</b>	0	0	0	0	<b>0</b>
8	Definite Malaria	0	0	0	0	<b>0</b>	0	0	0	0	<b>0</b>
9	Febrile or Malaria Vivax	29	33	41	54	<b>157</b>	0	0	0	0	<b>0</b>
10	Measles	0	0	0	0	<b>0</b>	0	0	0	0	<b>0</b>
11	Dengue	0	0	0	0	<b>0</b>	0	0	0	0	<b>0</b>
12	Dengue Hemorrhagic Fever (DHF)	14	18	17	24	<b>73</b>	0	0	0	0	<b>0</b>
13	Ear infections	8	8	13	10	<b>39</b>	0	0	0	0	<b>0</b>
14	Malnutrition	2	7	15	10	<b>34</b>	0	0	0	0	<b>0</b>
15	Others	127	93	227	174	<b>621</b>	0	0	0	0	<b>0</b>
<b>Total</b>		<b>515</b>	<b>439</b>	<b>864</b>	<b>781</b>	<b>2,599</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<sup>1</sup> Total number of child mortality at the health care and emergency facilities											

Likewise, there is a zero number of mortality for consulted diseases cases for adults over 15 years old recorded at the Covalima Health Care facilities over the 12 months period of 2018. Nevertheless, there is small number of unsurvived consulted diseases cases that resulted in mortality. See Table 5151 for details type of disease and number of consulted cases recorded in 2018.

**Table 51. Recorded number of consulted prevalence diseases of children < 1 year old and adults >15 years old in Covalima**

Diseases	< 1 year old				1-4 year old				5-14 years old				15+ years old				Total			
	Treated		Mortality result		Treated		Mortality result		Treated		Mortality result		Treated		Mortality result		Treated		Mortality result	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Acute diarrhea	419	336	0	0	584	514	0	0	293	383	0	0	410	626	0	0	1,706	1,859	0	0
Bloody diarrhea	2	4	0	0	8	6	0	0	4	4	0	0	8	13	0	0	22	27	0	0
Cholera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Immunization of School Pupils Act (ISPA)	918	814	0	0	1,192	1,292	0	0	760	1,060	0	0	1,575	2,979	0	0	4,445	6,145	0	0
Pneumonia	134	138	0	0	171	167	0	0	84	82	0	0	209	246	0	0	598	633	0	0
DHF/DF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Meningitis/Encephalitis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tetanus Neonatorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Measles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acute Flaccid Paralysis (AFP)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diphtheria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pertussis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HIV/AIDS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
Uretral Discharge													28		0		28		0	
Ulkus Genital	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	12	0	0
Scabies	39	21	0	0	82	80	0	0	111	112	0	0	124	135	0	0	356	348	0	0
Other skin diseases	236	215	0	0	400	330	0	0	300	363	0	0	594	762	0	0	1,530	1,670	0	0
Anthrax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rabies	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Traffic accident	1	0	0	0	1	0	0	0	6	6	0	0	67	25	0	0	75	31	0	0
Other type of accident	0	1	0	0	14	6	0	0	50	36	0	0	91	64	0	0	155	107	0	0
Other diseases	638	646	0	0	644	630	0	0	662	752	0	0	2,391	5,004	7	0	4,335	7,032	7	0
<b>Total consulted diseases</b>	<b>4,688</b>				<b>7,317</b>				<b>5,224</b>				<b>20,791</b>				<b>38,020</b>			

### 6.4.3. Institution, School and Health Facilities

#### Government Institutions

There are numbers of government institutions represented in Covalima in addition to the local government or authority elected within the Municipality itself, such as Post Administrator, Chief of Sucos (villages), Chief of Aldeias, youth leader, religion leader, and elderly leaders (Lia Nain). The government institution represents in Covalima, include MAEOT (Ministerio Estatal no Ordenamento do Territorio), Ministry of Health, Ministry of Education and Cultural, Ministry of Agriculture and Fisheries, Ministry of Finance and Planning, Ministry of public works, Ministry of Justice, Ministry of Defense and Security and Ministry of Commerce and Industrial; and the total numbers of government officials are 1, 570, which constitute of 1, 206 male officials and 364 female officials.

#### Schools Institutions

According to Census 2017, there two type academic institutions in Covalima, which are private and public own academic institutions for all academic level running in the municipality. As it previously mentioned that highest rank of academic institution level is Senior High School certificate or is known in the country as Secondary school level. Overall, there are total of 128 academic institutions, 21,696 students and 1,052 teachers running the education system in Covalima. Table 52 list of the

academic certificate level that are available in Covalima with its number male and female students and teachers within the institutions.

**Table 52. List of academic institutions with its number of students and teachers recorded in census 2017.**

School Institution Level	Number of Institution			Number of students			Number of Teachers		
	Public	Private	Total	Male	Female	Total	Male	Female	Total
Pre-Primary School	8	16	24	490	564	1,054	7	33	40
Primary School	85	11	96	9,024	8,712	17,736	510	316	826
General Secondary School	3	1	4	1,153	800	1,953	88	40	128
Vocational Secondary School	3	1	4	509	444	953	19	39	58
<b>Total</b>	<b>99</b>	<b>29</b>	<b>128</b>	<b>11,176</b>	<b>10,520</b>	<b>21,696</b>	<b>624</b>	<b>428</b>	<b>1,052</b>

## Health Care Facilities

The health care facilities in Covalima are randomly scattered within the municipality. There is one main hospital located in Suai, seven health care center, 17 health clinic posts, 9 SISCAs and two private clinics running in Covalima as of Census 2017 recorded. Table 53 provides the detail numbers of facility and employees per location and identifies the location of the health facilities.

**Table 53. The Health Care facilities and number of employees in Covalima**

Post Administratives	Hospital	Health Care Center	Health Care Post	SISCA	Private Clinic	Medics		Nurse		Midwives		Total no. of employees (Hospital & other health care facilities)
						Male	Female	Male	Female	Male	Female	
Fatululic	0	1	0	1	0	1	1	3	0	0	2	7
Fatumea	0	1	1	1	0	2	0	4	0	0	1	7
Fohorem	0	1	3	0	0	2	1	5	0	0	2	10
Maucatar	0	1	3	1	1	3	1	5	2	0	4	15
Suai	1	1	4	1	1	2	8	10	4	0	7	31
Tilomar	0	1	2	1	0	1	2	8	0	0	4	15
Zumalai	0	1	4	4	0	4	1	4	0	0	6	15
<b>Total</b>	<b>1</b>	<b>7</b>	<b>17</b>	<b>9</b>	<b>2</b>	<b>15</b>	<b>14</b>	<b>39</b>	<b>6</b>	<b>0</b>	<b>26</b>	<b>100</b>
<b>Total</b>						<b>29</b>		<b>45</b>		<b>26</b>		

### 6.4.4. Community and Family Structures

It is generally known that almost every single household in Timor-Leste has large family structure, which consist of mother, father and more than two number of children, which in some cases a family could have more than 10 children. It is normal in every family in the country to have their non-immediate family or second degree relatives live together in a household, such as uncles, aunties, grandparents, nieces and/or nephews.



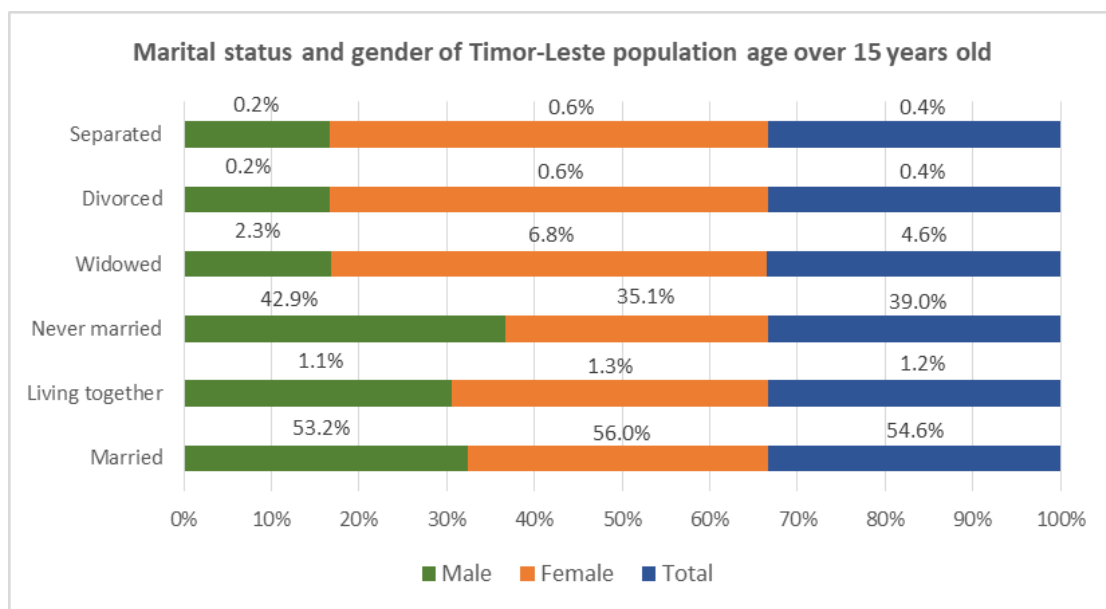
## **Family planning**

Family planning in Timor-Leste can be said still infrequent in its implementation within the countries. Nevertheless, there are actually number of families who are also participating in the family planning program runs by the government. There two methods of family planning practice in Timor-Leste, which are modern and traditional approaches. Modern methods uses female sterilization, implants, intrauterine contraceptive device (IUD), injectable, male and female condoms, and pill; and traditional method uses the following means, such as monitor the rhythm, withdrawal and fold methods (GDS, 2017).

The use contraception is actually increased over time, it was recorded 22% in 2009 to 26% in 2017 (GDS, 2017). Furthermore, according to census 2017, there is an approximate total of 166, 063 family, especially married women population age 15 -49 are participated in the government family planning program. In Covalima, the estimated total of 5,002 of married women population are participated in the government family planning program. Additionally, the latest survey in 2016 (GDS, 2017) shows that about 31.8% of Covalima married women population age 15 – 49 are on family planning and about 61.8% use both modern and traditional family planning.

## **Marital status and Fertility**

Census 2015 categorized marital status as follows married, living together, never married, widowed, divorced and separated. It further indicates that about 54.6% of Timor-Leste population age over 15 years old are married, 39% are never married, 4.6% are widowed, less than percent are divorced or separated and over one percent are living together. The graph in Figure 65 shows the marital status by gender of Timor-Leste population age over 15 years old that is developed based on the sex, age, place or residence, municipality, administrative and post administrative within the country.



**Figure 65. Marital status category and gender of population age over 15 years old**

The census 2015 further specifies that males' population have more tendency to never have married than females; and females on the other hand are highly likely to be married, divorced, living together, widowed, and separated compared to males' population.

## Fertility

The fertility rate in Timor-Leste is indicated by the number of child bear by women. In particular to this survey, the women populations in the country were studies for their sexual history, date of birth, and child survival status. The trends of fertility rate for women in rural area is higher than women live in urban. Figure 66 below shows the fertility trend in Timor-Leste that declined overtime recorded from the year 2000 to the latest of 2016.

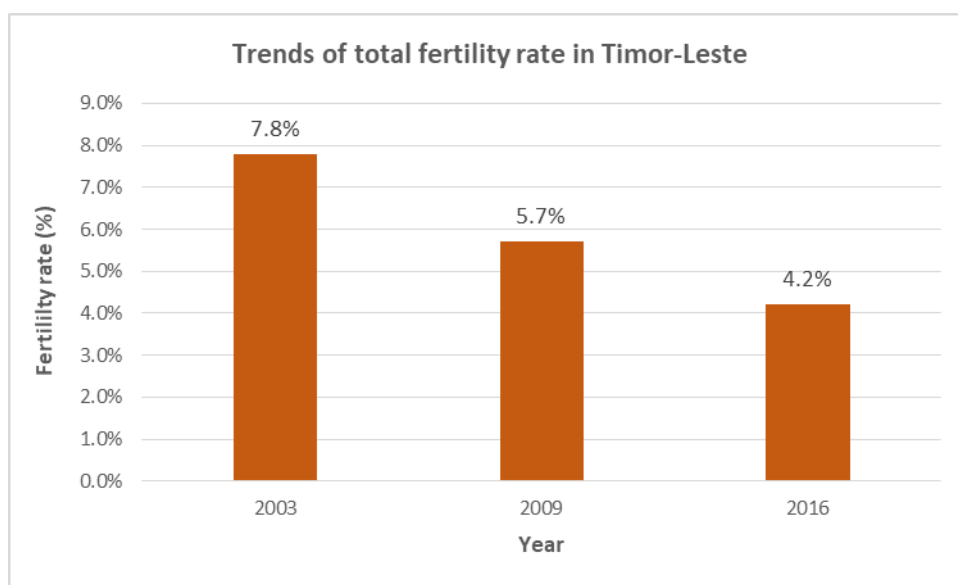


Figure 66. Trends of fertility rate in Timor Leste

Also the latest 2016 survey indicates that about 188 young women of age 15 to 19 years old in Covalima are in their early motherhood or pregnancy (teenage pregnancy); with the following category and its percentage, such as about 7.3% have had a live birth, 2.1% are pregnant with their first child and 9.3 have had child bearing (GDS, 2017)

#### 6.4.5. Ownership of land

In Timor-Leste, generally there are two main types of land ownership, which are public domain and private domain. Public domain or property refers to state-owned land or property that cannot be commercially exchanged or barter by any individual, community or group of society. This include land, cultural-historical and archeological heritages or sites; in particular to land, by law no individual, group or community of society can privately own land on hills or mountainous terrain, similarly, a land of 50 meters distance from the beach is consider public domain. Whereas, private domain or property is a land or a property owned privately by an individual, group or community of society, which the ownership shall be legally registered and acknowledged by and under the Land and Property Department of Ministry of Justice in the country. Moreover, for any other land or assets without proper or legal ownership are considered to be public domain or state-owned land or property.

The proposed project area of the five wells identified within the seven Sucos in Covalima has been granted to Timor Resources in accordance with the law and agreement established with the government of Timor-Leste for the process and extraction of natural resources in the country.

For if, there is land acquisition to be procured for the development of the proposed project, thus the government of Timor-Leste shall conduct public consultation and develop a relocation plan for affected community or household. The relocation plan shall include the restoration of livelihood

components that needs to specifically address the economic and physical displacement of the affected community or household.

#### 6.4.6. Any types of common or individual rights over natural resources

In relation to the previous Section 6.2.6, this section describes the rights of especially the local community access to the local natural resources in both land and marine resources either as an individual or communal. within or nearby the project proposed areas the communities that are directly or indirectly affected by the project development uses forest, lagoon ad marine water for their individual or collective subsistence consumption or small scale commercial activity in fishing, farming, hunting and settling. Within or nearby the studied areas there are many random agricultural farms, plantations, sacred water spring, cultural site, salt production, deep shore fishing activities, seashore molluscs collection and wild edible plants and fire wood collections.

Therefore, if these communities resources access areas were to be impacted, a resettlement plan as part of Environmental Management Plan (EMP) shall be developed to provide details on how these communities to still have the rights to access these resources. The plan shall be developed with the government in order to ensure that the plan is in accordance with the National legislation for compensation and resettlement and IFC performance standard. The following are the two document mentioned:

- IFC Performance Standard 5: Land Acquisition and Involuntary Resettlement
- Expropriation Law No. 28/2017 (Just recently approved)

## 6.5. Cultural Components

### 6.5.1. Cultural Heritage & Sacred Sites

Cultural heritage definition and the context in Timor-Leste:

**Quoted from EAST ASIA AND PACIFIC (2013)**

*Timor-Leste possesses a diverse and internationally significant array of cultural heritage which provides the foundations for peoples' identities, and indeed for developing the national identity. The United Nations, through the UNESCO, defines culture as a 'the set of distinctive spiritual, material, intellectual and emotional features of society or a social group, and it encompasses, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs. The heritage of a culture is in broadest terms the material or events that are the 'outputs' of cultural practice. UNESCO defines two types of cultural heritage, 'tangible' and 'intangible.' Tangible cultural heritage refers to materials, artifacts, monuments, buildings and sites that are the physical manifestations of a group or society's culture. Intangible cultural heritage refers to 'the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artifacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage'*<sup>3</sup>

*In Timor-Leste, cultural heritage, both tangible and intangible, is varied and vibrant. The customary cultural heritage of the nation's multitude of different ethno-linguistic groups is a living culture, a daily necessity and an integral part of individual and social identities. Sacred houses are an unparalleled physical representation of a combination of indigenous culture and resistance to occupation that is a central marker in the contemporary Timorese identity. The social and ritual aspects of customary cultures are permeated with intangible cultural heritage, such as dances and songs, and woodcraft, pottery, and weaving skills, and 'ritual language' poetry. Added to this are the heritages of colonial and occupying powers: The influence of Portuguese, Indonesian and Japanese government and culture are found in the tangible heritage remains of administrative buildings, graves, monuments and resistance era sites. One must also recognize the value of pre-colonial heritage, and Timor-Leste is home to internationally significant archeological and rock art sites.*

During the EIS survey period, many of cultural heritage aspects and materials both tangible and intangible were not observed within the studied areas. But one sacred site and one sacred water spring were identified within the five wells site studies areas. The cultural site is found within Kumbili well site, the area specifically called We dare or Abad laran; and the sacred water spring is within Raiketan well site areas, which is located nearby the Raiketan river. See Figure 67 below for the location of the cultural site.



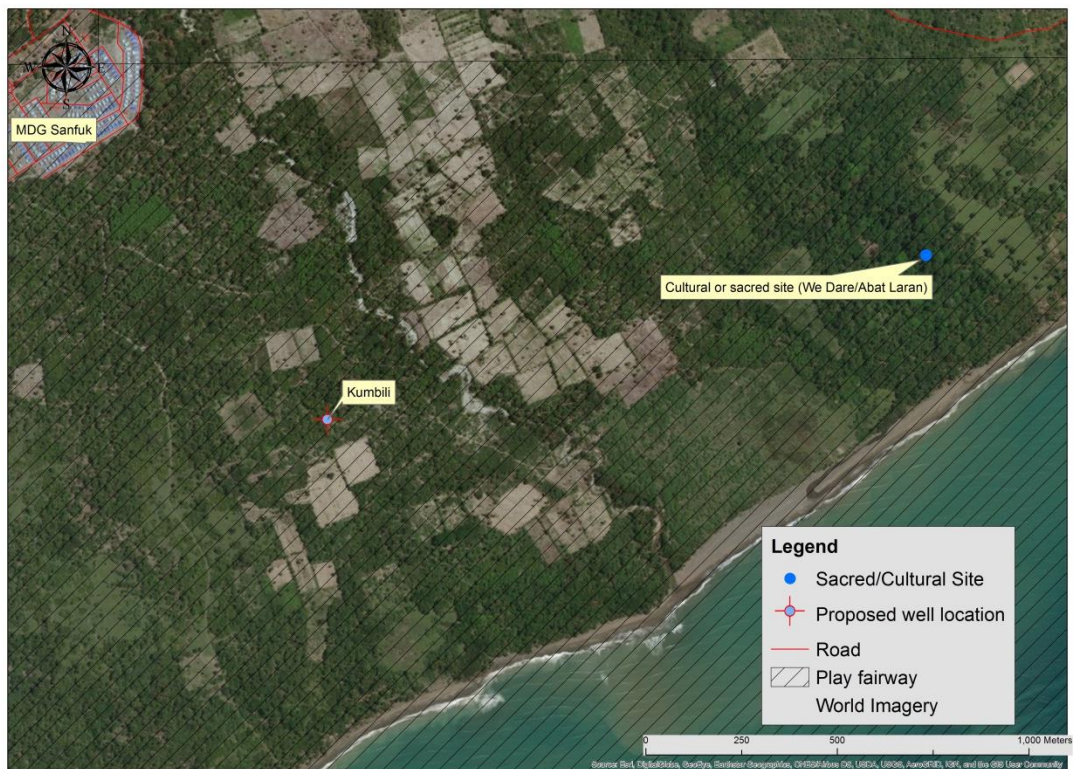


Figure 67. Cultural heritage site observed within Kumbili well site studied area



Figure 68. Sacred water spring site observed within Raiketan well site studied area

These cultural heritage and sacred sites are currently active. The local communities celebrate their cultural ceremony or conduct local ritual at the site, for some or all of the following ceremony purposes, such as marriage; death; birth; harvest of agricultural products, which is especially or usually for rice and corns; rains, especially when there is no rain for long period, the community will perform a ritual by their elders for calling the rains; and other purposes, such as asking permission for impacting sacred land or sites for development objectives.

#### 6.5.2. Archeological Sites

There is no momentous or historic traces of any archeological or anthropological work piece identified within the studied areas or there is no such studies of these aspects are found to be taken place within five well sites studied area. Therefore, there is no archeological sites or heritage were observed during the EIS survey in the field.

#### 6.5.3. Historical Sites

There no major historical sites observed during the latest 2019 EIS survey within the identified surveyed areas. There, however general historical sites within Covalima, these include Suai, which one of the post-administrative of Covalima that is used to be a historic kingdom on the south-central coast of Timor-Leste; a historical heritage located in Suai or historical church in Suai (unfinished building construction) that was burnt-down during riots back in 1999 (Gunn, 2011).

#### 6.5.4. Unique Landscape

There are no unique or specific aesthetic that are being protected or conserved either by or at local community or state level. Most of the studied areas lie within flat terrain landscape that majority surrounded by community housing, cemeteries, plantation, inconsistent pattern of community rice paddy fields, rivers and random building of church, chapel, road and new development of Suia Aiport runway.

## 7. Climate Change

This section describes relevant climate change to the drilling operations and decommissioning of the drilling platform. All relevant data and information on climate in this section are secondary sources and mostly taken from the national adaptation programme of action on climate change (NAPA) adopted in 2010.

### 7.1 Observation and Historical Weather Trends

Meteorological data was provided from an Automated Weather Station (AWS) owned by the Ministry of Agriculture within the Suai study area. The data spans from 2008 to 2014 calendar years for the following parameters:

- Maximum and minimum air temperature (degree Celcius)
- Relative Humidity (%)
- Evaporation (mm)
- Wind speed (m/s)
- Rainfall (mm)

The supplied data are on daily recorded basis and does not have report on wind direction. A typical meteorological AWS shall make an hourly basis observation. In addition to this lack of information, there are significant gaps between months and years over the reported period. As such data does not provide sufficient time-dependent resolution to adequately assess the current trends of climate change.

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

### 7.2 Future Projections under Projected Climate Change

There are number of models used to provide various projections of climate change in Timor-Leste. Those climate change projections, however do not represent a value specific to any actual location of a town or village in the country; it instead portrays the average change over the broad geographic region within the country and the surrounding oceans.



## Temperature

The temperature projection indicates Timor-Leste will experience increasing of annual average air temperature and sea-surface temperature in the future according to emission projection scenarios, which are analyzed for 30 interval years started from 2020, 2050 and 2080 and changes were calculated relative to the reference period 1961 – 1990. The increases of temperature for the years mentioned is in order of 0.8 °C, 0.5 °C and 2.2 °C respectively.

Extreme temperature events are also expected to increase, i.e. by 2050, a 7-day or 30-day heat wave event can be expected to increase by up to 2.3 °C and that length of such event can be expected to increase by two days.

## Rainfall

Rainfall is also expected to increase in relation to the reference period 1961 – 1990, by 2%, 4% and 6% by 2020, 2050 and 2080 respectively. This overall rainfall projections, though is different from the current rainfall projection for Indonesia, but showing similar rainfall increase trends to northern part of Australia. According to NAPA, these differences in the rainfall projection trends may have been due to a poor resolution of the current model used; and hence this data analysis may need to be considered wise perspective.

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

## Sea level rise and ocean acidification

NAPA (2010) indicates that the sea level rise in Timor-Leste is expected to be the same as global averages with variations of only minus 0 – 1 cm. However, it should be taken into considerations that Timor-Leste is estimated to have an annual uplift of 1cm given the tectonic activity. The following Table 5454 below shows the projection of sea level rise relative to 1990 reference period data:

**Table 54. Projection of the sea level rise**

<b>Projected year</b>	<b>Sea level rise(cm)</b>
2020	3.2 – 10 cm
2050	8.9 – 27.8 cm
2095	18 – 79 cm

NAPA further denotes that there is possibility of sea level rise larger than 0.5 – 1.0 m range by 2100 relative to the 1990 reference period data. Though, this projection cannot be ruled out for there is a considerable of uncertainty within the estimation of future sea level rise, nearly the uncertainties indicate that the corrections could be for higher rather than lower estimates.

It is also expected that given an increase in absorption of Carbon Dioxide (CO<sub>2</sub>), the sea water pH level in Timor-Leste will decrease and lead to ocean acidification, which would have impact on marine ecosystem. the projection scenario indicates that by 2070s relative to 1990 reference period data, the ocean pH level would decrease by -0.16 – 0.17.

### 7.3 Climate Implications of the Proposed Project or the Environment

**Table 55. Implication of climate change on the proposed project or environment**

Climate impact Source	Impact projection analysis	Potential factor impacted	Implications on project or environment
Temperature	<ul style="list-style-type: none"> <li>- Changes to ambient temperature</li> <li>- Increase evaporation</li> <li>- Increase humidity</li> </ul>	<ul style="list-style-type: none"> <li>- Ground and surface water</li> <li>- Flora and fauna</li> <li>- Forest ecosystem</li> <li>- community health</li> <li>- Agriculture</li> </ul>	<ul style="list-style-type: none"> <li>- potential impacts on human health due to increasing temperature, such as dehydration, easily fatigue</li> <li>- potentially increase in energy consumption due to increasing of cooling system</li> <li>- Drought affects the soil fertility for farming</li> </ul>
Rainfall	<ul style="list-style-type: none"> <li>- Changes to rainfall patterns with increased or decreased rainfall</li> <li>- Increase in extreme rainfall events e.g. cyclones</li> <li>- Changes to flow and flooding regimes of rivers and drainages</li> </ul>	<ul style="list-style-type: none"> <li>- Ground and surface water</li> <li>- Flora and fauna</li> <li>- Forest ecosystem</li> <li>- community health</li> <li>- infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>- Potential impacts to infrastructure and accommodation from flooding and cyclones</li> <li>- Affects the productivity due to extreme weather delays (e.g. road travelling, pre-drilling and drilling activity)</li> <li>- impacts to the post-closure land use and decrease in success of rehabilitation due to a drying climate</li> </ul>
Sea Level rise	<ul style="list-style-type: none"> <li>- Inundation of lower lying areas</li> <li>- Changes to flow and flooding regimes of rivers and drainages</li> <li>- Saltwater intrusion of aquifers</li> </ul>	<ul style="list-style-type: none"> <li>- Ground water</li> <li>- Marine ecosystem</li> <li>- Marine flora and fauna</li> <li>- Soil</li> </ul>	<ul style="list-style-type: none"> <li>- impacts to the coastal resources - inaccessible or unsafe</li> <li>- impacts to the water supply with increased salinity due to intrusion</li> <li>- impacts to long term land use and decrease in success of soil rehabilitation</li> </ul>

### 7.4 Climate Change Adaptation Measures

For climate change impacts NAPA identifies vulnerable sectors, which are needed to be prioritized for climate adaptation or mitigation measures. These include, food security, water availability, ecosystem, human health, human settlement and infrastructure and disaster management. Therefore, for any project related mitigation measures proposed in this EIS and EMP shall reflect these priorities

in addressing the climate change related impacts. The propose adaptation or mitigation measures are listed out in Table 56.

**Table 56. Climate change adaptation measures or proposed mitigations**

<b>Project Phase</b>	<b>Potential impact aspect</b>	<b>Adaptation measures or proposed mitigations</b>
Pre-construction, Construction, Operation, Post-operation	Surface water	Propose mitigations for impacts related to drainage, as follows: <ul style="list-style-type: none"> <li>- Cleaning of all oil, fuel and waste spills immediately</li> <li>- Waste management procedure to control litter</li> <li>- Mitigation of sedimentation of the culverts and on site drainage by means of an active drainage maintenance programme.</li> <li>- Mitigation of flooding during extreme runoff events through the use of berms and diversion drains to limit flooding of the construction site.</li> </ul>
Pre-construction, construction, Operation, Post-operation	Ground water	Propose mitigation measures recommended for impacts to water supply described below: <ul style="list-style-type: none"> <li>- Cleaning of all oil, fuel and waste spills immediately</li> <li>- Waste management procedure to control litter</li> <li>- Mitigation of sedimentation of the culverts and on site drainage by means of an active drainage maintenance programme.</li> <li>- Mitigation of flooding during extreme runoff events through the use of berms and diversion drains to limit flooding of the construction site.</li> </ul>
Pre-construction, Construction, Operation, Post-operation	Forest	Propose mitigation measures would be: <ul style="list-style-type: none"> <li>- Develop Rehabilitation Plan for forest ecosystem conservation</li> <li>-</li> </ul>
Pre-construction, Construction, Operation, Post-operation	Terrestrial Flora and Fauna	Propose mitigation measures for impacts to terrestrial ecology described below: <ul style="list-style-type: none"> <li>- Selection of the site to limit impact on habitat with the site selected having the lowest possible clearing footprint of all the configuration options.</li> <li>- Reduction in dust and noise generated through the implementation of a Dust and Noise Management Plan including wetting of unsealed roads, limiting dust generating</li> </ul>

		activities when it is windy and monitoring of dust and noise levels in the project area and/or in the sensitive receptors locations.
Pre-construction, construction, Operation, Post-operation	Air quality	<p>Propose mitigation measures include:</p> <ul style="list-style-type: none"> <li>- Develop and Maintenance of the Grievance Redress Mechanism established prior pre-construction and expansion to include construction impacted stakeholders</li> <li>- Carry out periodical air quality survey at the sensitive receptors location</li> <li>- Carry out health screening for workers, especially those work directly under any dusty work environment</li> </ul>
Pre-construction, construction, Operation, Post-operation	Community health	<p>Propose mitigation measures would be:</p> <ul style="list-style-type: none"> <li>- Workers should be provided with adequate shade, water and appropriate clothing including wide-brimmed hats and long-sleeves.</li> <li>- Workers should be closely monitored for symptoms of heat sickness and dehydration.</li> <li>- During extreme heat events, working hours should be adjusted to avoid the hottest parts of the day.</li> <li>- Develop and Maintenance of the Grievance Redress Mechanism established prior pre-construction and expansion to include construction impacted stakeholders</li> <li>- Facilitate education and awareness programs throughout the lifespan of the platform</li> <li>- Establish access controls to the site activities posing health and safety risks to the community.</li> <li>- Develop strict protocols for increased traffic safety.</li> </ul>

## **8. Alternatives**

There are no alternative locations are identified for the exploration drilling campaign.

## **9. Measures of Impact Assessment and Mitigation**

This section is developed with the purpose that the project proponent assesses impacts or any significant impacts of the project activities has on in particular to the environmental aspects, such as water, air, biodiversity, vegetation, land and marine ecosystem. The baseline conditions of the factors have been described within section 6 – Description of the Environment. The project impacts will be assessed on every phase throughout its lifecycle, i.e. pre-construction, construction, pre-drilling, drilling and decommissioning.

The impacts element will be measured in relation to the baseline conditions described previously, with the following quantification:

1. Duration of impacts is that short and could be long term (beyond the project lifecycle);
2. Environmental cost is that cost of restoring the baseline condition or relative loss of habitat; and
3. Location of the impacts is that localized or regional affected relative to the project locations and scales.

Any remains impacts after the implementation of identified mitigation measures or termed residual impacts evaluation will be undertaken based on the most likely success mitigations measures.

### **9.1 Methodology and Approach**

#### **Flora and Fauna**

During the environmental baseline survey the transect methods were used to identify species of the flora and fauna that potentially could be impacted by the drilling campaign. The transect lines were drawn up to 1 km from the well locations, then point intercept between the quadrat (20x20 meter) is placed every 200 meters for observations and calculations of every species of flora and fauna within the quadrat points. Similarly, the same methods were also used for transects within the radius 200 meters from the well locations, which the point of intercept was placed every 20 meters.

#### **Air Quality and Noise Survey**

Instruments were used for testing air quality and noise are Air Sampler Impinger, Sound Level Meter (SLM) and Portable Particle Counters. The Laboratory testing for ambient air and dust particles based on the SNI methods.

The air quality sampling and noise measurements were conducted at radius between 100 and 4,000 meters from the well locations during day.

The following aspects were considered during the surveillances:

- Topography and micrometeorology of the well locations
- Sampling frequency
- Density of the populations and
- Density of traffics
- Human activities
- Important environmental features
- Industrial and other domestic activities in relation to the socio-economic conditions

### **Water and Soil Sampling and Testing**

Water and soil sampling were taken according to the WHO and ASTM standards. The samples were taken mostly around the community areas and the well locations and its surroundings. The water physical tests which were carried out onsite are pH, Conductivity, Total Dissolved Solid (TDS) and Total Suspended Solid (TSS). Water chemical and bacteriological tests were conducted on the laboratory and all tests were based on the WHO drinking water quality guidelines as referred by the Ministry of Health.

The soil laboratory tests were performed on the selected samples recovered during the field investigation phase of this study, to verify field classifications and to estimate the index and engineering properties of the subsurface materials. All tests were conducted in general accordance with current applicable ASTM procedures or equivalent (*Geo-technical Investigation Testing*)

## **9.2 Scope of the Evaluation**

In quantifying the environmental and social impacts of the natural oil exploration drilling project at the five identified wells in the six Sucos of Covalima municipality, it is necessary to describe the acceptable and unacceptable level of risks. The approach towards the project mitigation measures will be based on the assumption that the project will be undertaken as currently planned program and schedule and will have impacts on the aspects mentioned within.

The scale of the impacts is considered within the following context:

1. Duration of impacts: short-term or long-term; and permanent or non-permanent
2. Area of influence is that within the project area or outside the project area is that localize or regional
3. Field data measure or assess against an acceptable standard
4. Cost of impacts redress

The impacts significance are classified from ‘Low’ to ‘Very High’. The social and environmental impacts of the project will be assessed in accordance with the Timor-Leste legislation requirements, such as:

1. Distinguish between significant positive and negative impacts;
2. Direct and indirect impacts;
3. Cumulative impacts;
4. Cross-border impacts;
5. Global impacts including climate change;
6. Long, medium and short term impacts;
7. Describe impacts in quantitative terms; and
8. Describe impacts in terms of environmental cost and benefits

The environmental and its associated aspects of the project were identified and discussed during Public Consultation scoping process along with the project document and ToR approved by the Regulatory Agency (ANPM) and the environmental license assessment committee.

Table below indicates the impact level used within this document (TR-SEIS, 2018)

**Table 57. Impact category level used for the project**

Likelihood	Risk Level				
	1 Insignificant	2 Minor	3 Moderate	4 Significant	5 Catastrophic
5 - Almost Certain	Medium	High	High	Very High	Very High
4 - Likely	Medium	Medium	High	High	Very High
3 - Possible	Low	Medium	High	High	High
2 - Unlikely	Low	Low	Medium	Medium	High
1 - Rare	Low	Low	Medium	Medium	High

**Table 58. Risk Assessment criteria**

Likelihood rating Definitions		
Likelihood rating	Description	Indicative Frequency
5 - Almost Certain	Event occurs frequently	Once a year or more frequently
4 - Likely	Event occurs several occasions	Once every three years
3 - Possible	Event might occur once	Once every ten years
2 - Unlikely	Even occurs rarely	Once every thirty years
1 - Rare	Event occurs almost never	Once every 100 years

### 9.3 Identification of the Impacts

**Table 59. Project impact aspects and risk assessment level (Timor Resources-SEIS, 2018)**

Level	1	2	3	4	5
Severity	Insignificant	Minor	Moderate	Major	Catastrophic
<b>Natural Environment - all physical components</b>	Minor effect on biological or physical environment	Moderate, short term effects - not affecting ecosystem function	Serious medium term environmental effects	Very serious, long term environmental impairment on ecosystem functions	Extreme long term environmental impact
<b>Health and Safety</b>	No medical treatment required nor property damaged	Reversible, disability require hospitalization	Moderate reversible, disability or impairment (>30%) to one or more person	single fatality and/or severe irreversible disability (>30%) to one or more person	Multiple fatalities or significant irreversible effects up to >50% persons
<b>Social/Cultural Heritage - all social and economic components</b>	Minor short term social impacts on local population, replaceable without difficulties	Moderate short term social impacts	ongoing moderate social impacts	ongoing serious social impacts, significant damages to cultural heritages/sites	Extreme social impacts
<b>Community/Government/Media Reputation</b>	Minor impacts to local public or media attention complaints	attention from media and/or heightened concern by local community	significant impact on national media/public/stakeholders	serious public/media outrage (international coverage)	Extreme international public and media outrage
<b>Legal</b>	Minor legal issues, non-compliance or breaches or regulations		Serious breach of regulation with investigation or report to authority with prosecution and/or moderate fine possible	Major breach of regulation; major litigation	Significant prosecution and fines, very serious litigation including class action
<b>Impact Cost</b>	\$0 - \$1,000	\$1,000 - \$10,000	\$10,000 - \$100,000	\$100,000 - \$1M	>\$1M

### 9.4 Determining the Significant Impacts

The impact aspects will be assessed based on the Environmental regulatory agency's recommendation, which to start from pre-drilling until decommissioning phases of the project. Table 60 below list out the project impacts identified within each phase.



Table 60. Impacts level identified for environmental and social component within the project phases

Impact level	Pre-drilling	Drilling	Decommissioning
<b>Very High</b>	N/A	N/A	N/A
<b>High</b>	Greenhouse gases (climate), traffic; Topography, geology and soils; Air Quality; Surface and groundwater	Noise and land contamination or pollution (or waste or oil spills contamination); Greenhouse gases (climate)	Noise, waste contamination or pollution (e.g. oil, fuel or other chemical waste substance; Greenhouse gases(Climate); Topography, geology and soils; Air Quality
<b>Medium</b>	Community health; Land Ownership and Land Rights, Natural Resources Rights; Employment; Terrestrial Flora and ecosystem	Community health; Institutions Schools and Health Facilities; and Terrestrial Fauna (birds); Employment	Contamination (Anthropogenic); Surface and groundwater; Terrestrial Fauna (birds); Traffic
<b>Low</b>	Cultural Heritage; Infrastructure; Institutions Schools and Health Facilities; Family Structure	traffic; Infrastructure; use of forest and other natural resources Family Structure; Population and Community	Employment; Infrastructure; use of forest and other natural resources Population and Community; Community health; Institutions Schools and Health Facilities; Family Structure; Cultural Heritage

## 9.5 Mitigation Measures

The following are the objectives of project management plan to mitigate all the identified impacts within this EIS document. These are, to ensure that all impacts are as much as practicably minimized; and to ensure that the components of project design accommodate all the project applicable or relatable environmental impacts, such as noise, dust, climate and terrestrial ecosystem. The following proposed mitigation measures may not be used or applicable at the decommissioning stage. See EMP document (Section 8) for those mitigations that may not be included in the decommissioning phase activities.

### 9.5.1. Climate mitigation measures:

- Fuel inventory and management system to be established
- Air quality monitoring plan
- All vehicle, equipment and/or machineries used shall follow manufacturing recommendation. This shall include a periodical vehicles, equipment and facilities inspections
- Use good quality of fuels and only use fuels which are specified based on the equipment requirements and specifications
- Engines and exhaust system shall be regularly serviced according to manufacture recommendations and maintained to meet the statutory limits/opacity tests.
- All vehicles and equipment shall be turned off when inactive

#### 9.5.2. Topography, Geology and soils mitigation measures:

- Cut and fill shall be properly designed and planned
- Management drainage systems include public drainages, culverts, ditch and water canal
- Provide regular maintenance of drainage systems to be included in project implementation management plan
- Regular monitor sedimentation and land use changes
- Topographic survey include drainage topographic
- Proper access road designs
- Soil sampling and laboratory analysis

#### 9.5.3. Air quality mitigation measures:

- Air Quality Monitoring Plan
- Fuel inventory and Management Plan include monitor daily fuel consumption rates
- All vehicle, equipment and/or machineries used shall follow manufacturing recommendation. This shall include a periodical vehicles, equipment and facilities inspections
- Use good quality of fuels
- Engines and exhaust system shall be regularly serviced according to manufacture recommendations and maintained to meet the statutory limits/opacity tests.
- All vehicles and equipment shall be turned off when inactive
- All onsite vehicle traffic shall be limited to an acceptable standard speed, especially on unpaved roads and community's areas or traffic speed management
- All areas with vehicles traffic shall be watered and all materials transported (if, there is) shall be covered or have dust suppressions
- Carry out air quality measurement every month,
- Carry out health screening every six-month for all workers,
- Storage areas shall be located away from sensitive receptors
- Develop and implement project Grievances Redress Mechanisms (GRM)

#### 9.5.4. Noise and Vibration mitigation measures:

- Monitor and measure noise and vibration frequently
- Carry out noise and vibration survey every month
- Carry out health surveillance to identify Noise Induce Hearing Loss (NIHL) and vibration related diseases i.e. Hand-Arm Vibration Syndrome (HAVS) every six-month,
- Use vehicles, machineries and equipment with lowest possible noise specifications
- Periodical vehicles and equipment maintenance services
- Develop and implement project Grievances Redress Mechanisms (GRM)
- Provide proper PPE for all personnel onsite

- Clear safety signs and marks
- Establish Safety Zone

#### 9.5.5. Surface and ground water mitigations measures:

- Well Drilling Program i.e. Casing Design and Cementing
- Use Water Based Mud and Mud Reserve Pit is designed to prevent any water contamination
- Prevent oil spills or any hazardous materials are released incidentally to the environment
- Develop or adopt waste management procedure for litter control
- Conduct an active cleaning of culverts and drainage sedimentation
- Use berms to control erosion, sedimentation and reduce surface runoff and diversion drains to limit flooding of the project site off to neighbours
- Well P&A Plan must be designed to prevent any water contamination in the future
- Generated waste water from facility or site has been covered in Waste Management Plan

#### 9.5.6. Coastal and marine water mitigations measures:

- The impacts on the coastal and marine water are not foreseen during operational phases because geographically all wells are not located around the coastal area. However, due to the gravity and location of the Karau, Raiketan and Mola Ain rivers and their estuaries, any massive oil spills or uncontained blowout or loss of containment (LOC) can reach and pollute coastal area and marine water. Therefore, the mitigation purpose to minimise the risks can only be based on:
  - Emergency Response Plan, and
  - Oil Spill Contingency Plan

#### 9.5.7. Terrestrial flora, fauna and ecosystem

- Select site to limit on habitat with having the lowest possible clearing footprints
- Develop or adopt waste management procedure for litter control
- Measure, control and monitor dust and noise acceptable level for fauna, especially birds and other sensitive noise fauna
- Measure, control and monitor light illumination
- Develop and implement rehabilitation activities

#### 9.5.8. Traffic and transport mitigation measures

- Transport infrastructure to access the well locations shall be upgraded to support container trucks travelling to the well sites.

- Minimize vehicle movement with appropriate schedule to limit the number of vehicle movements required in order to reduce the likely impacts on public road condition, safety and environment
- Implement one-way systems within the well site area and ensure that all vehicles and mobile equipment or machineries and signage are equipped reversing alarm in all reversing areas
- Install and/or display clearly and permanently all significant and necessary traffic signage. Signage shall be posted to indicate speed limits, restricted access, visitor parking, headroom, and other route hazards
- Control and enforce vehicles speed limits within and outside project area (include all public access areas and roads)
- Access roads widening may be required for heavy vehicles
- Assess the road conditions and maximum load designs before any heavy equipment is moved or rig move
- Establish and follow Rig Move Plan

#### 9.5.9. Employment mitigation measures:

- Develop and/or adopt appropriate system for locals hiring or firing processes or procedures
- Employment opportunity shall possible prioritize locals with qualify skills, knowledge and experiences
- Shall prioritize local affected community for an employment opportunity at the project site
- Develop and implement project Grievances Redress Mechanisms (GRM)
- Ensure to provide necessary and applicable training based on the nature of work for all local employees as a way for local capacity development
- Adopt the National Labour Code and SEPFOPE regulation and ensure that these employment code and regulation are well-distributed and informed to the local communities.
- Provide equal opportunity for everyone include consider gender balance for all employees

#### 9.5.10. Infrastructure mitigation measures:

- Develop and implement project Grievances Redress Mechanisms (GRM) to address the local community officially reported grievances in any aspects mentioned within this EIS document, which they believe affected as result of project development activities

- Prevent any damage to the public infrastructures, avoid as much as possible any disturbance to the public infrastructures

#### 9.5.11. Use of forest and other natural resources mitigation measures:

- Develop and implement rehabilitation activities to ensure that any loss of forest ecosystem are restore and redress to the possible baseline conditions
- Implement and maintain developed Grievances Redress Mechanisms (GRM) to address the local community officially reported grievances in any aspects mentioned within this EIS document, which they believe affected as result of project development activities

#### 9.5.12. Fishing mitigation measures:

- Minimize water pollution through appropriate means and equipment for control and managing waste disposal, especially for any type of hazardous waste, such as oil, fuel and other chemical waste
- Implement and maintain developed Grievances Redress Mechanisms (GRM) to address the local community officially reported grievances in any aspects mentioned within this EIS document, which they believe affected as result of project development activities

#### 9.5.13. Agriculture mitigation measures:

- Implement and maintain developed Grievances Redress Mechanisms (GRM) to address the local community officially reported grievances in any aspects mentioned within this EIS document, which they believe affected as result of project development activities
- Measure, Monitor and control dust, noise, sediments at the project site to minimize or limit the impacts
- Use proper means and equipment for monitoring and control of all type of any form of solid or liquid waste either non-hazardous or hazardous waste produced by the project activities to not affect the nearby community private or public areas
- Prevent any contamination to any agricultural infrastructure

#### 9.5.14. Tourism mitigation measures:

- The Project location does not have or is located nearby any popular destination for tourism. Therefore, it is not considered that the Project will affect any of the seven Sucos' tourism site or popularity.

#### 9.5.15. Community and population mitigation measures:

- Develop and implement project Grievances Redress Mechanisms (GRM) to address the local community officially reported grievances in any aspects mentioned within this EIS document, which they believe affected as result of project development activities.

#### 9.5.16. Community health mitigation measures:

- Develop and implement project Grievances Redress Mechanisms (GRM) to address the local community officially reported grievances in any aspects mentioned within this EIS document, which they believe affected as result of project development activities
- Establish access control to site activities that posing health and safety risks to the community

#### 9.5.17. Institution, Schools and health facilities mitigation measures:

- Install safety signs for any nearby public facility
- Conduct socialization on safety awareness on the public road or public areas that in a close distance with the project site areas
- Provide support for education and awareness campaign throughout the project lifecycle
- Conduct regular cleaning and water sprinkling on the roads that impacted by the drilling campaign
- Ensure that all trucks with materials shall be watered and covered before travelling on any public road or within public areas.
- Conduct regular air quality monitoring and application of dust suppressants to sections of roads used routinely by vehicles that pass through the public road, and close to habitation and facilities including conducting routine air quality monitoring
- Use lowest possible noise specifications equipment or machineries
- Implement Grievances Redress Mechanisms (GRM)

#### 9.5.18. Community and family structure mitigation measures:

- Conduct a continuous or ongoing consultation with stakeholders throughout the project lifecycle
- Implement Grievances Redress Mechanisms (GRM)
- Provide and ensure equal job opportunity to community

#### 9.5.19. Land ownership and rights mitigation measures:

- If there is a resettlement for project affected community, a resettlement plan shall include provision for loss of income for those who lost their economic activity as result of the

project development activities (within land or water), such as loss of commercial or fishing subsistence activities, distraction of agricultural or plantation farm activities, etc.

- Develop and implement project Grievances Redress Mechanisms (GRM) to address the local community officially reported grievances in any aspects mentioned within this EIS document, which they believe affected as result of project development activities
- Government together with Timor Resources shall conduct public consultation with and for any community resettlement and restoration of livelihoods, which these shall be incorporated into a developed resettlement or restoration of livelihoods plan for affected community
- TR has developed a leasing contract plan that covered any related resettlement issues with the project affected communities or households

#### 9.5.20. Natural resources rights mitigation measures:

- If there is a resettlement for project affected community, a resettlement plan shall include provision for loss of income for those who lost their economic activity as result of the project development activities (within land or water), such as loss of commercial or fishing subsistence activities, distraction of agricultural or plantation farm activities, etc.

#### 9.5.21. Cultural heritage, archeological and sacred sites mitigation measures:

- Record and document the number of cultural heritage, archaeological and sacred sites identified within the proposed project site
- Minimise direct impacts (if, there is) on the Cultural heritage, archaeological and sacred sites
- Ensure the rehabilitation plan include provision of relocation of the cultural heritage, archaeological and sacred sites in accordance with an acceptable standards, e.g. UNSECO
- Conduct a transparency communication or consultation in relation to any impacted cultural heritage, archaeological and sacred sites with all relevance stakeholders or government institutions
- Conduct community consultation for if there is to be a restricted access by the project activities; and ensure that there shall be access restriction or control measures or protocol developed for the restriction sites, which the control measure or protocol shall be in accordance with the local community requirements

#### 9.5.22. Unique landscapes mitigation measures:

- There are no unique or specific aesthetic landscapes identified within the project site or footprints.

#### 9.5.23. Contamination, Safety and other general mitigation measures:

- Training and awareness of safety campaign
- All personnel shall be equipped with all applicable PPE for all types of work carry out during the phase or based on the nature of the work
- Control access to the site, including creating safe perimeter zone, gate and traffic control
- Use proper method and equipment for oils spill to follow oil spills standards management
- Good housekeeping practices
- Provision of solid waste removal services to the project site
- Education of employees about safety and environment impacts from litters and contaminations
- If, there is noise and/or dust complaint is recorded through the grievance redress framework and monitoring confirms, it is beyond the guideline level a retrofit mitigation measure shall be implemented
- Establish and implement environmental monitoring for assessing the site in accordance with the project duration

#### 9.5.24. Waste management and mitigation measures:

- Develop waste management plan as a framework under project Environmental Management Plan for all related type of project generated waste (i.e. liquid, solid, hazardous and/or non-hazardous). The plan shall include oil, fuel and chemical substance spills procedure and shall identify a responsible entity
- Designate a specific area for refuelling of heavy equipment onsite
- Use of spill kits for every refuelling activity, and no manual or bottle refuelling on any equipment or heavy machineries
- Develop regular waste collection schedule
- All generated waste onsite shall be identified and labelled i.e. recyclable, non-recyclable, plastic, paper, bottles, etc.
- For hazardous type of waste, such as fuel, unused oil, and other chemical dispersant or substances shall be stored in a separate location or storage from normal waste
- Shall there be a third party for waste handling and collection and/or refuelling, it then shall follow Timor Resources approved EMP-Health Safety, Security and Environmental Management Plan in place, Safety Policy and other related environmental management plan frameworks
- All vehicles, equipment and heavy machineries shall be inspect daily and conduct regular maintenance, especially for oil or fuel leakages issue
- All waste management handling and plan shall be developed in accordance with Timor-Leste national policy and regulation as well as all related standard procedures or best practices applicable in the country



## **9.6 Determination of the Any Residual Impacts**

Mitigation measures for any residual impacts shall adopt according to an acceptable standards for all related residual impacts of the identified impacts described within this EIS document. For instance, air and noise pollution; land and marine contamination or pollution; and

The residual impact assessment will be undertaken based on the most likely success of the mitigation measures.

## **10. Evaluation of Social Impacts**

This Section 10 of this EIS provides an insight of the project related social aspects that may or may not be impacted directly or indirectly. This social impacts will be evaluated generally to socio-cultural aspects, existing institutional and local political status and participation in addition to fundamental social issues describes in Section 10.4.

### **10.1 Intention and Objective**

The main objective of the social impact evaluation is to identify any social aspects, which can be potentially impacted by the development of the proposed project; and to design a management and a control measures to avoid, mitigate and/or compensate any adverse impacts; and thus can improve general conditions, such as rural road construction or open an opportunity for positive social development, for instance employment and training.

For this proposed project there has been series of project socializations and public consultations undertaken with the local communities, especially of those reside within the impacted areas or Sucos where the five wells are located or identified. With these undertaken socialization and consultation with the communities, a recommendation, a concern and a perspective were kept and analyzed to develop a social impact evaluation framework or plan that provide mitigation or control measures in particular to the project affected community for their involuntary relocation and/or economic disturbances (if there is), such as temporary restriction to access to natural resources and temporary business relocation.

### **10.2 Description of Socio-Cultural Context, Institutional, and Political History**

The general description of socio-cultural and institutional has been detailed under Section 6.4 – Social Components. In terms of Socio-cultural and institutional context, the proposed project development will not have a direct or an indirect adverse impact on this social aspect, rather it will open an opportunity for social development both directly and indirectly, such as creating job opportunities; skills and knowledge development through job training; enhance local economic activities, for instance local community have an opportunity to open kiosk, shops or small restaurants or any goods and services to provide to the local employees during the project construction or even during the operational; and buying qualified local products or services or sub-contracting to qualified local entrepreneurs or companies for products or services, which shall meet the project requirements. With the socio-cultural and institutional aspects in mind, the proposed project will ensure that the opportunities from the project will not be biased against any race, gender, religion and/or political party, but the proposed project will prioritize locals, and highly encourage women application; as well as ensure that any application of the locals shall meet the project qualifications and requirements.

Politically, the Covalima municipality is in a stable political state environment with population living in a harmony with a mutual respects for each other's believes and choices. There are no signs of political group activities that show discontent of an individual or a certain group members towards the government, certain political parties, any association party or members of certain religions.

Furthermore, there shall be a development plan as part of Environmental Management Plan (EMP) framework for if there is an affected community or household in terms involuntarily relocation of

their business activities and/or houses permanently or temporarily; and temporary restriction access to natural resources. The relocation plan of the project affected community or household shall be developed and socialized by the government or related Ministries or institutions.

### **10.3 Consideration of Legislation and Regulations**

The Timor-Leste highest legislation or the Constitution of the Democratic Republic of Timor-Leste under Section 141 stated that *Ownership, use and development of land as one of the factors for economic production shall be regulated by law.*

Thus, the Social Impact Evaluation plan for avoidance, mitigation and/or compensation measures shall and will be developed in accordance with the Timor-Leste national legislation and regulation (applicable Decree Laws), IFC performance standards and other relevance and applicable national and international best practices in the country.

### **10.4 Analysis of Fundamental Social Issues**

Generally, the fundamental social issues are centered most of the time in community (mislead cultural and social believes and low income family), education and employment. Covalima municipality has diverse societies in terms of language, dialects, religions and political believes. Gender imbalance is still obvious within the municipality, especially within education, institutions (employment) and family structures. See details under Section 6.4. For these basic social issues, the proposed project opens opportunity for improving or providing chances or benefits that would be mutually favorable for both the community and the project.

The proposed project in its design and planning will provide job opportunities for locals, informal education through job training, enhance local economic activity through buying local products and services and provide opportunities to involve in the project by participating as a subcontractor for providing qualified products or services that meet the project requirements.

It has been mentioned previously that the job opportunity will be prioritized for local communities, the project will employ as some communities as practicable depending on their skills and knowledge. The locals will be employed through a recruitment process for fair and transparency in selection to avoid social jealousy and/or misinterpretation, priority will be given initially to the community living within the seven Sucos (Matai, Camanasa, Labarai, Belekasak, Tashilin, Debos and Raime) of the impacted areas and women applications are highly encouraged. The job opportunity then follow by training opportunity in the work place, the local employees will be given training to improve their skills and knowledge, which would not be limited to any of their own particular skills or knowledge, but would be expanded to other basic required knowledge or skills such as language, general safety, office computer skills and other general social and environmental knowledge and skills. The work place training could be given in a different level depending on the employee's academic level, determination and the number of employees need training per project phase. The training is voluntary and free of charge, including classroom materials, such as stationary and reading materials.

The proposed project further can increase the local community economic activity; for instance, the local community can open kiosk, shops and/or small eatery place for local workers or employees who work in the project site during pre-drilling or even drilling activities. This indirectly offers opportunities for typically household wife to be involved in the project by providing these services, in which at the same they could bring an extra income into the family. In addition, as part of project local content; it would also provide a direct involvement of the local community in the project through subcontracting works or services to qualify local entrepreneurs or companies that meet project requirements, such as cleaning services, waste disposal, catering, internet services, security, recruitment agency, and qualified products provider, for examples, concrete bricks, sands, gravels, fuels and others. These means and opportunities would also provide indirect employment for the locals to work in the project through the local subcontractors or suppliers.

The foremost priority of these opportunities will be given to those communities or households reside within the impacted areas, which are of the seven Sucos and especially surrounding the five well sites. These affected communities or households are identified and listed; and project management frameworks for involuntary relocation of community's houses, cultural sites, and business activities, access to natural resources that are either permanent or temporary as well as mitigation, control and monitoring measures shall be developed within project management plan documents. Additional, a grievance procedure shall be developed to appropriately record and redress or provide resolution to the affected community or households' complaints or concerns for any related project issues raise by them. The grievances procedure shall have registry that identifies corrective actions and closures as well as performance indication and improvement for any cases reported officially through a grievances procedure application form. Grievances procedure can be liaised with a government related institutions, especially for a case that resolution does not reciprocate between the project and affected community or household; or in other words the affected community or household escalate a project related issue beyond the project control. The grievance procedure can be either as independent document or can be part of project management plan frameworks.

The project management plans and frameworks shall be planned and implemented in accordance with the related community needs, National Timor-Leste legislation and national or international acceptable best practices acknowledged in the country.

## 11. Economic Evaluation

It is known that the latest record of economic activities within the municipality is considerably low; with the community earn less than \$40 per month. In addition to this, the employment rate increase rather slow at both national and municipal level. With the presence of this project in the municipality, it could actually and highly likely to increase the local community income or economic opportunities. These include job opportunities for locals, market opportunities, rural road development and other social development activity that could be improved through company social responsibility (CSR).

The economic values for environmental impacts of the project will be mitigated through the following acceptable standard approaches:

1. Select plants and equipment that meet the dust and noise quality best practice for the well-being of local employees and communities as well as the environment.
2. Use proper equipment and methodology for site clearance to limit impacts of noise and dust pollution to the nearest community and environment.
3. Ensure local communities have access to employment opportunities in the project implementation phase
4. Select proper drilling and decommissioning technology and approach that limit environmental impact.
5. Develop and implement Grievances Redress Mechanism (GRM) to ensure that any project in compliance are managed and control; and establish and maintain harmony relationship with local community.
6. Establish and implement environmental monitoring program control and monitor the project implementation impacts are within standard threshold setup within this EIS document.
7. Develop and implement Biodiversity activities plan to replace or restore any loss forest ecosystem, terrestrial habitats, flora and fauna, wetlands and/or mangroves.
8. Use all applicable (qualified) local products and services through local shops and companies.

The monetary economic benefits on both the environment and local community as well to the country as whole have been covered under local content.

Other project impacts that are not necessarily converted into monetary values are household labour and civic activity and other forms of “collective efficacy” or “social capital” such as building community trust, reciprocity and civic engagement are not included in monetary value (Cahn, 2014). These non-monetary value aspects are not likely to be impacted by any project activities. They are in fact embedded or rooted within the traditional customs and culture of local community. For instance, by traditional culture and/or belief women are to stay at home and do the household labour (Barbara & Kelly, 2013). These aspects may not have monetary value, but they do have social value within the community and their culture.

## 12. Summary of Environmental Management Plan

The Environmental Management Plan (EMP) is a plan developed in addition to EIS document for the proposed project in order to provide information of the standard operation procedures and processes in implementing of the project activities. The EMP is focused on the safety and healthy perspective of the project in terms of human, plants, animals and the environment as whole that may or may not be impacted as results of the development of the project.

The objective of the EMP is to provide project activities processes and procedures that have mitigation measures based on all identified and related impacts aspects and level specified within the EIS. It is an independent document of the EIS that will act as a tool for ensuring the mitigation of all the identified negative impacts and development of all the positive impacts are carried out effectively throughout the project lifecycle.

The following are the EMP key approaches in control and monitoring of the implementation project activities, include:

- Identify all environmental impacts through environmental impact studies
- Minimize environmental impacts through engineering and design means
- Manage risk of ongoing impacts through continuous monitoring and measurement throughout the project lifecycle

The EMP shall be methodically improved to ensure that best available technologies and methods as well as environmental management practices are implemented in a way that it is cost-effective, pragmatic and efficient.

The project EMP provides the following:

- Environmental impacts and its mitigations measures for all aspects identified; and in accordance with the acceptable best practices
- Monitoring measures and standards
- Threshold of measurement criteria, which are internationally accepted
- Reporting requirements
- Continuous improvement process

Further, the EMP will be reviewed based on the following conditions, such as:

- Changes of a plan or activity process or procedure that consider to pose any detrimental effect to project, human or environmental as whole; it also applicable for any positive changes that consider to add value into the project, social or environment as whole;
- Changes of responsibility towards any social and environmental aspects identified within the project EIS or EMP and its frameworks;
- Changes of any project related country legislation that may require to update the EMP and its frameworks; and
- Changes of monitoring results that may require to update any threshold or environmental limit value identified within project EIS or EMP and its frameworks.

The estimated cost for the project environmental aspect identified within the EIS and EMP are as follow, see Table **Error! Reference source not found.** below.

**Table 61. Project activities estimated cost for environmental aspects identified**

Item	Inclusivity	Pre-drilling	Drilling	Decommissioning
Air quality	Dust	Refer to EMP-Section 19	Refer to EMP-Section 19	Refer to EMP-Section 19
Noise and Vibration	Noise, vibration, hearing screening			
Environmental Monitoring	water and soil measurement			
Biodiversity or ecology activities	Restoring or recuperation of ecology state			
Lighting	Lighting			
Onshore disposal	All types of waste generated by the project			
Terrestrial flora and fauna	Monitoring of birds and habitats			
Employment	All related employment issue			
Fishing	Fishing resources			
Population and community	Social impacts			
Cultural Heritage	Cultural impacts			

### **13. Disclosure of Information and Public Consultation**

Public Consultation for drilling activity of Timor Resource in Suai is very crucial not only been part of the normal standard to obtain the environmental license but more importantly is to gather inputs, opinion, ideas from communities affected by the said activity and at the same time serves as a means of spreading the technical and no technical information. Facilitated by Safety Management Consultancy (SMC), Timor Resource together with SMC itself has presented to the communities information such as location of the drilling sites (Five drilling sites in total), the well depth, equipment use, infrastructure involved, legal bases, local content, the effect of activity to communities and surrounding environment and so on.

The participants include Local Community leaders such as Chefe Suco, Chefe Aldeia and Local Youth Groups. There were also Representative of Local Authorities such as District Administrator, Sub District Administrator and Vice Commander of Police.

The Public Consultation was carried out each day for each separate drilling location and Participation at those five drilling sites was positive. Exchanging information, question and answer as well as civility during the consultation have been positively displayed.

#### **Methodology and Approach**

The Public Consultation has been conducted by means of direct meeting between the project owner and the participant. The facilitator and the project owner directly presenting the material to the participants with a specific section dedicated to question and answer.

Before the actual consultation, the facilitator has directly engaged with the participant informing the rundown of the public consultation itself. Apart from direct engagement there was also invitation formally issued to the participant.



## **Detail of Public Participation Activity**

### **1. Date: Monday, 21 October 2019, Location: Camenasa Community Hall**

#### **Attendance:**

ANPM - HSE team, TR team, Local community leaders of Camenasa: Chefe Suco, Chefe Aldeia, Oficiais Policia Comunitaria (OPS) and Cultural leaders of Holbelis; Local Authorities: Representatives of Municipio Administração Estatal (MAE), Segundo Commandante PNTL, other members of PNTL.

Total Participants: 97 participants

*Consultation Commenced at 9:00 am to 12:30 pm*

### **2. Date: Tuesday 22 October 2019 Location: Belecasac Community Hall**

#### **Attendance**

SMC team, Local Community leaders of Belecasac-Chefe de Suco and Chefe villages Representative of Local Authorities- Representative of the District Administrator Sub District Administrator of Maucatar, Representative of Local Youth Group, Vice Command of Police, Local Community – Total 89 participants

*Consultation Commenced at 9:00 am to 12:30 pm*

### **3. Date: Wednesday, 23 October 2019 Location: Matai Community Hall**

#### **Attendance**

ANPM – HSE team and 9 other members, TR team, SMC team, Local Community leaders of Matai- Chefe de Suco and Chefe villages Traditional leaders.

Representative of the Local Authorities- Agriculture, Environment Representative of the District Administrator, Sub District Administrator of Maucatar, Representative of Local Youth Group

Local Police Commander, Local Community – Total 135 participants

*Consultation Commenced at 9:00 am to 12:30 pm*

**4. Date: Thursday, 24 October 2019 Location: Labarai Community Hall (Detail attached)**

**Attendance:**

ANPM – HSE team and 9 other members, TR team, SMC team. Local Community leaders of Labarai: Chefe de Suco and Chefe villages Traditional Leaders

Representative of the Local Authorities- Agriculture Representative of the District Administrator, Sub District Administrator of Suai, Representative of Local Youth Group

Local Veterans, Local Police Commander, Local Community – Total 132 participants

*Consultation Commenced at 9:00 am to 12:30 pm*

**5. Date: Friday 25 October 2019 Location: Community Hall of Tashilin**

**Attendance:**

Representative of the Local Authorities - The District Administrator, Sub District Administrator of Suai, Representative of Local Youth Group.

Local Veterans, Local Police Commander, OPS and Local Community – Total 89 participants.

*Consultation Commenced at 9:00 am to 12:30 pm*

**Question (Preoccupation) Raised During Public Consultation**

Following is the questions raised during the public consultation at those five well by the participant;

- **Local participation**

The preoccupation of the locals were focusing on how their participation in terms of workforce and direct contribution such as providing goods and services to the project owner. It is advised by the project owner (Timor Resource) that preference will be given to locals. However, the readiness of locals to participate is the key. TR will provide the means to enhance local participation for example providing training to workforce and if available with preferable standards, goods and service will be acquired from locals.

- **Cultural and traditional respect and ceremonies**

Before, during and after the drilling activities, respecting the cultural and traditional sites and ceremonies has to be prioritized by the project owner. Indeed there are some traditional ceremonies has been taken place during the initial engagement and TR pledges its promise to pay respect always the culture and traditions of the surrounding drilling sites.

- **Avoiding damaging the environment**

It is hoped that the project owner will pay much attention to the environment specially the flora and fauna. Livestock and their feeding ground has to be preserved.

- **Compensation to land and other valuable Trees**

Compensation for the community's land has become one of the central issues raises during the Public Consultation. Project owner pledges to pay attention to it and work hand in hand with the related authority to identify and taking care of the issue properly.

- **Providing infrastructure to communities**

Providing clean water, road accesses, schools, gathering places for communities, sports facilities have also been asked to the project owner. The pledges has been given to communities by the project owner that as much as they can, the project owner will in coordination with other related government institution as well as communities leader realize their queries.

## **Conclusion and Recommendation**

Overall, the Public Consultation has been conducted successfully in terms of participation and enthusiasm of communities. All preoccupation of communities have been addressed properly by the project owner. However, strong coordination between the project owner, communities and related government institution is advised.

#### **14. Difficulties Encountered**

The key challenging in the development of this EIS was the time limitation in obtaining a full insight baseline data and information from the survey area; and limitation of data that are required to be as latest as 2015 and above. The field survey timeframe indeed was restricted and not optimal for collecting certain data including air quality, coastal water and climate.

It is important to note that Timor-Leste is still considered as one of the countries that is lacked in human resources and technology to provide its own data and information in regard to climate, especially for simulation of future data that are particularly made reference to the past data, such as cyclones. Many data available in the Country are taken globally from the nearest region to the country such as Indonesia, Australia and Pacific, in which many of the data are provided based on data and analysis that are recorded and still used from the past 10 or 20 years back. Therefore, it is quite impractical to require this EIS to elaborate and provide climate information in particular to Cyclone from the recent year of 2015, as there is indeed unavailable or lacked in the country.

## **15. Conclusion and Recommendation**

The project will have impacts on the environment, especially human, terrestrial fauna and flora. However the project implementation plan has been designed to keep the minimum environmental impacts. Therefore, selected well locations are considered the best available option, as it will have minimum environmental impacts.

The negative environmental impacts caused by the project activities are unavoidable due to its nature of work and the current available technology that has been foreseen for each project stage. The impacts on the marine organisms and fishing activities are not likely to occur as the project designs and locations do not targeting any coastal environment. Even though the drilling campaign will cause some disturbances to the environment, especially some bird species which are critically endanger and restricted, the impacts will not be permanent or longer because the drilling campaign is planned for maximum two months on each well.

The impacts on the cultural heritage, archaeological site and tourism may be negligible as the well locations and their access roads that have been chosen do not interfering these environmental features.

However, the mitigation plans to minimize negative environmental impacts shall be continuously implemented and complied. This has to be done to ensure the drilling campaign project shall be executed according to the Timor-Leste's laws and regulations and other relevant standards and guidelines which have been adopted by Timor Resource.

## 16. Non - Technical Summary

Actividade perfurasaun ba mina matan lima ho naran Karau, Lafaek, Kumbili, Raiketan no Laisapi iha municipio covalima sei hala'o iha tinan ida ne'e nia laran. Mina matan lima nebe mak sei fura lokaliza iha suco hat hanesan Kamnasa, Matai, Labarai no Tasilin. Suku seluk mak bele mos hetan impaktu maka Belekasak no Debos tanba mina matan balun ne'ebe mak lokaliza iha kedas bareira entre suku rua ne'e nian.

Prosesu perfurasaun ida ne'e sei hala'o husi Kompania Timor Resource ho nia parseiru Timor GAP, E.P. Timor Resources hanesan kompania privadu ba Mina no gas husi Australia e Timor Gap maka sai hanesan kompania nasional ba Mina no gas Timor-Leste. Timor-Resources halo ona akordu ho Governu Timor-Leste no permite sira atu halo esplorasau ba area Bloku A (PSC TL OT-17-08). Objetivo husi perfurasaun ida ne'e atu hodi koko dadus sira ne'ebe hetan ona husi estudu geologico no geofisico ne'ebe kolekta ona husi tinan 1969 to ohin loron no perfurasaun ida ne'e rasik atu hodi koko estrutura sira iha rai okos ne'e iha mina ou lae. Atu halo prosesu perfurasaun ida ne'e, Timor Resource halo ona kontratu ho kompania Eastern Drilling atu halo prosesu perfurasaun ida ne'e.

Prosesu perfurasaun ida ne'e sei kompostu husi fase rua mak hanesan:

- Fase molok perfurasaun nebe mak sei kompostu husi aktividade mak hanesan Estudu ba rai no teste laboratorio, survey ba topografia, loke dalan atu ba iha mina matan, no aktividade seluk tan nebe relevante molok hahu perfurasaun.
- Fase segundu maka hanaran fase perfurasaun. Fase ida ne'e kompostu husi aktividade maka hanesan perfurasaun ba mina matan lima baseia ba dadus geological nebe mak kolekta ona durante ne'e husi Timor Resources ho nia parseiro. Fase ida ne sei implementa tuir lei no regulasaun no standarte industrial nian.

Implementasaun ba projeto ida ne'e sei halao tuir dekreto lei numero 5/2011 konaba lisensa ambiental no lei sira seluk nebe mak vigora iha Timor-Leste. Tanba ida ne'e Timor Resources hatama ona Estudu impaktu ambiental no plano managementu ambiental atu nune'e Autoridade Nacional do Petroleo e Minerais bele fo Lisensa Ambiental molok projeto ne'e hahu.

Atu bele hetan lisensa ambiental, Timor Resources serbisu hamutuk ona ho kompania Safety Management Consultancy (SMC) atu halo estudu ambiental iha area lima nia laran. Objetivo husi estudu ida ne atu hodi hatene tuir kondisaun ambiente iha area lima nebe mak sei hetan impaktu husi prosesu ne rasik.

SMC mos serbisu hamutuk ho Timor Resource atu halo Sistema Managementu Ambiental ne'ebe mak sei koalia konaba mekanismu oinsa atu protégé ambiente iha durasaun de projeto ida ne'e rasik. Dokumentus EMP ou Planu Managementu Ambiental ida ne'e sei sai hanesan mata dalan ida atu nune'e bele prevene impaktu ne'ebe la aseitavel. Em geral, planu ida ne'e sei hare konaba oinsa maneja impaktu sira hanesan rai rahun, barulhu, qualidade be, problema social no kultural ne'ebe bele mosu durante prosesu perfurasaun ida ne'e to'o remata.

Konsultasaun publiku ho objetivo atu fahe informasaun ba comunidade sira konaba aktividade perfurasaun ne rasik halao ona iha fulan Outobro tinan 2019 iha suku lima hanesan Kamnasa, Matai, Belekasak, Labarai no mos Tashilin. Iha konsultasaun publiku, SMC hamutuk ho Timor Resource fahe ona informasaun hanesan fatin perfurasaun, ekipamentu ne'ebe mak sei uja, konteudu local nomos informasaun seluk hanesan ambiente no seluk seluk tan. Participante husi konsultasaun publiku ida ne'e kompostu husi lideres comunidade, Chefe Suku, Chefe Aldeia, representante husi administrador municipal no Sub Distrito nomos kumunidade sira. Em geral, preokupasaun husi comunidade suku lima ne'e nian maka hanesan oportunidade serbisu no kultura.

Ikus liu, aktividade perfurasaun ida ne'e sei bele iha impaktu ba ambiente hanesan rai rahun no barulhu. Maibe, Kompania mos iha ona plano atu maneja ida ne'ebe mak sei uja hodi hamenus ipaktu negativo husi prosesu perfurasaun ne rasik.

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