

# Initial Environmental Examination

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March 2021

## Timor-Leste: Water Supply and Sanitation Investment Project: Viqueque City

Prepared by the Ministry of Public Works for the Asian Development Bank.

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## ABBREVIATIONS

WSSIP	- Water Supply and Sanitation Investment Project
ACMs	- Asbestos Containing Materials
ADB	- Asian Development Bank
DED	- Detailed Engineering Design
DNAP	- National Directorate for Protected Areas
DNCP	- National Directorate for Pollution Control
EARF	- Environmental Assessment and Review Framework
EHS	- Environment, Health and Safety
EIA	- Environmental Impact Assessment
EIS	- Environmental Impact Statement
EMP	- Environmental Management Plan
EMR	- Environmental Monitoring Report
ESS	- Environmental Safeguard Specialist
ESA	- Environmental Safeguard Assistant
FSTP	- Faecal Sludge Treatment Plant
GRM	- Grievance Redress Mechanism
IEE	- Initial Environmental Examination
IFC	- International Finance Corporation
MPW	- Ministry of Public Works
PA	- Protected Area
PD	- Project Document
PDC	- Project Design Consultant
PSC	- Project Supervision Consultant
PMU	- Project Management Unit
SEA	- Superior Environmental Authority
SEIS	- Simplified Environmental Impact Statement
CEMP	- Site-specific Construction EMP
SMASA	- Municipal Water, Sanitation and Environment Services
SPS	- Safeguard Policy Statement
TOR	- Terms of Reference
WDZ	- Water Distribution Zone
WTP	- Water Treatment Plant
WHO	- World Health Organization
WSS	- Water Supply and Sanitation

## WEIGHTS AND MEASURES

\$	- United States Dollars
°C	- Celsius/centigrade
amsl	- above mean sea level
dba	- decibel audible
ha	- hectare/s
km	- kilometre/s
km <sup>2</sup>	- square kilometre/s
lps	- litres per second
m	- meter/s
m <sup>3</sup>	- cubic meter/s
mg/l	- milligram/s per litre
mm	- millimetre/s
µg/m <sup>3</sup>	- microgram/s per cubic meter

## NOTES

In this report, “\$” refers to United States dollars and “SMASA” refers to SMASA-Viqueque unless otherwise stated.

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## EXECUTIVE SUMMARY

1. The Water Supply and Sanitation Investment Project (WSSIP) will support the Government of Timor-Leste to improve water supply and sanitation in the three project cities (Lospalos, Viqueque and Same) by drawing on experiences and lessons learned from the ADB Second District Capitals Water Supply Project.

2. This Initial Environmental Examination (IEE) has been carried out during the detailed engineering design (DED) phase for the proposed project, in accordance with ADB's Safeguards Policy Statement (SPS) 2009, and the Government of Timor-Leste environmental requirements and guidelines currently in effect. The objective of such a procedure is to ensure that projects are environmentally sound, designed to operate in compliance with applicable regulatory requirements, and are not likely to cause significant environmental, health, or safety hazards.

3. The government intends to implement the project over a 7-year period (indicative implementation period is 2022 to 2028) and will be supported through ADB financing using a project lending approach. The MPW is the implementing agency responsible for the overall management, implementation and monitoring of the project and the SMASA office in Viqueque will manage day-to-day operation at the municipality level. The scope of the DED prepared for the project includes:

- (i) Rehabilitate the potable water distribution network to consumers within the defined Water Zones;
- (ii) Evaluate existing and new sources for possible supply of the water distribution system;
- (iii) Evaluate the condition and scale of the Sanitation situation in the Project Area and design wastewater treatment infrastructure for 4 Public toilets; and
- (iv) Evaluate and Design a stand-alone Faecal Sludge Treatment Plant (FSTP) to receive the collection and treatment of septic tank sludge effluent from all households, buildings and schools within the 15 Km project range.

4. The DED scope also includes all the areas that will be required to implement the abstraction, treatment and distribution of water for human consumption, as well as provide designs and solutions for sanitation for buildings, schools and housing within a diameter area of 15 Km around the city.

5. The various project infrastructure components are in poor condition and are required to be completely rehabilitated/substituted. These are the existing and proposed water origins i.e. springs and boreholes, water storage, water treatment facilities, transmission and distribution lines and public toilets and Faecal Sludge Treatment Plant (FSTP).

6. The water supply system will be composed of surface water source, namely Loihunu I (Buibau), with a current calculated production capacity of up to 50 L/s (4,320 m<sup>3</sup>/day) and Cuha River Intake, which will require a production capacity of up to 50 L/s (4,320 m<sup>3</sup>/day), to respond to a 2040 water demand of 54.2 L/s (4,682 m<sup>3</sup>/day). This yield will be responsible to supply 4 different zones encompassing all the existing and projected households in Viqueque city up to 2040.

7. After storage, distribution and consumption, the generated wastewater and sludge are then treated primarily in the household septic tanks and afterwards transferred into the proposed Faecal Sludge Treatment Plant in Suco Maluro.

8. Clean, adequate drinking water is a basic human need and developing drinking water supply facilities has numerous beneficial impacts to individuals and communities. Furthermore, when coupled to sanitation improvement, there is a substantial increase in the quality of life

within the project area. Some of the major beneficial impacts of the proposed project are the increase of local employment generation, skill enhancement, improved health and hygiene and also empowering more women.

9. However, this project is also estimated to have negative environmental and social impacts, particularly during the construction and operational stages, particularly the construction phase which is more likely to produce negative impacts towards the environment and the local community than the remaining phases of the projects, albeit temporary. Other than the pipe laying works (new and/or rehabilitation), the remaining construction activities will be restricted to their respective confined area, thus the interference with the public and surrounding community should be minimal. Negative impacts to be generated are predicted as mostly temporary, such as noise and air pollution (that causes disturbance to the nearby dwellings and commercial buildings), construction waste (solid and liquid), increased traffic (especially in narrow roads), as well as health and safety risk to workers, declining of water quality, soil erosion, etc.

10. The project's environment and potential impacts were assessed through the use of an ADB REA (Rapid Environmental Assessment) Checklist, followed by the application of an evaluation matrix and impact assessment rating for all components and activities in the Pre-construction, Construction, Operation and Decommissioning Phases of the Project. The significance of the impacts was assessed according to the condition of the affected environmental and social components at the time of evaluation and the scale of impact should the impact persist.

11. It is thus concluded that the water supply and sanitation investment project in Viqueque can be categorized as a Category B (IEE) for environment, as per ADB SPS 2009, given it does not have significant adverse environmental impacts that are irreversible, diverse, or unprecedented, or that potential impacts are unlikely to affect areas larger than the sites or facilities subject to physical works and in most cases mitigation measures can be designed with uncomplicated measures commonly used at construction sites and known to civil works contractors.

12. Additionally, the project will also present corresponding Project Document (PD) for the purpose of Timor-Leste official environmental screening process and, when category is confirmed, a Simplified Environmental Impact Statement (SEIS) and an Environmental Management Plan (EMP) will be presented, in accordance with the Government of Timor-Leste environmental legislation in effect.

13. The IEE procedure for Category B projects, under Decree-Law no. 05/2011, requires the proponent to undergo a full Public Consultation. Likewise, the project follows ADB's Safeguard Policy (ADB, April 2009), which requires borrowers/clients to perform meaningful consultation with affected people.

14. The ADB IEE (ADB, 2020) undertook Public Consultation for Viqueque in the Viqueque Municipality Administrative Assembly Room on the 10<sup>th</sup> of October 2020, participated by local government agencies and authorities (Chief of Suco and Village), and representative members of the communities within the project area, where the issues of significant social concern, predicted environmental impacts and proposed mitigation measures were presented, in order to collect all useful and relevant inputs from them, for the project construction phase.

15. The stakeholders presented their concerns, suggestions and recommendations for the project implementation, focusing mainly on issues such as Land & Property, Acceleration of the Project Implementation, Project Area, Water distribution system does not serve all villages, misuse by consumers (and direct impact on water availability in the distribution system and measurement for structural preservation of cultural and religious assets within the project area.

16. In addition, 4 other Public Consultations were carried out under the social component in Suco Carabalu (12<sup>th</sup> December 2020), Suco Loihuno (12<sup>th</sup> December 2020), Suco Uma Quic

(13<sup>th</sup> December 2020) and Suco Uma Uain Craic (13<sup>th</sup> December 2020), which registered a significant attendance and strong female participation and further confirmed the expectations and worries in the previous Public Consultation and reassured the team that there is very little risk of any water conflicts or impacts felt by the community during implementation and operation of the future system.

17. Every grievance shall be registered by the Contractor under a carefully documented process during construction and development of the project. The MPW will also be involved in the clients' complaints and establish a good network with the chefe suco and aldeia for cultural facilitation purposes. The environmental and social safeguards officer will be fully responsible on the overall grievance redress issues particularly on the environmental and social issues using a combination mechanism.





## 1. INTRODUCTION

### 1.1. Background

1. The Water Supply and Sanitation Investment Project (WSSIP) is a Government of Timor-Leste project that intends to provide access to improved water supply and sanitation in the three project cities (Lospalos, Viqueque and Same) by drawing on experiences and lessons learned from the ADB Second District Capitals Water Supply Project.

2. The significant growing number of the population in all cities is resulting in the increase of water demand and wastewater production in the private and domestic sectors. Issues such as continuous water scarcity, poor infrastructures, inadequate water and wastewater quality has led the Government of Timor-Leste to focus on the water and sanitation improvement, particularly in the urban areas.

3. The WSSIP will build upon the current Government efforts in providing water supply and sanitation (WSS) services in Timor-Leste's urban areas, working towards the achievement of Sustainable Development Goal (SDG)-6 to ensure availability and sustainable management of water and sanitation for all by 2030, in line with the country's Strategic Development Plan 2011 – 2030 (G-RDTL, 2011), specifically the water sanitation strategy of "...providing a safe piped 24-hour water supply to households in 12 District [now "municipality"] centres..., by 2030,..." across Timor-Leste. It will also finance climate-resilient and inclusive WSS infrastructure in project municipalities and strengthen institutional and community capacity, sustainable service delivery, and project development.

4. The WSSIP is expected to impact on the quality of life for urban populations, especially the poor and marginalized, achieving inclusive and sustainable access to WSS services in the cities, through the improvement of water supply and sanitation infrastructure and strengthening of institutional and community capacities.

5. Shortage of investment funds, skilled personnel, and inadequate operation and maintenance (O&M) budgets, hinders municipalities from providing adequate, cost-effective services, even though the Decentralization Policy (2016) and the Statute of the Municipal Authorities (2016) establishes municipalities as an autonomous government institution with responsibility for WSS services, after a transition period.

6. While municipalities' capacity is being built, the government intends to implement the project over a 7-year period (indicative implementation period is 2022 to 2028) and will be supported through ADB financing using a sector lending approach. The MPW is the implementing agency responsible for the overall management, implementation and monitoring of the project and the SMASA offices will manage day-to-day operation at the municipality level.

### 1.2. The WSSIP and Viqueque City

7. This IEE report is prepared for the WSSIP – Viqueque City, within the Suco Loihuno, Caraubalo, Uma Quic, Uma Uain Craic and Maluro, which has the following components under the project Output 2:

- rehabilitate and expand the Viqueque urban water supply system to cover the new demand volumes for the project horizon year of 2040, including:
  - (i) Rehabilitation and improvement of the existing Loihuni I Spring intake and complement current water production with the Kuha River;
  - (ii) Rehabilitation and improvement of existing water storage and treatment facilities;

- (iii) Rehabilitation of 43 Km within the expanded water supply distribution pipe system (4 Zones), simplifying management and substantially improving the level of service and reducing water losses in the project area; and
  - (iv) Installation of bulk metering system within the distribution network and replacement and/or installation of domestic meters for all existing and new connections for proper accounting of water use and system losses.
- establish fully functioning water supply and sanitation infrastructure in 4 (four) public locations that is effectively operated, maintained and managed to provide a minimum level of service for water supply and sanitation to all municipal dwellers while they are active in the city premises;
  - establish septic tank sludge treatment and disposal facilities and associated sludge transport system within a diameter area of 15 Km around the Viqueque municipal capital that is effectively operated, maintained and managed and that safely transports the septic tank sludge effluent from all households, buildings and schools to a future stand-alone Faecal Sludge Treatment Plant (FSTP) in Suco Maluro.

### **1.3. Purpose and Scope of the Initial Environmental Examination**

8. This Initial Environmental Examination (IEE) is the preliminary environmental evaluation for the Water Supply and Sanitation Investment Project – Viqueque City (known as WSSIP - Viqueque) and has been carried out during the Detailed Design phase, in accordance with ADB's Safeguards Policy Statement (SPS) 2009, and the Government of Timor-Leste environmental requirements and guidelines currently in effect. The objective of such a procedure is to ensure that projects are environmentally sound, designed to operate in compliance with applicable regulatory requirements, and are not likely to cause significant environmental, health, or safety hazards.

9. An approved company, registered with the Secretariat State for Environment (SSE) has undertaken this IEE (for the purpose of the ADB due diligence procedure) and will prepare the Project Document (PD), Simplified Environmental Impact Statement (SEIS) and Environmental Management Plan (EMP) for the purpose of the Timor-Leste Environmental Licensing requirements.

10. The IEE covers the 3 Outputs under the project (Output 1: Regulatory environment improved; Output 2: Water supply and sanitation infrastructure improved; and Output 3: Institutional effectiveness improved) and all mitigation measures and monitoring under this IEE, have been compiled under a separate Environmental Management Plan (EMP).

11. The environmental assessment was conducted for the Viqueque city water supply and sanitation project, based on (i) the D4 - Preliminary Engineering Design, and (ii) most likely environmentally sensitive components.

12. The IEE report itself describes this process, where it (i) provides project information and environmental requirements; (ii) provides baseline physical, ecological, cultural and socioeconomic description surrounding the project's area; (iii) identifies and assesses potential environmental impacts from the project's implementation; (iv) includes recommendations for measures to avoid, mitigate, and compensate adverse impacts; (v) informs on stakeholder consultations and participation activities during project preparation; (vi) provides an environmental management plan; and (vi) presents a grievance redress mechanism for the project.

13. This analysis consisted of a stepped approach (characterization of the environment, description of project components, impacts analysis and management and mitigation measures) with close joint work with the ADP technical team in order to reduce the predicted significant impacts from the various proposed project components in the Design, Construction, Operation and Decommissioning Phases of the Project in this city.

14. The evaluation of the specific environmental conditions for Viqueque city was based on a short preliminary visit during the inception phase (on the 20 and 21 February 2020) and after a rather long period of delay due to COVID-19 restrictions, the team carried out a more in-depth site visit to Viqueque (24 to 26 June 2020).

15. A photographic registry was carried out of the surrounding conditions of all proposed project components defined at the time and the team applied ADB REA checklists for the Water and Sanitation Sector (see Appendix 1) to help survey the preliminary environmental conditions and possible impacts of the WSS components in the project area and review project interactions in regards to the most significant component conditionalities i.e. location, biodiversity and climate change. It also supported and guided the team and client on the probable environmental categorization of the WSS rehabilitation project, depending of the difficulties and/or possible impact control regarding stand-alone, specific infrastructure or in regards to areas where project components may encounter environmental sensitivities and bottlenecks for the project.

16. The field characterization was complemented with a desktop review of generally available secondary information on each of the project areas, in particular from the 2016 Initial Environmental Examination (IEE) documents from the Second District Capitals Project and additional bibliography. The characterization intended to provide a description of the Environmental conditions in each of the project areas in Viqueque and has been described in Chapter 5 “Description of the Environment”.

17. The team involved and collaborated with several local and national level institutions that supported the study, in particular during the field study and data collection, namely:

- (i) Viqueque Directorate of Water and Sanitation (Mr. Marito da Costa and technician staff Mr. Celestino Freitas and Mr. Mário Pinto);
- (ii) Ministry of Agriculture and Fisheries: General Director from Forestry, Coffee and Industrial Plants, (Mr. Raimundo Mau) and Chief of Department of Conservation (Mr. Joao Antalmo);
- (iii) Secretary of State for Arts and Culture: General Director from Secretary of State for Arts and Culture (Mr. Manuel Ximenes Smith), National Director of Cultural Patrimony (Mr. Gil Paulino dos Santos Oliveira) and Chief of Department of Archaeology (Mrs. Irene dos Reis Goncalves);
- (iv) Local authorities: Chief of Suco Loihuni (Mr. Miguel DC Melo), Chief of Suco Caraubalu (Mr. João Pinto), Chief of Suco Uma Uain Craic (Mr. Angelo Miguel da Silva) and Chief of Suco Uma Quic ( Mr. Hermenegildo Rangel).

18. The environmental assessment of the Viqueque water supply and sanitation project shows it is not likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. Potential impacts are unlikely to affect areas larger than the sites or facilities subject to physical works. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed with uncomplicated measures commonly used at construction sites and known to civil works contractors.

19. Under this scenario, the water supply and sanitation investment project in Viqueque has been concluded as a strong candidate for a Category B for environment, as per ADB SPS 2009 and the Government of Timor-Leste Environmental Licensing Legislation (see Chapter 2 for information on project categorization). Additionally, the project will also present corresponding Project Documents (for official environmental screening purposes) and, when reviewed and (if)

confirmed, a Simplified Environmental Impact Statement (SEIS) and an Environmental Management Plan (EMP) will be presented, in accordance with the Government of Timor-Leste environmental legislation in effect.

#### **1.4. Details of Proponent and Consultant that prepared the Report**

20. The Ministry of Public Works (MPW) is responsible for planning, implementation, regulation, and monitoring of WSS and supports the water and sanitation facilities in municipalities, these operated locally together with the SMASA office.

21. The project proponent and representative details are the following:

***Ministry of Public Works (MPW)***

Mr. Salvador Pires, Minister  
MPW Corporate Services Building  
Avenida 20 de Maio, Caicoli, Díli, Timor-Leste

***SMASA Viqueque Municipal Office***

Mr. Marito da Costa, Director  
Suco Caraubalu, Viqueque, Viqueque, Timor-Leste

22. The Ministry of Public Works (MPW), on behalf of the Government of the Democratic Republic of Timor-Leste, contracted the consortium Águas de Portugal Timor-Leste / Engidro to prepare the “*Detailed Engineering Design of Timor-Leste Water Supply and Sanitation Investment Project of Same, Lospalos and Viqueque*”, financed by the Infrastructure Fund of the Government of Democratic Republic of Timor-Leste. OASIS – Sustainable Projects is the Consultant subcontracted by ADP/Engidro and responsible for preparing the IEE and EMP report.

## 2. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

### 2.1. The ADB Environmental Process

#### 2.1.1. ADB Safeguard Policy Statement

23. The ADB SPS 2009 (ADB, Safeguard Policy Statement, 2009) are operational policies that seek to avoid, minimize, or mitigate adverse environmental and social impacts, including protecting the rights of those likely to be affected or marginalized by the development process. They consist of three operational policies on the environment, Indigenous Peoples, and involuntary resettlement.

24. ADB SPS 2009 requires borrowers to meet a set of requirements (Safeguards Requirements 1) when delivering environmental safeguards for projects supported by ADB, to ensure the environmental soundness and sustainability of projects and support the integration of environmental considerations into the project decision-making process, which SMASA will be required to comply with these requirements, for this project. Below is a summary of the step-by-step process, while more detailed information can be sought in the ADB SPS 2009.

- (i) **Screening and Categorization:** Projects are screened for their expected environmental impacts, and assigned to a specific category.<sup>1</sup> Categorization must be based on the most environmental sensitive component. However, for project(s) with component(s) that can trigger Category A or with potentially significant adverse impacts that are diverse, irreversible, or unprecedented, the Project Design Team shall examine alternatives to the project's location, design, technology, and components to avoid, and, if avoidance is not possible, minimize adverse environmental impacts and risks, and to meet Category B categorization. The screening/categorisation process must be properly documented, taking into account the environmental costs and benefits of the various alternatives considered and the "no action" alternative.
- (ii) **Environmental Assessment:** a description of environmental and social baseline information within the project area to provide an understanding of current conditions, thus forming the benchmark for assessment against identified project activities and respective impacts. Environmental impacts and risks are then analysed for all relevant stages of the project cycle, including design and planning stage, construction, operation, decommissioning, and post-closure activities such as rehabilitation or restoration.
- (iii) **Environmental Planning and Management:** After environmental impact assessment, the Project Design Team prepares an environmental management plan (EMP) to be included in the IEE report. The EMP describes and addresses the potential impacts and risks identified by the environmental assessment and the level of detail and complexity of the EMP and the priority of the identified measures and actions is commensurate with the project's impact and risks. The EMP includes the proposed

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<sup>1</sup> Per ADB SPS 2009 (i) **Category A:** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required. (ii) **Category B:** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible and, in most cases, mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required. (iii) **Category C:** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed. (iv) **Category FI:** A proposed project is classified as category FI if it involves investment of ADB funds to or through a financial intermediary.

mitigation measures, environmental monitoring and reporting requirements, emergency response procedures, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators.

- (iv) **Public Information Disclosure:** The Project owner, in this case MPW, shall submit, for disclosure i.e. on ADB or MPW, or other website or paper copies in the MPW office, a final draft IEE in a form and language(s) understandable to affected people and other stakeholders so that they, as well as other stakeholders and the public can provide meaningful inputs into the project design and implementation.
- (v) **Consultation and Participation:** The MPW, together with the PDC and the ESS, shall carry out meaningful consultation<sup>2</sup> with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation, where the consultation process and its results must be documented and reflected in the environmental assessment report.
- (vi) **Grievance Redress Mechanism:** MPW shall establish a mechanism to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the project's environmental performance, scaled to the risks and adverse impacts of the project.
- (vii) **Monitoring and Reporting:** MPW, together with the PMU, shall monitor, measure and document the progress of implementation of the EMP and identify necessary corrective actions and reflect them in a corrective action plan. These events shall be reported to ADB semi-annually in an environmental monitoring report (EMR) that describes progress in EMP implementation and compliance issues and corrective actions, if any, as well as from any non-compliances detected in any site visits, review meetings and/or missions.
- (viii) **Unanticipated Environmental Impacts:** Where unanticipated environmental impacts become apparent during project implementation, MPW and the PMU shall update or prepare a new the environmental assessment and EMP to assess the potential impacts, evaluate the alternatives and outline mitigation measures and resources to address those impacts.
- (ix) **Pollution Prevention and Control Technologies:** During the design, construction, and operation of the project, the MPW and PMU must apply pollution prevention and control technologies and practices consistent with international good practices i.e. internationally recognized standards such as the IFC EHS guidelines. When the Government of Timor-Leste regulations differ from these levels and measures, the PMU shall achieve whichever is more stringent.
- (x) **Occupational Health and Safety:** the MPW and the PMU shall ensure that all workers<sup>3</sup> are provided with a safe and healthy working environment, taking into

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<sup>2</sup> ADB SPS, 2009: meaningful consultation means a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

<sup>3</sup> Means ALL workers, including nonemployee workers engaged by the borrower/client through contractors or other intermediaries, that work directly in the project sites or perform work directly related to the project's core functions.

account internationally recognised standards such as i.e. IFC HSE, to identify risks inherent to the sector and specific classes of hazards in the project work areas (physical, chemical, biological, and radiological hazards, etc) and ensure steps are taken to prevent accidents, injury, and disease arising from or during the course of work i.e. follow guidance from World Bank Group's Environmental, Health and Safety Guidelines.

- (xi) **Community Health and Safety:** the MPW and the PMU shall ensure that risks are identified and potential impacts assessed on the safety of affected communities during the design, construction, operation, and decommissioning of the project, and guarantee that preventive measures and plans are established to address them in a manner commensurate with the identified risks and impacts.
- (xii) **Physical Cultural Resources:** the MPW and the PMU are responsible for overseeing the siting and designing of the project so as to avoid significant damage to physical cultural resources. Such resources will be identified and the project's potential impacts on these resources assessed using field-based surveys in the environmental assessment process and especially chance finds procedures shall be included in the EMP.
- (xiii) **Bidding and Contract Documents:** the MPW and the PMU shall ensure the IEE, SEIS and EMP are included in bidding and contract documents and verified by the MPW, ensuring that these include specific provisions requiring contractors to (i) comply with all other regulatory conditions required by the Government of Timor-Leste and ADB<sup>4</sup> and (ii) to submit to MPW/PMU, for review and approval, a site-specific environmental management plan (CEMP).<sup>5</sup> No works can commence prior to approval of the CEMP; a copy of the EMP or approved CEMP must be on site during the construction period at all times and Non-compliance with, or any deviation from, the conditions set out in the EMP or CEMP will constitute a failure in compliance and shall require corrective actions from the contractor.
- (xiv) **Conditions for Award of Contract and Commencement of Work:** MPW shall not award any Works contract until: (i) relevant EMP provisions are incorporated into the Works contract and the CEMP has been prepared by the contractor and subsequently approved by the PMU; and (ii) the IEE is updated to reflect the Project's detailed design and any conditions resulting from the domestic environmental compliance license, and the PMU has subsequently obtained MPW and ADB's clearance of the IEE and corresponding EMP. Works cannot commence without the domestic environmental license having been secured.

## 2.1.2. Project Category under ADB SPS 2009

25. All projects funded by ADB must comply with its Safeguard Policy Statement (SPS) to ensure that projects are environmentally sound, designed to operate in compliance with

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<sup>4</sup> Contractors to comply with (i) all applicable labor laws and core labor standards on (a) prohibition of child labor; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; and (c) elimination of forced labor; and with (ii) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites.

<sup>5</sup> CEMP to include (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures as per EMP; (iii) monitoring program as per CEMP; and (iv) budget for CEMP implementation.

applicable regulatory requirements, and are not likely to cause significant environmental, health, or safety hazards.

26. Environmental assessment has been conducted for the Viqueque water supply and sanitation Project based on (i) Detailed Engineering Design, and (ii) most likely environmentally sensitive components. The environmental assessment used ADB's rapid environmental assessment (REA) checklist (see Appendix 1) and the field review during the project. The environmental assessment of the Viqueque Water supply and sanitation project shows it is not likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented, or that potential impacts are unlikely to affect areas larger than the sites or facilities subject to physical works. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed with uncomplicated measures commonly used at construction sites and known to civil works contractors.

27. Therefore, under the ADB SPS 2009, the Viqueque water supply and sanitation project is classified as Category B for environment and this initial environmental examination (IEE) report has been prepared based on its requirements. However, Environmental Assessment beyond the IEE will have to take into account the result from the screening process under the Timor-Leste legislation.

## **2.2. GOVERNMENT ENVIRONMENTAL RULES AND REGULATIONS**

### **2.2.1. Decree Law No. 26/2012 – Base Law of Environment**

28. Decree Law No. 26/2012, 4th July is the Basic Environmental Law, setting the framework for Environmental Protection in Timor-Leste, the environmental principles to follow and makes the State responsible to ensure that citizens are guaranteed a healthy, ecologically balanced environment and the use of natural resources is done in a sustainable way, as defined in the Constitution of the Democratic Republic of Timor-Leste. It sets the standard and commitment for all future environmental laws and policies (including all terrestrial and marine areas, soil and sub-soil), to single or collective persons, national or foreign, public or private, residing or undergoing activities in Timor-Leste.

29. It also commits the Government to compulsory Environmental Evaluation of its policies, plans and projects, and defines important procedures and requirements such as e.g. the Environmental Assessment and Licensing process and environmental standards, including the use of International Environmental Standards i.e. WHO or equivalent, if National Standards aren't established.

### **2.2.2. Decree Law No. 5/2011 – Environmental Licensing**

30. While all projects funded by ADB must comply with their Safeguards to ensure that projects are environmentally sound, designed to operate in compliance with applicable regulatory requirements, and are not likely to cause significant environmental, health, or safety hazards, in Timor-Leste, environmental screening and categorization follows similar suit but is also dependent on project component and scale comparison with Decree-Law no. 5/2011 – Environmental Licensing, particularly Annex I – Category A (EIA) or Annex II – Category B (IEE) thresholds.

31. Decree Law No. 5/2011 was published on the 9th of February 2011 and is the regulatory implementation of article 15 of the Base Law for Environment, where it defines the methods of environmental classification/screening, evaluation, decision, licensing and monitoring of development projects, throughout their construction, operation and decommissioning phases.

32. It requires a proponent to screen the proposed project and undertake either Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) of the proposed



project and have it reviewed and approved by the Environmental Regulator (ANLA)<sup>6</sup>, prior to implementation.

33. The preparation, review, approval and monitoring of EIA and IEE projects are dealt with in the Articles within Chapters IV, VI, VII and X, while environmental screening and categorization is dependent on project component and scale comparison with Annexes 1 and 2, which list down the project activities and thresholds that define a Category A (EIA) or Category B (IEE) requirement or, concurrent with the principles of the ADB SPS 2009, the ANLA determines and duly justifies the category of a proposed project based on the most sensitive environmental component.

34. This means that a project may have components listed in different Sectors of both annexes (depending on the scale of each of them) but the project, overall, assumes the environmentally most significant Category of any of the sectors it falls into.

35. Most importantly, Ministerial Diploma no. 46/2017, determines not only the technical contents for the deliverable documentation but also empowers the Environmental Authority to determine/choose, duly justified, a category A for a proposed project based on the most sensitive environmental component, concurrent with the principles of the ADB and IFC or the determination of a less sensitive category i.e. downgrade A to B, if also duly justified.

36. Table 1 indicates the possible screening categorization under the DL 05/2011, based on both the Category A and Category B thresholds, for the proposed project components referred in this report.

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<sup>6</sup> The National Authority for Environmental Licensing (ANLA) is responsible for the: (i) review of applications for Environmental Licensing; (ii) Screening approval for Project Categorization; (iii) review, analysis and approval of submitted IEE, EIA and related Reports/Documents; (iv) forward EIA/IEE Reports together with its technical opinions, suggestions and decision proposal to the SEA (currently the Secretary of State for Environment); and (v) monitoring and evaluation of project implementation impacts.

Figure 1 EIA and IEE process under DL5/2011 – Steps and Timing

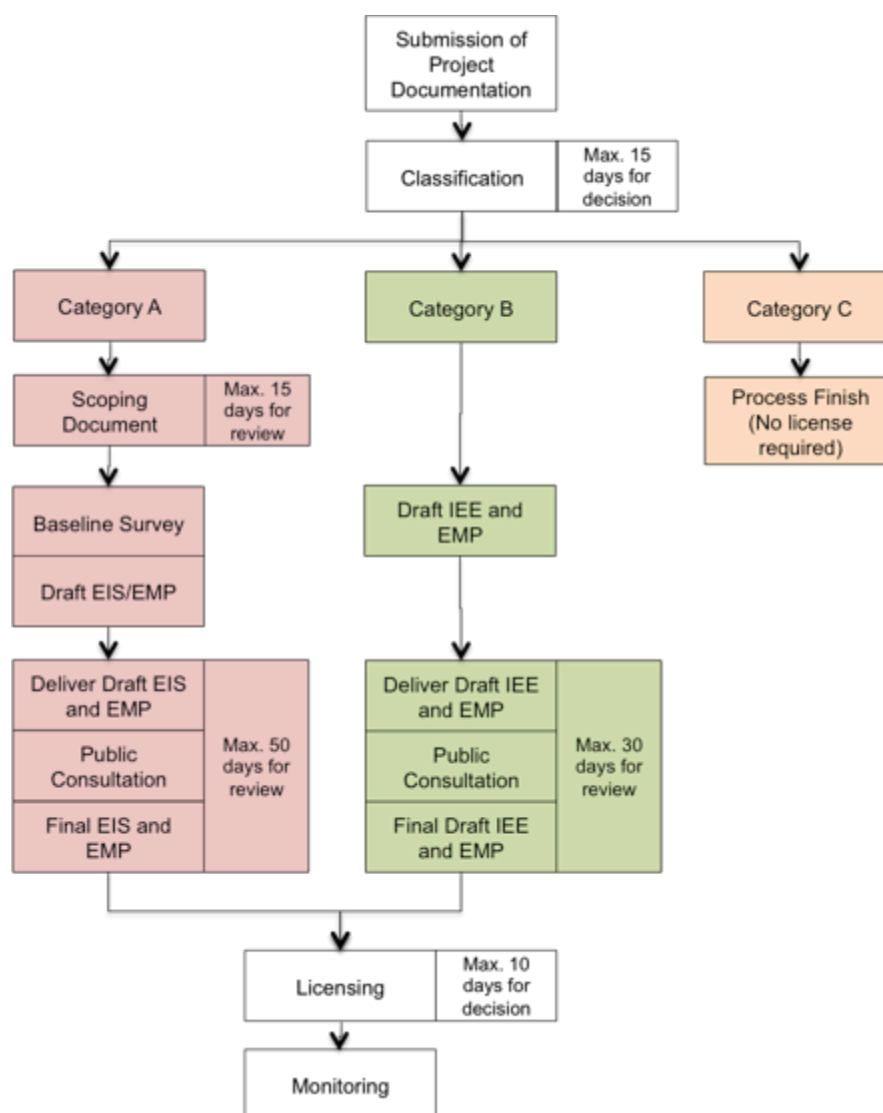


Table 1 Environmental Licensing Categorisation Thresholds under Decree-Law No. 05/2011

	<b>Category A Threshold (EIA required)</b>	<b>Category B Threshold (IEE required)</b>
<b>VII. Sanitation Sector</b>		
3. Wastewater Treatment Plants (WWTP)	≥ 10,000 families/eq.	< 10,000 families/eq.
<b>VIII. Water Sector</b>		
5. Systems of water collection from lakes, rivers, springs and other water sources (excluding the soil or groundwater)	Annual Abstracted Volume > 1 million CBM/year	N/A
6. Abstraction of groundwater with boreholes	≥ 10 L/sec.	< 10 L/sec.
8. Construction of aqueducts and water networks	≥ 3 Km	< 3 Km
<b>XII. Location Factors</b>		
1. Sensitive ecosystems or with value (beaches, mangroves, coral reefs, protected areas, marine areas)	ALL	N/A
2. Unique and valuable landscape	ALL	N/A
3. Archaeological/ Historic site	ALL	N/A
4. Areas Densely populated	Resettlement ≥ 300 people	N/A
5. Cultural or tribal communities	ALL	N/A
6. Sensitive geographic areas	ALL	N/A

37. The ANLA review time (non-consecutive, non-inclusive of Consultant time of assessment and document drafting and without any delays) for a Category A (EIA) is the sum of: i) Project Document (PD) [15 days] + ii) Scoping Document (SD) [15 days] + 1<sup>st</sup> Draft EIS/EMP, Public Consultation and Final Draft EIS/EMP [50 days] + Decision on License [10 days], totalling 90 working days.

38. For Category B projects (IEE), the process does not include step ii) SD and step iii) Simplified Environmental Impact Statement (SEIS) has a turnaround requirement of 30 days review, bringing the process to a Total of 55 work days.

39. It is important to understand that the Environmental Regulator has the power to double (once) any or all timeframes within the process, if duly justified and always in written form to the project proponent, within the legal timeframes.

40. Also relevant to the Environmental Licensing Procedure are the diplomas that include implementing rules and regulations for certain aspects of DL 05/2011, which are:

- (i) Ministerial Diploma no. 44/2017, of 2nd August - Regulation on Impact and Benefits Agreement;
- (ii) Ministerial Diploma no. 45/2017, of 2nd August - Regulation on the Statute and Rules of procedure for the Evaluation Committee for the Management of the Environmental Assessment Process for Category A projects;
- (iii) Ministerial Diploma no. 46/2017, of 2nd August - Regulation on the Detailed Requirements for Screening (Project Document [PD]), Scoping and the Terms of Reference (TOR), Environmental Impact Statements (EIS), Simplified Environmental Impact Statements (SEIS) and Environmental Management Plan (EMP) for Environmental Assessment;
- (iv) Ministerial Diploma no. 47/2017, of 2nd August - Regulation on the Public Participation Procedures and Requirements During the Environmental Assessment Process.

### **2.2.3. Project Classification under Decree Law No. 5/2011 – Environmental Licensing**

41. The project's main objective is to guarantee that the overall balance of environmental and social impacts results in positive outcome, taking into special consideration the mitigation commitments in the Environmental Management Plan, the compliance with the RDTL environmental assessment process and especially given the project's special relationship with the institution's technical assistance support.

42. The proponent is certain that the classification of the project components for Viqueque City falls under a Category B given the project components does not fall within any sensitive or protected areas, it is a rehabilitation of the water network i.e. a brownfield project, with pre-existing pipe alignments and zones that have undergone significant land use change since almost 30 years ago, during the first installation and thus lead to the new intervention being less significant and of temporary duration, particularly given a few "greenfield" project components are located in the distribution system extension areas, outside of the PA boundaries.

43. This assumption is further justified based on the ANLA previously attributed Category B Environmental License for the Government projects for rehabilitation of water distribution infrastructure in the District Capitals Water Supply Project for Manatuto and Pante Macassar 2014 (see Appendix 11). These two projects are of similar nature to the Viqueque project and the scale of pipeline dimension and length, as well as water sourcing and borehole capacity, is higher than that proposed by the Viqueque project, legitimizing the assumption that the resulting

screening exercise and categorization for the Viqueque project results in a Category B, as follows:

Table 2 - Estimated Environmental Classification for Viqueque Project Components

Proposed Components	Proposed Capacity	Estimated Classification	Included in XII. Location Factors?
<u>Sanitation</u>			
Public Bathrooms Septic Systems	N/A	N/A	No
Feacal Sludge Treatment Plant	4,038 HH	B	No
<u>Water Distribution</u>			
Rehabilitation (Mains and Distribution)	43,046m	B <sup>(1)</sup>	No
<u>Water Sources (Existing and/or New)</u>			
Loihuno 1 <sup>(4)</sup>	(5 to 50) L/sec <sup>(1)</sup> (157,680 – 1,576,800) m <sup>3</sup> /year	B <sup>(1)</sup>	No
Kuha River <sup>(4)</sup>	(5 to 50) L/sec <sup>(1)</sup> (157,680 – 1,576,800) m <sup>3</sup> /year	B <sup>(1)</sup>	No

<sup>(1)</sup> As in previous ANLA attributed Category B Licenses to similar-scaled water source volumes and length of distribution network such as MPW projects in Pante Macassar and Manatuto (see Appendix 11).

44. The proposed system in Viqueque is based on “brownfield” sub-projects i.e. existing water piping and/or springs or boreholes, established by SMASA several decades ago, in order to guarantee that their customers had minimum access to water for consumption. It is assumed that, at the time of their establishment, locational factors were not the priority for government institutions across the board, as opposed to guaranteeing water supply to the people. In addition, the location of the sources available at the time was very limited, resuming to existing springs that the local community leaders gave authorization to extract under “cultural” rule (which is still very active today). Viqueque’s culture is very conspicuous and the essence is still strongly associated with people particularly in rural and semi-urban areas. Local people are still conceiving the notion of animism (see 5.3.2) where most natural resources are protected by natural spirits and the people’s ancestors. As a way of respecting the nature, the interested parties are obligated to comply the permission requirements prior exploiting the referred resource.

45. Currently, the Viqueque water distribution system has evolved around these established spring systems, particularly in regards to the Loihunu Springs. The importance of these two sources is now augmented by the fact that SMASA requires the water distribution system to expand into the city’s urban expansion areas.

46. Based on the extension of proposed water extraction and the nature of the proposed rehabilitation works for the city, the rehabilitation of the water network to these sources will be a pipe substitution i.e. a brownfield project and thus lead to the current intervention being less significant and of temporary duration.

47. It is not likely that the rehabilitation and operation of these water sources will have significant adverse environmental impacts that are irreversible, diverse, or unprecedented, or that potential impacts are unlikely to affect areas larger than the sites or facilities subject to physical works and in most cases mitigation measures can be designed with uncomplicated measures commonly used at construction sites and known to civil works contractors.

48. With an almost complete IEE process and Preliminary Detailed Engineering Designs (DEDs), a Project Document has been delivered to the Timor-Leste Environmental Regulator (ANLA) to initiate the Domestic Environmental Licensing process. The tentative plan, based on this delivery and the timeframes under Decree-Law 5/2011, and provided there are no delays from the part of the ANLA, are estimated as follows:

- Delivery of Project Document:

30 December 2020

- ANLA Classification (Estimated): 25 February 2021
- Delivery of Draft Simplified EIS/EMP to ANLA for review (30 w/days): 01 March 2021
- Public Consultation of draft SEIS/EMP: 15 March 2021
- Delivery of reviewed Draft SEIS/EMP to ANLA: 22 March 2021
- Deadline for ANLA comments: 4 May 2021
- Estimated time for SSE to decide on License (10 w/days): 18 May 2021

## 2.2.4. Other Relevant National Laws, Policies and Guidelines in Timor-Leste

49. Table 3 below summarizes all other national laws, policies and guidelines that are relevant to the Project.

Table 3 Other relevant National Laws, Policies and Guidelines in Timor-Leste

Policy/Law/ Guideline	Relevant Provisions	Applicability
DL No. 6/2020 - Legal Framework for Protection and Conservation of Biodiversity	Defines the legal framework for biodiversity conservation and sustainable use of its components to meet the current needs of protection of biodiversity in Timor-Leste, for special areas inside and outside of the National Protected Areas System (Article 26), especially management measures for a list of special/priority ecosystems (swamps, estuaries, mangroves, corals and coral reefs, marine grasses and sacred Lulik sites. Includes the List of Protected (Annex I) and Exotic/Invasive Species (Annex II) and the rules and prohibited activities for their management (Chapters IV and V). Establishes the considerations to be taken in Environmental Impact Evaluations (Chapter VII), namely identification and description of adverse effects and appropriate measures proposed to prevent, minimize and mitigate the identified impacts.	Relevant to project components in areas adjacent to the Protected areas and stand-alone areas where protected Species may be found i.e. crocodiles in Cuha River.
DL No. 5/2016 – National System for Protected Areas (PA)	Establishes the necessary legal instruments for the protection of declared sensitive ecological areas in Timor-Leste (Article 11) and their allowed and prohibited activities. Provides for a List of Established Protected Areas (Article 50 and Annex I), their typology (Article 12) and geographical demarcation (Article 17) and management instruments (Article 23) for approved activities within Areas (Article 32) such as Land Use Zone i.e. allows infrastructure installation for human use.	Not relevant to project as none of the components are within a Protected area i.e. Mount Bullo Protected Area.
Law no. 14/2017 – General Framework for Forestry	Defines the fundamental principles and norms regarding management, protection, conservation and sustainable use of forests and watersheds (Article 1), Forest Classification [State, Community and Private] (Article 8) and Forest (Article 14) and River Basin (Article 17) Management Plans and Forbidden Activities in these areas (Article 24). It also includes Climate Change requirements for Forest development (Article 28), for emissions reduction and conservation of carbon stocks.	Relevant to project components that traverse or are located within any type of forest in the project area. EMP implementation is the overall measure to mitigate adverse impacts.
Regulation UNTAET no.17/2000 – Prohibition of Logging operations and Export of Wood	Provided for in Law 14/2017, establishes the prohibition for felling, burning or destroying trees or forests (Article 2) and the activities exempt of these prohibitions (Article 3)	Relevant to project components that will require cutting trees within alignments and ROWs. EMP implementation is the overall measure to mitigate adverse impacts.
Government Resolution No. 33/2011 – National Adaptation Plan of Action (NAPA) for Climate Change	Adopts trans-sectoral measures to reduce Climate Change vulnerability in essential sectors in Timor-Leste (Agro-forestry, Water supply, Biodiversity, Health, Infrastructure, Natural Disasters). Definition and Prioritization of Proposed Adaptation measures for said sectors (NAPA Table 13), particularly those indicated in Annex 2 - Adaptation measures for the Water Sector (no. 1, 4, 5, 6, 9, 11 and 13) and for Natural Disasters (no. 3 – avoidance of landslides and 4. Early warning systems i.e. droughts or storms).	Relevant to project in the implementation of adaptation measures for Water Source and Distribution System.
Government Resolution No. 8/2012 – Sanitation Policy	Clarifies the sanitation responsibilities and encouragement on improving the sanitary section, including that each family and institution is responsible for the construction, use and maintaining their own hygienic and sanitary facilities, hand washing facilities and others. Also includes Strategies to follow such as Component 2 - Improved Sanitation: b) and c) management and safe integrated management, treatment and elimination of human excreta;	Relevant to the Proponent responsibility for implementation of the project in the urban development of the city.

Policy/Law/ Guideline	Relevant Provisions	Applicability
	Component 3 – Sanitation Financing: Institutional Sanitation (1) investment in public toilets; (2) financed by the user (per use); Urban Sanitation (1) Direct Investment in Urban Sanitation Infrastructure i.e. FSTP; (2) with user payment for O&M costs; (3) based on integrated Urban Planning. Defines the MOPW responsibilities (Section 3) in strengthening, planning, developing and managing urban sanitation services to a) collect sludge from septic tanks and b) operate centralized / decentralised sewer systems.	
Decree Law No. 33/2008 – Hygiene and Public Order	This law establishes the administrative policy measures for Districts regarding hygiene and public order, defining the relations between Public Administration and Citizens, applicable to urban areas in the Districts and specific locations in districts. Defines the prohibitions in general (Article 5) regarding impact to public infrastructure and land, from 1.a) discharge polluted waters i.e. faecal sludge/sludge; b) Waste in streets; c) drainage obstruction; e) spoils and construction material on sidewalks; and h) noise to community.	Relevant regarding project Work Camps, construction ROW and FSTP treated sludge and distribution of dried bio digested sludge for Agricultural Distribution. EMP implementation is the overall measure to mitigate adverse impacts.
Decree Law No. 4/2004 – Legal Framework for Distribution of Water for Human Consumption	Establishes the conditions for the water distribution system for human consumption (Article 2). The Water and Sanitation Services are required to supply water to the public (urban) which is safe and sustainable (Article 4) and with adequate quality (Article 12)	Compliance with Water Quality Standards in effect in Timor-Leste.
Decree Law No. 33/2017 – Legal Framework for Cultural Heritage	Defines the concept of cultural heritage and the measures for its support, protection, preservation and conservation in Timor-Leste (Article 1) and its different cultural classification (Article 21). It also defines and regulates a 50 metre Protection Zone around immovable Heritage (Article 23) and the rules and licensing requirements for general work within these Zones (Article 26).	Relevant regarding project Work Camps, construction ROW. When Heritage sites Protection Zones cannot be avoided, EMP implementation is the overall measure to mitigate adverse impacts.
Decree-Law no. 4/2012 – Labour Code	describes the duties and obligations of the private employer and employee while exercising their function within the scope of work, or within the bounds of a work contract (Chapter 1), with the aim of creating good working conditions (Article 20) and a fair, safe and healthy working environment (Article 35).	Environmental management plan (EMP) provides measures to mitigate workers' health and safety hazards.
Law no. 6/2017 – Base Law for Planning	Base rules for Territorial Planning in Timor-Leste. Intends for (Article 3) sustainability of urban areas, with improvement of living conditions for citizens. Establishes the different soil uses (Article 8) and the Municipal Territory Plan and the Land Use Plan (Article 17).	Relevant to location of all project components, particularly FSTP.
Law no. 8/2017 – Public Expropriation	Rules on land expropriation for public interest reasons, responsibilities, procedures, fair compensation, respect for vulnerable groups (Article 10) and project planning requirements that include expropriation, such as public consultation (Article 22), environmental licensing [if applicable] and social or economic impact assessment studies (Article 19).	Relevant to location of all project components, particularly ROW. EMP implementation, Social Safeguards and LARAP are the overall measures to mitigate adverse impacts.
Decree-Law no. 3/2016 – Municipal Administration Statutes	The DL gives local government the functions, duties and powers to, among others: (i) conserve and protect their local environment and natural resources; (ii) plan, implement and/or operate and maintain local water supply projects; (iii) implement or arrange for implementation local sanitation/sewerage/solid waste and drainage projects; (iv) protect cultural heritage and religious sites; and/or (v) monitor project activities within their jurisdictions.	Provides basis for Viqueque Municipality, through SMASA, to monitor the environmental performance of the projects.
Decree-Law no. 2/2017 – Urban Solid Waste Management System	Defines the rules that the urban solid waste management system abides by in Timor-Leste, led by the Municipal Authority (Article 2), the typology of Urban Solid Waste (Article 6), as well as the obligations of all users of the system (Article 16), especially the management and collection of waste from construction works (Article 33).	EMP implementation is the overall measure to mitigate adverse impacts and all projects to manage generated solid wastes accordingly.

## 2.2.5. Pollution Control Standards in Timor-Leste

50. In regards to pollution prevention and control technologies and practices, the Government of Timor-Leste has yet to implement their National Standards (for Air, Water, Noise, etc) and therefore, under the legal requirements of the Base Law for Environment, these minimum requirements are safeguarded by the use of World Health Organisation (WHO) guidelines and, where non-existent, the IFC Environmental, Health and Safety Guidelines are usually referred to as international good practice, consistent with ADB SPS 2009 practice. The Key environmental quality standards applied are listed and presented in Appendix 12.

### 3. DESCRIPTION OF THE PROJECT

51. Viqueque Municipality and the city of Viqueque in particular is currently attracting an increasing population due to its strategic location on route to the Mount Mundo Perdido ecotourism attraction and also due to the South Coast Oil & Gas Development Plan. Because of this strategic location, the municipality will tend to grow moderately in the near future.

52. This adaptation requirement highlights the need for the Water Supply and Sanitation Investment Project for Viqueque city, which is encompassed of a number of existing water sources and distribution alignments and this planned expansion will increase water demands and the equivalent wastewater.

53. This chapter is aimed specifically on the sub-project components descriptions of the water sourcing, treatment and storage, supply and consequently, the sanitation sector. The existing features, gaps and proposed water sources, rehabilitation of and/or new construction of conveyance and treatment, distribution, public toilets and faecal sludge treatment plants are all explained in this section, including the technical designs and criteria used.

#### 3.1. Existing condition and need for the Project

54. At present SMASA provides around 2,592 cubic meters of water per day to its population through an aggregate transmission and distribution network length of around 24 km. The project is needed because SMASA presently provides an inadequate water supply service to the Viqueque residents with significant losses and insufficient cost recovery to the government.

55. The water supply has not been able to meet the growing demand for water from the consumers because the water springs are not producing sufficient flow and the capacity of water storages is very small.

56. There are numerous groups and communities with existing pipelines but the water cannot be supplied due to the poor condition of the pipelines. The existing distribution alignments are not quite integrated due to various old pipes built during the Indonesian occupancy combined with several NGO projects, leading to constant leakages. Issues of intermittent water supply and high incidence of illegal connections are part of the main issues why the water system is currently unable to serve the Viqueque population.

57. In addition, according to the SMASA, there hasn't been a proper management system established for wastewater and solid waste disposal in the municipality. More importantly, the schools' sanitation facilities are not adequate, mainly due to a lack of maintenance from the responsible parties or operators.

58. The increase in water consumption leads to increased production of wastewater, and therefore, in this project, the sanitation scope will be specifically focused on the faecal sludge production from the household's septic tanks and public toilets and its consequent off-grid treatment.

59. The project will address all of these issues by refurbishing the existing network to repair leaks, increase capacity and pressure, remove illegal connections, and provide a new system of metering to streamline leak detection and aid cost recovery.

60. It is expected to benefit a base year population of Viqueque city of 12,883 (2020) and design year population of 24,424 (2040) by providing a reliable and adequate supply of safe and potable water, by upgrading the existing water supply situation and creating an adequate sanitation management system within a 15 km diameter of service area around the Viqueque city centre.

61. The construction activities such as replacing or rehabilitating old pipes with new ones, increasing the water tank capacity and water treatment, upgrading water sources, creating pilot projects for 4 public toilets, and the installation of a faecal sludge treatment plant, will be implemented within this project, aiming to meet the growing water demand and sanitation requirements.

### 3.2. Overview of the Project

62. Viqueque city project area is located in the Southeast area of the Island, within the Viqueque valley at 50 masl, 5km away from Mount Builo, the second highest mountain of the municipality at 1,793 masl. The city has a typical tropical monsoonal climate with a 7 to 9 months Wet season with two peaks in January and May with an average annual rainfall of 1000 millimetres in the lower areas and as high as 1700 millimetres in the mountain region.

63. The Project scope includes all the areas that will be required to implement the abstraction, treatment and distribution of water for human consumption, as well as provide designs and solutions for sanitation for public buildings and schools within a diameter area of 15 Km around the city, as clarified by the client in April 2020, taking the Viqueque Water Distribution Zones defined in the Second District Capitals Water Supply Project (ADB, 2016) as the guidelines for the project area and scope.

64. The 15 Km Diameter Project area around Viqueque encompasses the following:

- **Suco Loihunu:** 2/5 of the Suco lies within the 15 Km project area, where a small part of the Southern area of the Suco includes one of the proposed pilot wells testing sites. While it does not include any of the proposed water distribution system, to the North, outside the 15Km project area it includes the Loihunu I, II and III Spring System, which is adjacent to the Mount Builo Protected Area (PA), at a distance of 700m from the PA border and the Mount Mundo Perdido Protected Area, 4000m to the Northwest;
- **Suco Caraubalu:** included in the Viqueque city, half of the Suco lies within the 15 Km project area, where a small part of the Western area of the Suco includes roughly a 1/2 of the proposed Water Supply Network and 2 proposed pilot wells testing sites and 3 of the proposed Public Toilets under the sanitation component;
- **Suco Uma Uain Craic:** lies totally in the centre of the 15 Km project area, where a small part of the Western area of the Suco includes roughly 1/3 of the proposed Water Supply Network; and
- **Suco Uma Quic:** 4/5 of the Suco lies within the 15 Km project area, where a small part of the Northeastern area of the Suco includes roughly a 1/6 of the proposed Water Supply Network, and 1 of the proposed Public Toilets under the sanitation component.

65. Additionally, the Sanitation Component of Viqueque WATSAN Project area encompasses all households, buildings and schools within the 15Km diameter project area that are served by the proposed Faecal Sludge Treatment Plant (FSTP).

#### 3.2.1. Existing Water Components

##### 3.2.1.1. Water Sources

66. Current Public water supply in Viqueque depends on an existing system (See Figure 2, Map 3.1 in Appendix 3 and Appendix 13), with the following different sources, locations and volumes:



- Loihuno system: the Viqueque water supply system for the community includes 3 springs, composed of:
  - Loihuno 1 (Buibau) spring: located in Aldeia Uatolana, Suco Ossorua, on the foothill of but 700m outside the border of Mount Builo (a declared protected area under the Decree Law 5/2016) and at approximately 10 km northward from the Uluk Leu Rua Tank, it supplies water to the urban area of Viqueque and includes four private outlets (1/2" pipe and natural outlet). This spring has an approximate yield of 48 L/s (as per flow measurement on the 26<sup>th</sup> October 2020). During dry season the water is reported to have very low flow causing difficulty towards the inlet structure to allow water to enter the distribution system;
  - Loihuno II (Moloco) spring: located 20 meters from Loihuno 1, this spring has a considerable flow exclusively used for private users (14 users with rudimentary tubes between 1 and 3"). Loihuno 1 and 2 springs are located in proximity to one another but at approximately 10 km northward from the Uluk Leu Rua Tank;
  - Loihunu III (Loihunu) spring: water comes directly from Mundo Perdido and only serves the community, mainly aquaculture activity such as fish farming. The water monitoring exercise shows an approximate flow of 20 L/s (26<sup>th</sup> October 2020) but it will be diverted for agriculture purposes only.
- Several New Boreholes: Prospection areas were studied and selected for bore testing and potential sites for exploration were drilled under the DED phase of the project but were found to be unsuccessful, thus directing the decision to focus on the Cuha River Intake and extraction.
- Cuha River: given the variability and various competing water uses in the Loihunu system and that no groundwater was found during the borehole exercise, Cuha river has been brought forward as an option for water sourcing. From a quick Landsat satellite imagery evaluation (1987 to 2020), it was concluded that the river's volume of water is undervalued, as there is evidence of water in the dry months when the width of the river section is smaller. This capture could be done through wells in the alluvium or by direct intakes of river water through screened tubes that capture the water to a sealed well.

67. Apart from the Cuha River Intake, the water distribution system as a whole has not had substantial change and as a result the current Flow Diagram does not differ a lot from the 2015 Master plan (see Figure 3).

68. The Design team is currently evaluating the long-term productivity/yield of the water sources after placing V-Notch equipment and have done investigations in October 2020, aiming to get definite numbers of the production yield. The total yield of the Loihunu System (Buibau + Loihuno [III]) can go up to approx. 70 lps.

69. According to DNSA previous water quality testing, the Loihuno source has episodes of biological contamination, mostly from upstream agriculture, husbandry and domestic activities i.e. poor sanitation practices and infrastructure.

Figure 2 Viqueque City - Project Scope and Components

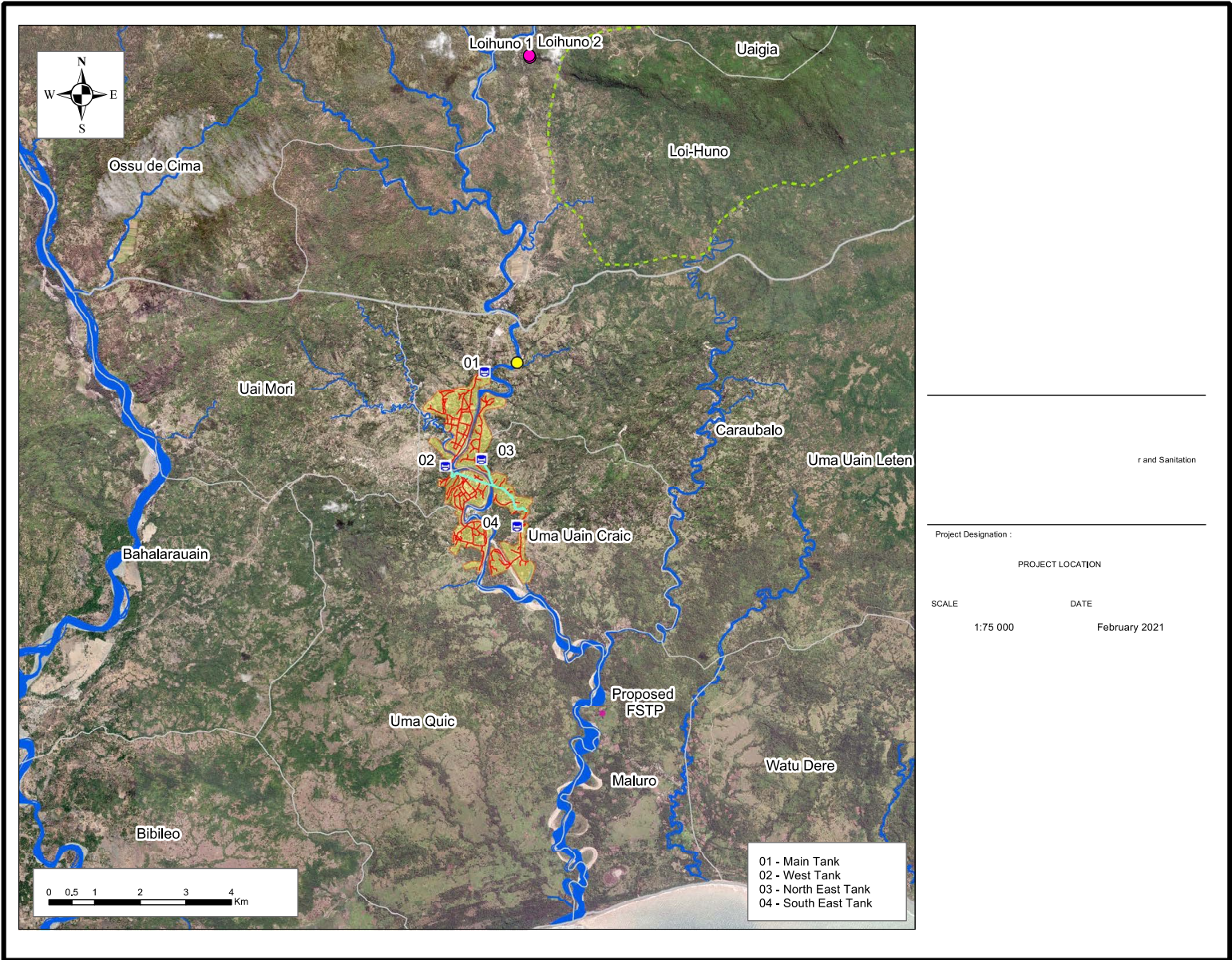
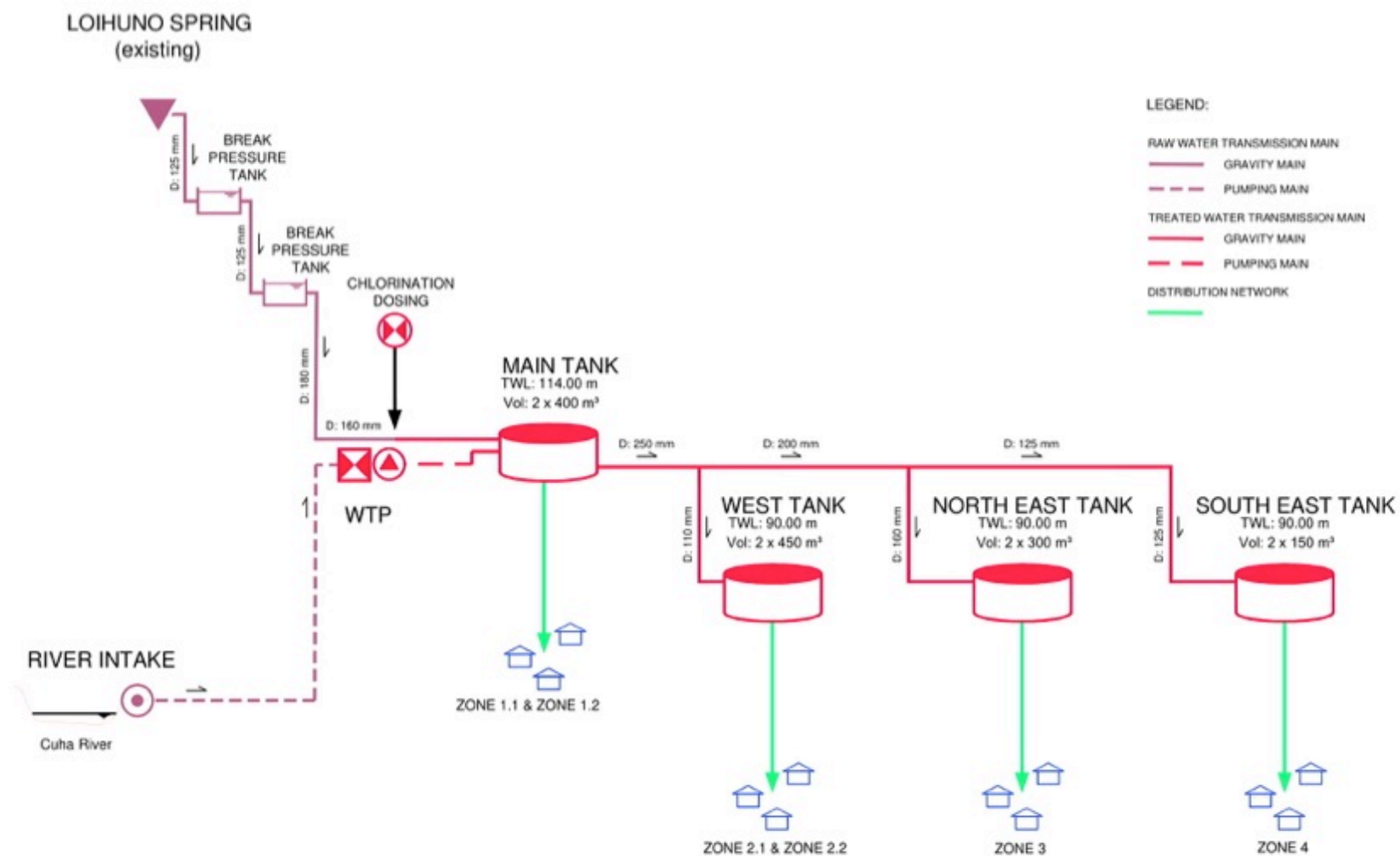


Figure 3 Flow Diagram for Viqueque proposed Water Distribution System (source: AdP-TL/Engidro, 2020)





70. These have provided preliminary water estimation data to be able to estimate supply towards the expected demands for the 2040 Scenario B = 54.2 lps. The project will propose a mix of abstraction between the existing spring and the river intake to guarantee sustainability of the extraction while guaranteeing water distribution to all SMASA clients.

Figure 4 Viqueque Water Sources



Loihuno known as Buibau spring



Loihuno II Spring Water Abstraction System



Origin of Loihuno III



Cuha River (Southeast view)

### 3.2.1.2. Distribution System.

71. Most of the transmission and distribution pipes are galvanized steel pipelines of varying age from the period of Indonesian administration, old Portuguese pipes particularly in the old city area, and newer pipes installed by SMASA or by rural projects such as i.e. under the National Program for Suco Development (PNDS) project. According to the 2015 Master plan, there are also numerous duplicate mains identified. The distribution system requires rationalization and simplification as well as decommissioning and removal of all existing, inoperative pipes.

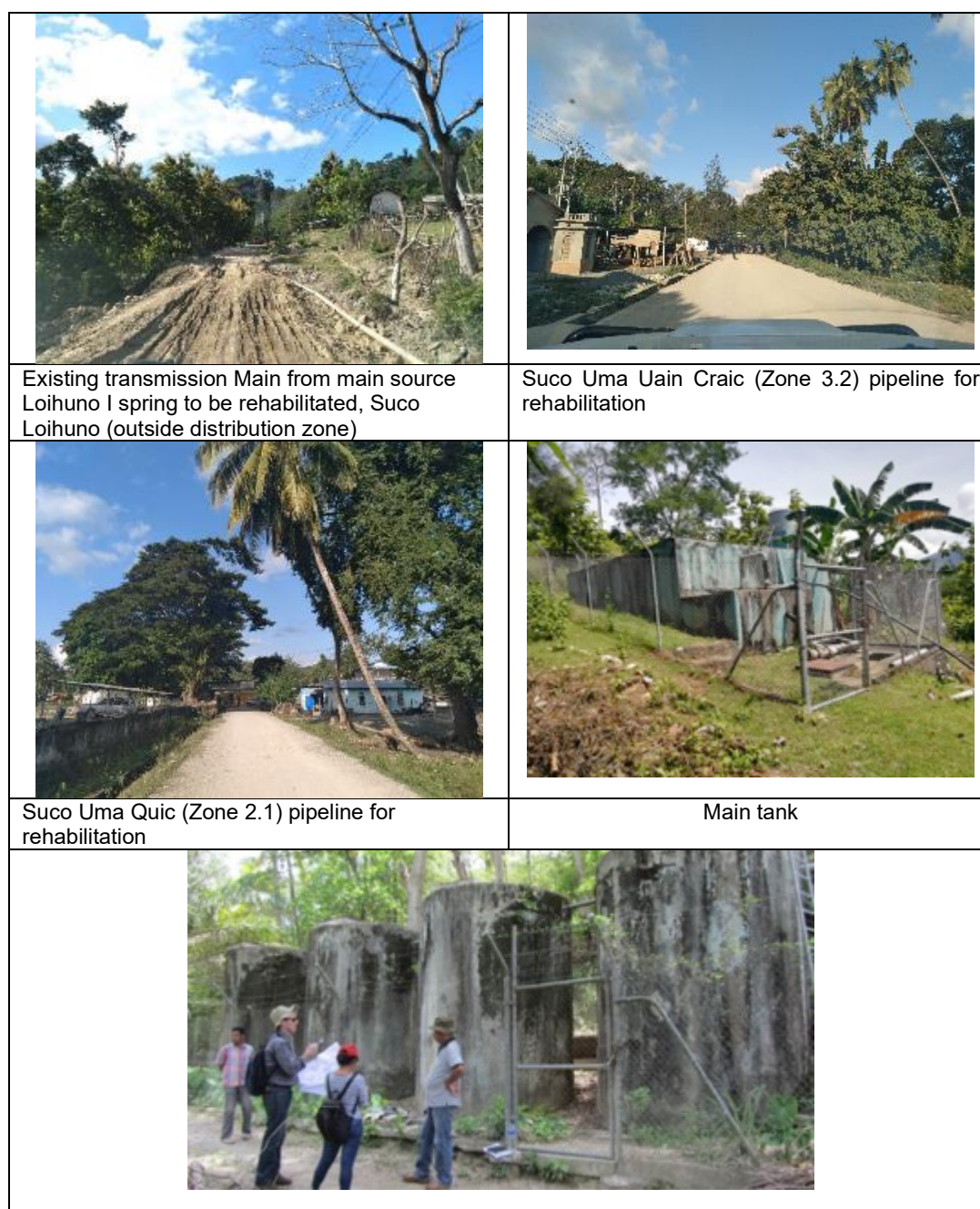
72. The Loihuno spring system supplies the main operating reservoir to subsequently supply all distribution zones through transmission and distribution alignments with gravitational system.

73. The distribution zone in Viqueque comprises of 4 different zones with manual rotation in terms of supplying to the customers on an intermittent basis. The service levels are very poor with low coverage, intermittent supply and low pressure. According to the test results and field observations, contamination of the water in the distribution occurs due to low pressure during periods when the supply is not operational. Depending on a single reservoir for distribution is considered ineffective as Viqueque is relatively flat and the city has grown substantially. The pumped system, pump maintenance issues and daytime operation exacerbate the poor service levels.

74. Most of the connections are unmetered with less sharing of piped water supply. The community mostly depends on sharing alternative sources including dug wells and tube wells. The 2015 Master plan states that 64% are registered and supplied to the houses in the urban area with low quantity and poor service quality. In general, many of the older pipes, intended to be abandoned and replaced by the JICA system, remain functioning and consumer connections

have not been transferred to the new distribution pipelines. This resulted in continued utilization of the older distribution pipelines, along with leaking/water loss conditions.

Figure 5 Example of Distribution areas and existing installation



### 3.2.1.3. Water Quality

75. The project has a recent history of water quality test results, some carried out between 2000 and 2008, with only one test per year from 2003 to 2008, while other tests were performed in 2014 for the 4 cities Master plan and other sporadic tests in 2019 and 2020, at various points in the distribution network and at some water sources. The results from the water quality tests can be seen in Appendix 4.

76. Conclusions on these results were the following:

- For the period between 2000 and 2006, there is bacteriological contamination (total coliforms and *Escherichia coli* presence) in the distribution system and Loihuno water

sources. The total hardness is tested until 2003 and is above the limit (around 290 mg/l) CaCO<sub>3</sub> for Loihuno intake and around 330 mg/l CaCO<sub>3</sub> for Loihuno Spring);

- Regarding the water quality tests performed in 2008, there is no bacteriological contamination (total coliforms and *Escherichia coli*) in the distribution system. There are some measurements of the residual chlorine in the distribution system and value is within the guideline limits;
- The water quality tests performed in 2014 for the Master plan (See Appendix 4) shown that there is bacteriological contamination (total coliforms) only at one point in the distribution system (in this system, the water is disinfected). The total hardness is above the limit (around 210 mg/l CaCO<sub>3</sub>);
- The water temperature is normally high reaching temperatures of 30°C in some samples. The other parameters tested are according to the limits of the guidelines from Timor and WHO.

#### 3.2.1.4. Gaps in the Water Supply

##### Water Balance: Demand vs Supply.

77. The water supplied to consumers throughout the years has proven to be insufficient due to higher demand and the infrastructures for water abstraction and delivery not being upgraded for a very long-time, hindering optimal operation and distribution, as well as the limited number of natural water sources available.

78. The Detailed Design followed a dimensioning design process that reviewed 2 different scenarios, namely Scenario A in adherence to 2016 Master plan (equivalent to current distribution capacity and customers). However, the project should be able to provide reliable water sources sufficient for the expected expansion requirements for Viqueque city. Therefore, a Scenario B was chosen as the project horizon, as it includes expansion areas and user numbers for the next 20 years, up to 2040.

79. To clear the uncertainty of the production yield of the sources, a hydrogeological study was conducted in October 2020 (in equivalent conditions to the end of the Dry Season) to determine the available yield of proposed boreholes and existing springs through bore testing and v-notch installation. Table 4 presents the water demand versus water flow estimation.

80. Exploration bores were carried out at all 4 proposed prospection points between 27<sup>th</sup> July and 12<sup>th</sup> September 2020. However, the pumping tests were unsuccessful, and it was concluded that groundwater is unavailable in the project area. Therefore, the team has decided to select Kuha River as final option for complementing the system with water for Viqueque. A Water Treatment Plant is to be constructed to treat raw water abstraction from the Kuha river that has predominantly high turbidity and bacteriological contamination.

81. Table 4 presents the water demands versus October 2020 water flow investigation results, which suggest that, under these numbers, and pending a long-term monitoring program, the current proposed sources can produce enough flow for the requirements of the distribution system up to 2040, for the bigger part of the Dry season. They show that Loihunu 1 and Kuha River Intake are estimated to have more than enough water flow to supply the current and future demands for Viqueque Municipal Capital.

82. These preliminary results also take into account the social and ecological needs for the spring's water sources, such as i.e. agriculture and aquaculture activities identified during the IEE characterisation. An ecological flow was initially considered to account for the variability of rain and flow between dry and wet season and guarantee minimum conditions for water-related ecological services downstream of the springs. This flow has been determined, at a minimum, of 30% average monthly flow for Wet Season and 10% for Dry Season. However, the water sharing for Loihunu sources has been assumed to be divided by sources and not by flow within individual sources, which lowers the importance and/or need to establish the ecological/social



flow for Loihunu 1 as it will continue to be a dedicated source for the Distribution system and Loihunu 2 and 3 will serve both the social and the ecological needs of the surrounding area.

Table 4 – Water Demands versus Origins Availability

<b>VIQUEQUE</b>	<b>2020 (October) Dry Season</b>			<b>2040 (Horizon Year)</b>		
<b>Demands</b>	<b>Lps</b>	<b>m<sup>3</sup>/day</b>	<b>%</b>	<b>Lps</b>	<b>m<sup>3</sup>/day</b>	<b>%</b>
2020 Scenario B	28.6	2471.04				
2030 Scenario B	39.3	3395.52				
2040 Scenario B	54.2	4682.88				
<b>Existing sources</b>						
Loihunu I - Buibau Spring						
Public Supply	54.0	4665.6	100%	54.0	4665.6	100%
Social Demand (with Agriculture)	0	0	0%	0	0	0%
Remaining Flow	0	0	0%	0	0	0%
Loihunu III Spring(*)						
Public Supply	0	0	0%	0	0	0%
Social Demand (with Agriculture)	---	---	---	---	---	---
Remaining Flow	20	1,728.0	---	20	1,728.0	100%
<b>Total</b>	<b>54.0</b>	<b>4665.6</b>		<b>54.0</b>	<b>4665.6</b>	
<b>Potential Sources (River)</b>	<b>Lps</b>	<b>m<sup>3</sup>/day</b>	<b>Hours/day</b>	<b>Lps</b>	<b>m<sup>3</sup>/day</b>	<b>Hours/day</b>
River Intake - Cuha River	52.0	4492.8		52.00	4492.8	
<b>Potential Sources</b>	<b>Lps</b>	<b>m<sup>3</sup>/day</b>	<b>Hours/day</b>	<b>Lps</b>	<b>m<sup>3</sup>/day</b>	<b>Hours/day</b>
Borehole 1, 2, 3, and 4	0	0		0	0	0
<b>Total Production Capacity</b>	<b>106.0</b>	<b>9158.4</b>		<b>106.0</b>	<b>9158.4</b>	

(\*) In accordance to D4 Report, discharge flow will be measured during the current project

83. Loihunu I and River intake show maximum production yield with a total of 106 lps, which is more than sufficient to meet the 2040 water demand. It's also important to take into account that the hydrogeological study was conducted at a time between dry and wet season, and thus requires some caution given flow volumes may not represent realistic dry season variability. Therefore, both Loihunu I and Cuha River will each vary their abstraction rate between 0 and 50 lps to manage both sources sustainably and account for possible spring water season variability without stopping supply to the city.

Figure 6 - Borehole Testing in 4 Designated Prospection Points





84. As the river and springs are expected to surpass the 54.2 lps as soon as they come online, the table below shows the only scenario possible for Viqueque to guarantee supply and maintain sustainability up to 2040.

Table 5 - Water Sources Scenarios

Viqueque	Scenario 2040	Proposed Water Sources	Loihuno springs and new river intake at north of the city
----------	---------------	------------------------	---

85. The existing springs will be analysed for their current productivity and the other concurrent water uses i.e. the river to assure the estimate consumption for the next 10 – 20 years.

### 3.2.2. Proposed Water Supply

#### 3.2.2.1. Water Conveyance and Treatment

86. The proposed scenario of Viqueque water supply system considers a water supply assured by two water sources: Loihuno spring and Cuha river intake to be built in the north area of the city. It was admitted that either the Loihuno springs and the river intake will have good productivity and that the water has good quality.

87. Due to the characteristics of the raw water from the river intake, the water treatment process will have more treatment steps than the Loihuno spring. The WTP should have the following treatment line: coagulation, flocculation, sedimentation, filtration and disinfection with chlorine. WTP is expected to be located next to the road and at the city limits. Water from Loihuno spring will be disinfected in the WTP site.

88. The system operation should make increased use of the water from the spring in order to minimize the energy use (water from the boreholes needs to be pumped). This situation could arise during the first few years of operation, in the periods with less water consumptions and especially during the dry season.

89. The water supply system has an elevation range between 320 m at Loihuno spring and 37m at the distribution network. The water from Loihuno spring will feed the Main Tank by a gravity transmission main with 7.05 km of extension. Given the elevation gap, from 320 m at Loihuno spring to 114 m at Main Tank, it was planned to equip the transmission main with two pressure break tanks to limit the maximum pressure value to 10 bar.



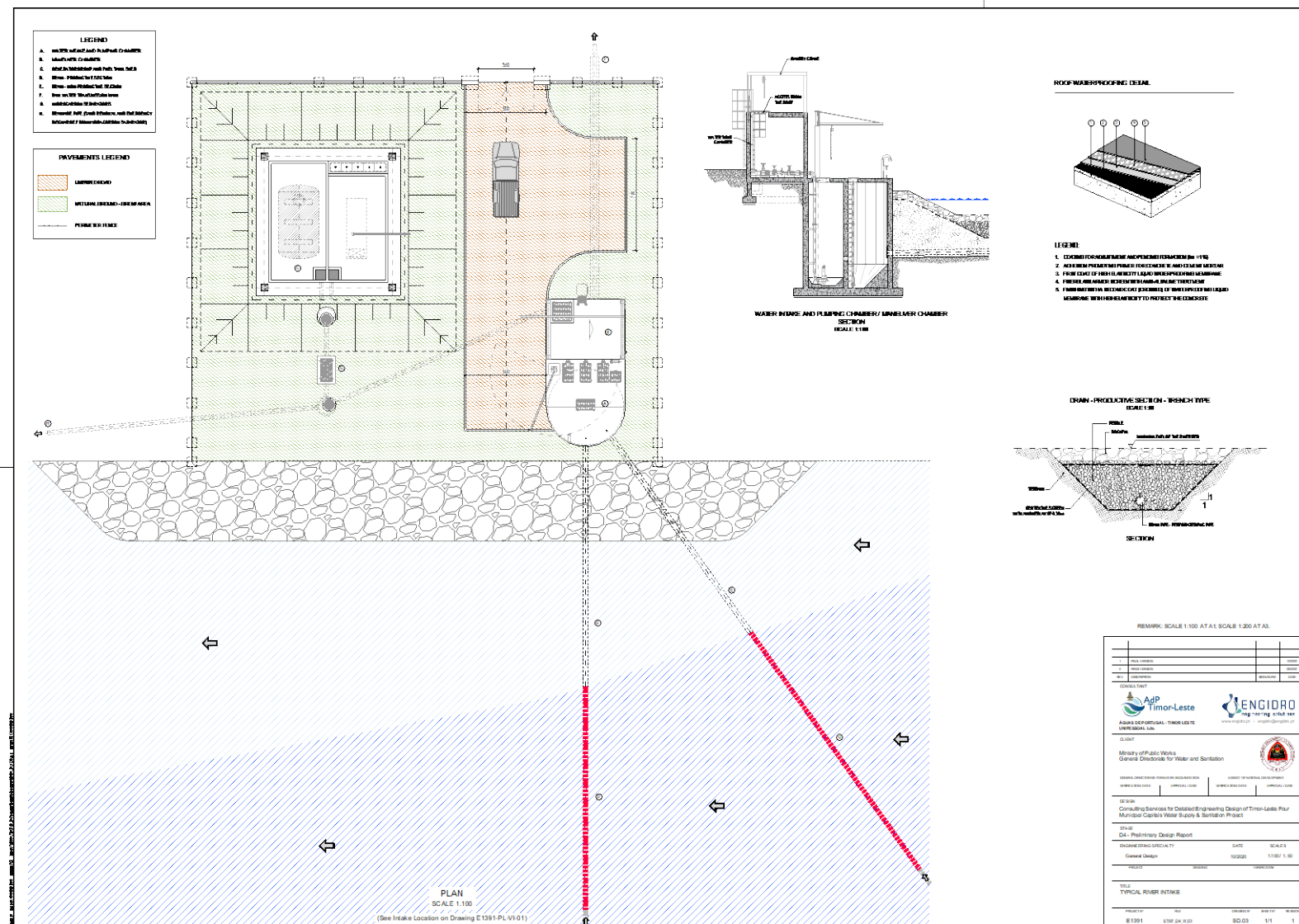
Figure 7 - Loihuno Transmission Main. Pressure Break Tanks



90. The water extracted from the Cuha river to the river Intake Tank will be pumped directly into the WTP through a 0,81 km long pressure line. The water treated at WTP will be pumped through a 240 m long transmission main and stored at the Main Tank.

91. From the Main Tank (114m elevation), starts a gravity transmission main that, along its 6,04 km total length, will supply the West Tank, the Northeast Tank and the Southeast Tank, all three at 90m elevation.

Table 6 Kuha River Proposed Intake Infrastructure



92. From the Main Tank to the bifurcation to the West Tank the transmission main has 2.54 km and the connection to the tank has 155 m of extension. From this bifurcation to the bifurcation to the North East Tank the transmission main trench has 1.28 km and the connection to the tank has 645 m of extension. The last trench of the gravity transmission main to the South East Tank is 1.42 km long.

93. In Table 7 is the proposed water tank storage calculated according to the water demand projection for 2040 and in Table 8 the list of proposed Water Distribution Zones for Viqueque.

Table 7 - Water Tanks Capacity to be increased

City	Tank	MDP* (m <sup>3</sup> /d)			Storage Needed (m <sup>3</sup> )		Proposed Storage (m <sup>3</sup> )
Viqueque	Main Tank	393	531	721	531	721	800
	West Tank	486	639	849	639	849	900
	North East Tank	278	398	563	398	563	600
	South East Tank	121	190	288	190	288	300
	Raw Water Tank <sup>(2)</sup>	-	-	-	-	-	700
	Total	1,277	1,759	2,422	1,759	2,422	3,300

Table 8 Viqueque Distribution Zones

Water Tank	Distribution Zone	Elevation
Main Ground Tank (elev. 120 m)	Zone 1.1	From 80m to 58m
	Zone 1.2	From 60m to 51m
West Ground Tank (elev. 90 m)	Zone 2.1	From 69m to 38m
	Zone 2.2	From 94m to 75m
Northeast Ground Tank (elev. 90 m)	Zone 3	From 62m to 39m
Southeast Ground Tank (elev. 90 m)	Zone 4	From 76m to 37m

### 3.2.2.2. Rehabilitation of the Transmission and Distribution Mains

94. The type of construction for transmission lines and distribution networks has to follow the design criteria, starting from the material selection, trench design type and the operational system.

#### a) Material Selection

95. The following criteria is proposed regarding material selection:

##### Transmission Lines (HPDE and Ductile Iron):

- Transmission lines with nominal pressure below 16 bar and nominal diameters below 315 mm – use of HPDE;
- Transmission lines with nominal diameters equal or above 300 mm - use of ductile iron;
- All transmission lines with nominal pressure equal or above 16 bar (regardless of the diameter) – use of ductile iron.

##### Distribution Network (HPDE):

- Distribution network & house service connection – use of HDPE;
- Laying of Transmission Mains and Distribution Network.

#### b) Trench Design

96. It is assumed that pipes will be implanted underground, in general, laid along and within the road Right of Way (RoW) or outside the RoW for the purpose of replacing/rehabilitating

existing pipes. Inside the city area, transmission mains will be laid below the distribution network level, as represented in Figure 8, on both sides of the road alignments, in order to allow the construction of the service connections on each side of the road without interference with transmission mains and, also, to make it more difficult for illegal connections, while typical trench details are presented in Figure 9.

97. The distribution networks will be connected to the water tanks. Even in situations where this option implies new network extension, the resulting benefits are significant since the operation of the systems will be facilitated and, therefore the transmission lines system will not be vulnerable to any ruptures in the distribution network.

Figure 8 Laying of Transmission and Distribution Lines Along a Road. Typical Cross Sections

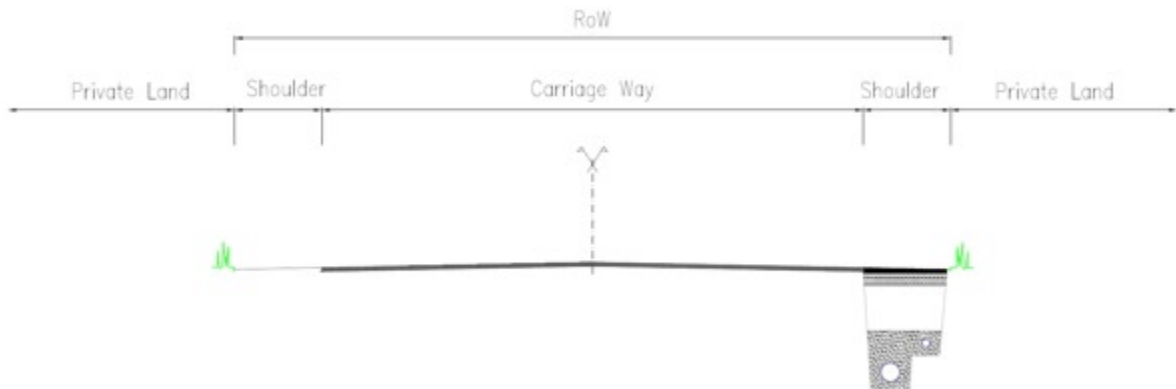
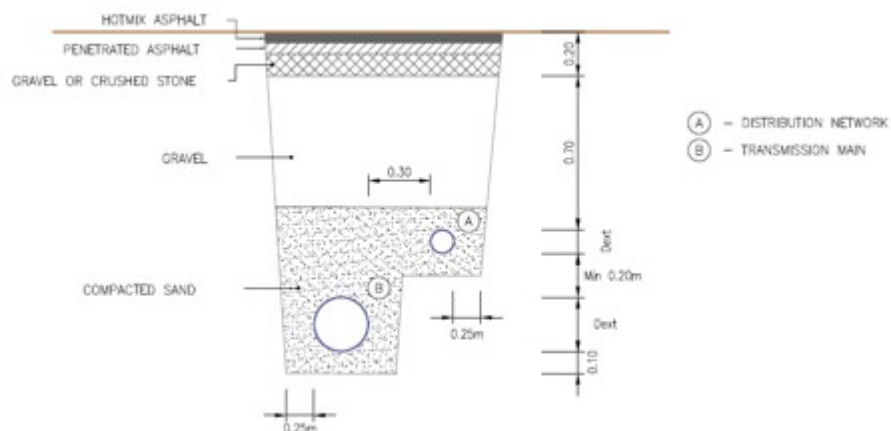


Figure 9 Typical Double Trench Transmission Mains Service



### c) Gravity Transmission Mains Operation

98. To ensure a balanced water supply to the water tanks, when a transmission main supplies more than one water tank, the connection to the tanks will be equipped with automatic control valves, which allows the flow control and will avoid the occurrence of random feeds depending on the value on piezometric head value in the pipe connection on each reservoir.

### d) Distribution Network Pressure Zones

99. In each distribution zone, the pressure in the network can vary between a minimum of 10 m and a maximum of 60 m. When a water tank supplies a distribution network that has more

than one pressure zone, the pressure zones will be set by Break Pressure Tanks (BPTs) or by Pressure Reducing Valves (PRVs).

### 3.2.3. Sanitation System

#### 3.2.3.1. Existing Sanitation in Viqueque

100. According to the 2016 Master plan, the National 2030 target for household sanitation is 100% access to hygienic toilets and improved hygiene behaviour, consistent with the Government Resolution No. 8/2012 - Sanitation policy. However, major deficiencies of current toilets in Viqueque are: open defecation practices; lack of cleanliness; insufficient water supply; poor construction standards and inadequate lighting. School Sanitation is also not “User friendly” (where none of the toilets cater for special infrastructural requirement of children, physically handicapped persons or menstruating girls), and there is inadequacy of funds for operation and maintenance.

101. According to the 2016 Master plan, 15% households in Viqueque practice open defecation (see Table 9). All the remaining households that do not practice open defecation are contributing with sludge, through their own toilets or shared toilets.

102. It is presumed that nearly most Households in the project area have installed a sanitation system similar to a septic tank but with a permeable bottom that unfortunately serves as a leaching pit with an accumulating sludge top layer [referring to sub-section 3.4.4- Current Status on p-177 of the 2016 Master plan].

103. Although not ideal, these sanitation facilities are nevertheless producing digested sludge (which needs to be removed once in two years) and infiltrating semi-treated wastewater into the ground and water table.

Table 9 Toilet Access in Viqueque as per 2014 Household Survey

Toilet type		Units	Percentage Access <sup>1</sup>
			Viqueque
1	Open defecation	%	15
2	Unhygienic toilet (owned)	%	26
3	Unhygienic toilet (shared)	%	9
4	Hygienic toilet (owned)	%	44
5	Hygienic toilet (shared)	%	6
<b>Total</b>			<b>100</b>
<b>Current (2014)</b>		<b>Number of Households<sup>2</sup></b>	
1	Open defecation	HH	278
2	Unhygienic toilet (owned)	HH	487
3	Unhygienic toilet (shared)	HH	174
4	Hygienic toilet (owned)	HH	835
5	Hygienic toilet (shared)	HH	104
<b>Total</b>			<b>1,879</b>

<sup>1</sup> Based on Household Survey

<sup>2</sup> Projected based on population growth with similar percentage access to 2014 Household Survey

#### 3.2.3.2. Proposed Sanitation Projects

104. The proposed sanitation treatment sector is composed of 4 pilot test sites for public toilets (with septic tank and effluent soak pit system) and the construction of the Faecal Sludge Treatment Plant (FSTP) to receive the sludge from these pilots, as well as all buildings and households located within 15 km of the Viqueque city (see Figure 10 and Figure 21 and Appendix 3, Map 3.1).

105. The public toilets’ pilot test locations will be chosen per the location and conditions of current sanitation infrastructure, users, as well as the state of the toilet facilities.



106. It is worth noting that there are concerns across the majority of these public toilet management responsible persons given that current sanitation facilities do not have regular maintenance or access to water supply.

Figure 10 Public Toilets and FSTP Proposed Location – Viqueque

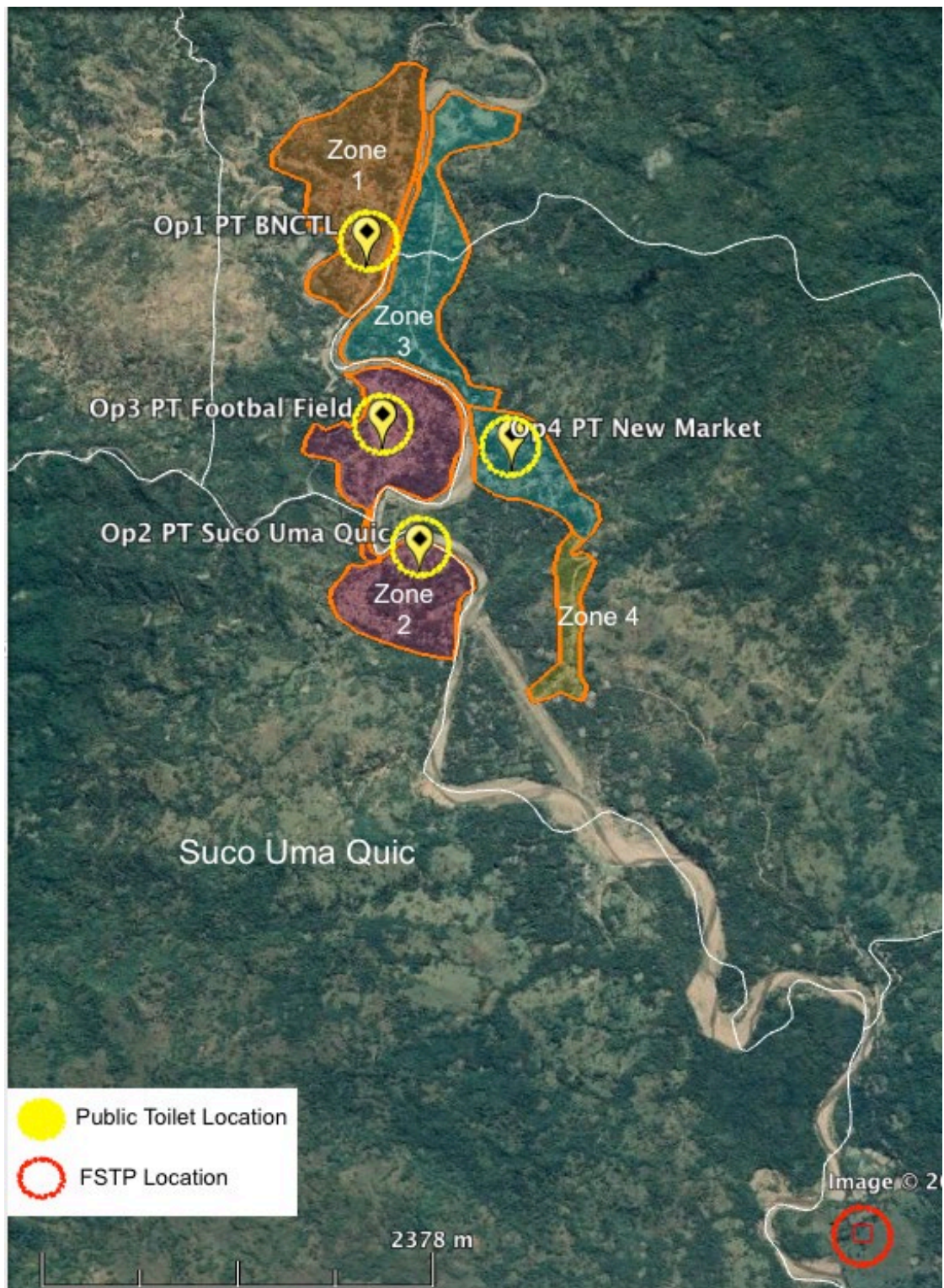




Figure 21 Aerial Imageries of Public Toilets Proposed Locations



VI PTF Op 1 - BNCTL and BNU, Suco Caraubalo, Aldeia Mamula



VI PTF Op 3 - St. Cristovao Football Field, Suco Caraubalo



VI PTF Op 2 - Sede Suco Uma Quic, Suco Uma Quic



VI PTF Op 4 - New Market, Suco Caraubalo, Aldeia Wessa

### A. Public Toilets.

107. The proposed specifications for the Public Toilets are based on the information below, with gender separation of toilets:

#### Male Toilets:

- Adult: 3 urinal stalls;
- Adult & Children: 3 latrines (each with 1.2 m<sup>2</sup>[approx.]);
- Children: 1 small urinal.

#### Female Toilets:

- Adults & Children: 5 latrines (each with 1.2 m<sup>2</sup>[approx.]);
- Facilities for menstruating girls.

#### Physically disabled Toilets:

- Adults & Children: A common latrine for physically disabled person shall be provided at the centre of men's and women's section. Area of latrine with a ramp etc. for a handicapped person=3.70 m<sup>2</sup> [approx.].

108. The treatment of the public toilet sludge is being proposed in a two-step process, as described below:

- Primary Treatment - Septic Tank: shall have minimum width of 750 mm, minimum depth of one metre below water level and a minimum liquid capacity of 1 000 litres. Inlet: The pipe shall be fixed inside the tank, with top limb rising above scum level and the bottom limb extending about 300 mm below the top water level. Outlet – It would be fixed like inlet but shall be 50 mm below the invert of the inlet pipe.
- Secondary Treatment - Soak Pit or Dispersion trench or Subsurface absorption system: These infrastructures will be carefully selected and designed according to the available areas, local conditions and receiving environment, based on the number of expected users and adapted to the specific local characteristics where the public toilets will be implemented.

Table 10 Recommended sizes of Septic Tank

No. of users	Length [m]	Breadth (m)	Liquid depth [m] {Cleaning interval}	
			1 year	2 year
7	2.64	0.75	1.0	1.3
15	2.73	0.75	1.4	2.0
300	15.5	3.9	1.0	1.25

Figure 32 Septic Tank for up to 50 Persons Capacity

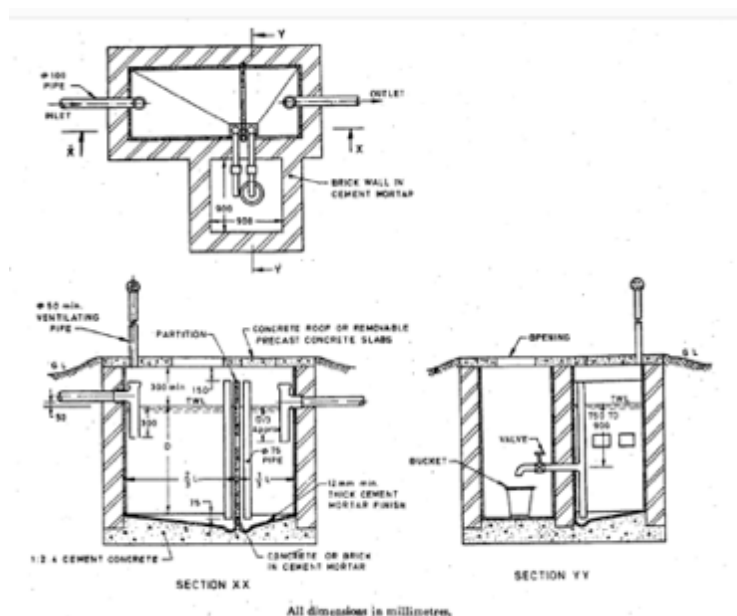
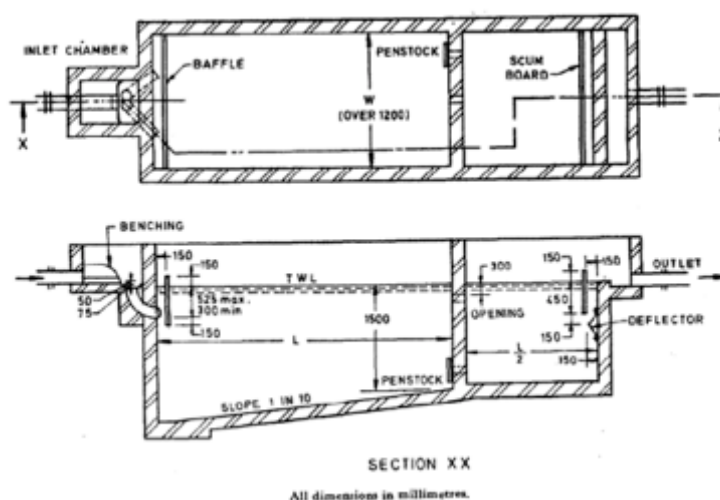




Figure 43 Septic Tank for up to 200 persons



## B. Faecal Sludge Treatment Plant.

109. The FSTP was designed considering the future users of the sanitation system up to 2040, namely public buildings, households and schools. The FSTP will be supplied with sludge collected by vacuum trucks from domestic and non-domestic sources and the estimated daily volume collected in Viqueque can be viewed in Table 11.

Table 11 - Total Sludge Volume to be collected daily projections

Village	UNIT	2015	2020	2025	2030	2035	2040
Viqueque	m <sup>3</sup> /d	0.7	0.9	-----	1.5	-----	2.4

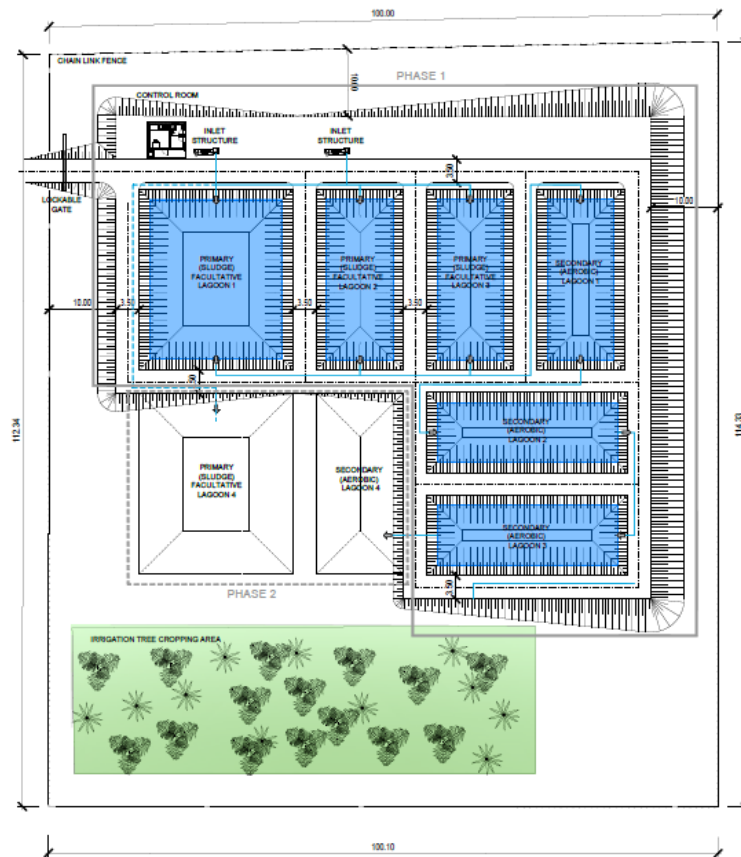
110. This service will then require transport from the sources to the FSTP, where accessibility of trucks for sludge collection and routing to the treatment plant are of the most importance, requiring easy access but with a reasonable distance from the proposed FSTP to the nearest household (>400m) and the route should be free from flood areas and/or possible landslide, with a duration of transport no longer than 30 minutes.

111. To define the FSTP ideal/possible location, the following requirements were taken into account:

- Proposed location of FSTP shall be available within 15 km distance
- Easy road access
- The land should be relatively flat to facilitate the construction of lagoons without excessive earthworks
- The lagoons will be constructed using earthen embankments. Site is assumed to be on soil.

112. Therefore, the proposed FSTP has been chosen to be located in Suco Maluro (See Figure 10, Figure 65 and Appendix 3, Map 3.1.), since the location fills in all the above-mentioned requirements and a relatively safe distance of 100m from the highest floodplain level. In terms of land status, the location is not earmarked for city expansion, according to information from the Viqueque municipality and SMASA, and it is declared as communal land use, by the local community.

Figure 54 FSTP Viqueque proposed installation and segments



113. In regards to treatment, the FSTP will combine the following technical steps in a modular manner:

Table 12 - Faecal Sludge Treatment.

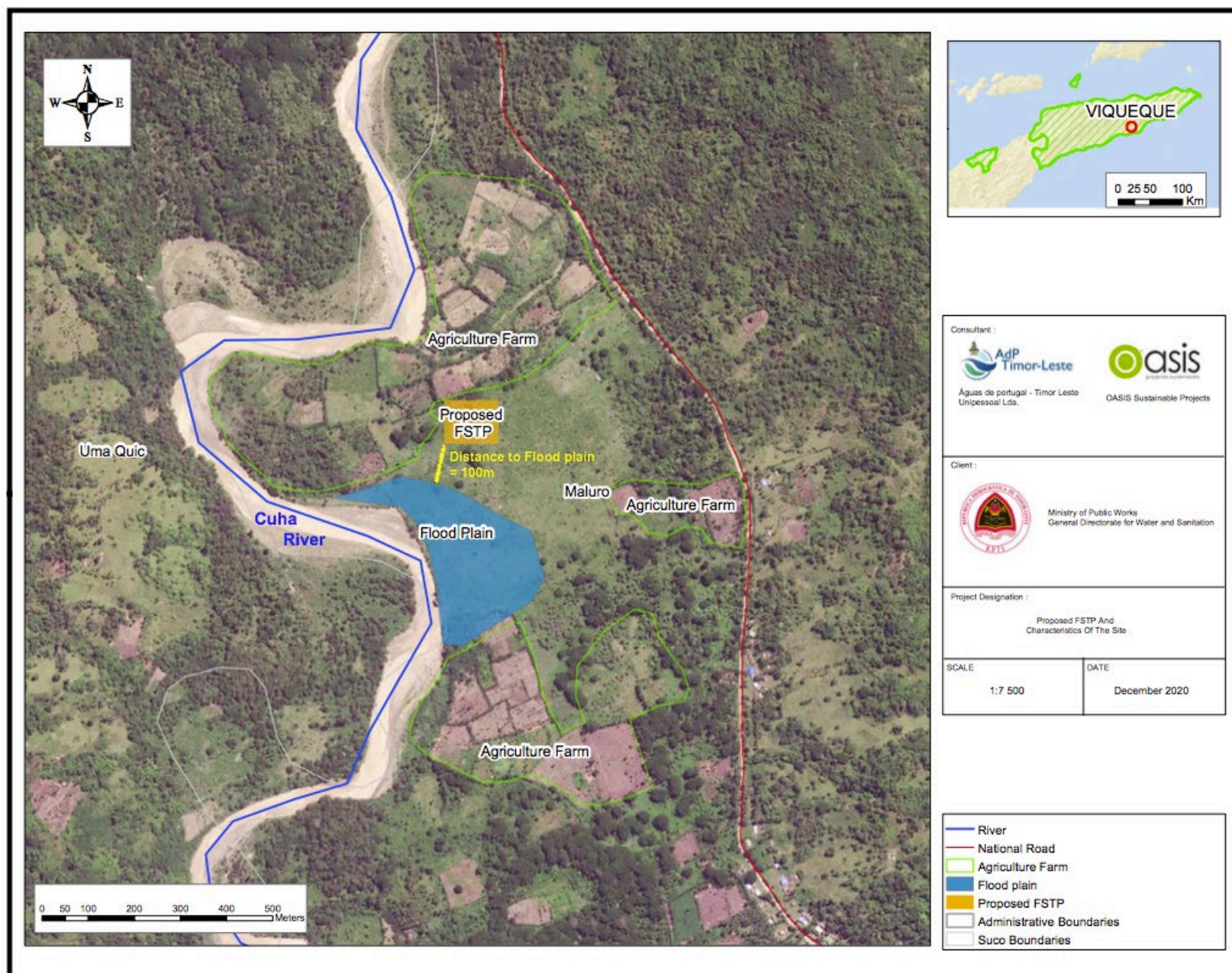
TREATMENT STAGES	TREATMENT MODULES
Sludge Stabilization/ Dewatering	Drying Beds
Liquid Wastewater Treatment	Integrated Settler and Anaerobic Filter
	Horizontal Planted Gravel Filter

114. The Sludge arrives at the FSTP where it is deposited into drying beds to undergo liquid-solid separation and drying. The dried sludge from the drying beds are removed once in 1 or 2 years depending on rate of feeding and directed to a Sludge Pasteurization Unit-Storage of bio-solids. The rest of the liquid percolates or the effluent wastewater is conveyed to separate treatment units, in two stages in the FSTP modules.

115. The primary stages i.e. settler, is mainly for Sedimentation of any solids that have entered the modules along with the percolate where the liquid remains aerobic as not to generate offensive odours. The second stage i.e. Anaerobic Filter is for anaerobic degradation of any dissolved and suspended organic matter.

116. The partially treated wastewater from the secondary treatment unit would be conveyed into a horizontal planted gravel filter. Therefore, the treated wastewater is safely used for irrigation purposes and the bio-solids can be used as soil conditioner for agricultural use.

Figure 65 Proposed FSTP and surrounding land use



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## 4. ALTERNATIVES ANALYSIS

### 4.1. 'Without-project' or 'do-nothing' Alternative.

117. The citizens of Viqueque city are currently consuming untreated or partially treated water from the existing water supply systems, increasing the possibility of water-borne disease incidence due to poor access to safe and potable water supply, resulting in health hazards in the project area and exposing the surroundings to environmental problems.

118. The existing water supply in the project area is intermittent, not able to meet the increasing demands of the increasing population of Viqueque. Limited water supply will compel SMASA customers to control the use of water for various purposes, including sanitation practices, such as flushing after use of latrine, bathing, washing clothes etc. influencing negatively on the domestic hygiene of the project area. This may pose increase in the risk of the incidence of diseases such as Typhoid, Cholera, Dysentery, or increase stunting and in turn result in the environmental problems.

119. The 'Do-Nothing' alternative reduces substantially the chance of people in the project area to combat diseases such as these because they continue to consume untreated water, increasing the risk of infections that will obviously have an impact on public health, animal health and the health of the ecosystems. It may also be an impediment to the development of Viqueque City, hindering further social and economic development of the municipality and, indirectly, the Government of Timor-Leste's commitment to SDG-6 to increase the percentage of the population with access to sustainable, safe drinking water and basic sanitation.

120. Overall, the proposed project and its components, as the 'with project alternative' will be the best solution to overcome the aforementioned threats that are likely to occur in its absence and a whole city will have convenient access to reliable, adequate, safe, potable water supply and a sanitation system that extends from the domestic area to public spaces and thus, good hygiene and sanitation practices will be promoted and the consequent reduction of possible health and safety risks. It will bring about improved public health and a living environment that will contribute to improved quality of life in the municipality and create an enabling environment for local economic development and improved social services that communities within the project area will benefit from.

### 4.2. Design Alternative.

121. The proposed project has been designed as a totally gravity surface water system with a distribution system comprising a bulk water system and a household distribution system. In this way the whole of the service area will be divided into a number of service areas with dedicated storage reservoirs, divided on the basis of elevation differences and proximity. However, all subsystems can be operated independently as they are also inter-linked, where possible, and water from neighbouring subsystems can be supplied to another adjacent subsystem in case of maintenance and other unforeseen events.

### 4.3. Faecal Sludge Treatment Plant (FSTP) Location Alternative

122. The choice of the FSTP location depends on a series of considerations and conditions that have been identified during the project site visit, as well as during the application of the REA checklists, such as a) distance to communities to avoid impact and loss of amenity; b) reasonable existing access to avoid impacts with new road constructions; c) no sensitive ecological areas; d) preferably public land; and d) close to agricultural land for application of dried sludge treated from the FSTP maintenance activities.

123. 3 sites were identified, all with the land space of 15,000m<sup>2</sup> required for the implementation of the FSTP (see Table 13). Of the 3 locations, Site 3 – Suco Maluro was the chosen location for the FSTP since it filled almost all the criteria, had the best conditions regarding distance to community and the existence of substantial agricultural land adjacent to the site to absorb the proposed dried treated sludge while reasonably not far from the city.



124. The site was not the only choice. Site 2 was part of the options with the existence of substantial agricultural land, although the area is coincidentally adjacent to a sacred area (Lamasu 1), according to the information received from local community. Site 3 was also considered sacred by the community (Lamasu 1&2), and has a very significant slope which renders it difficult to construct future FSTP and will be very expensive in terms of the construction cost.

Table 13 FSTP Proposed Locations in Viqueque City

FSTP	Coordinates	Actual Area Available (m <sup>2</sup> )	Distance from (m)		Site Masl (m)	Description / Location Characteristics	Comments
			Houses	Water Body			
1	Lat: - 8.891005° Long: 126.384807°	64000	350	250	30	Location characteristics: located on abandoned land with unclear land status, difficult terrain and extreme slopes requiring major investment for new access road construction for trucks Distance from the road about 420 meters, 350m away from closest community settlement and 140 meters from the river In Lulik/sacred Area (Lamasu Hill 1)	Not recommended
2	Lat: - 8.889219° Long: 126.379329°	8000	140	100	50	Location characteristics: Located above a community garden, flat area, distance from the road about 700 meters, 120 meters from community settlements and 80 meters from the river In Lulik/sacred Area (Lamasu Hill 1&2) where foreigners are not allowed to access without the community's permission	Not recommended
3	Lat: - 8.913561° Long: 126.393317°	10000	450	350	21	Location characteristics: Recommended by SMASA on abandoned land with state-owned land status, flat area, distance from the road about 280 meters 450 meters from community settlements and 350 m from the river	Recommended



### Components and Site Salient Features

#### A. FSTP No. 2, Suco Uma Uain Craic

- (+)
- a) The topography is relatively flat and surrounded by community's farms.
- (-)
- 120 meters from community settlements. The sludge transference will result amenity either odour, and noise from movement of sludge trucks and operational activity.
  - High chance that the land status is private.
  - The site is not easily accessed, road in poor condition requires rehabilitation.
  - Surrounded by sacred area in the West and East (Lamasu 1&2).
  - 55 m from a small creek connecting to the Cuha river which may lead to flood prone.
- Landslide anticipation occurrence due to sedimentary soil structure and visible natural landslides.



Northeast view of the sacred area 30-50 m from the

East view of the Proposed Location. Agriculture plot.	proposed site
<b>B. FSTP No. 1, Suco Uma Uain Craic</b>	
<p>(+)</p> <p>b) 400 m from community settlements.</p> <p>(-)</p> <ul style="list-style-type: none"> <li>• Unclear land status with no agricultural activities found.</li> <li>• Areas with various of slopes.</li> <li>• The site is not easily accessed, no existing road which may require new construction.</li> <li>• The site is considered in a sensitive area since it is located near the Lamasu 1 Hill top, known as a sacred area.</li> </ul>	
 <p>South view of the Proposed Area. Unstable slope</p>	 <p>South view of the Proposed area. Slope land.</p>

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## 5. DESCRIPTION OF THE ENVIRONMENT

### 5.1. Physical Environment

#### 5.1.1. Topography

125. The Loihunu area, located to the north of the project site, is surrounded by Mount Mundo Perdido (1,763m) in the west and Mount Builo (1,234m) in the East (ADB, 2016).

126. The geologic formations present in the area around Mount Mundo Perdido and Loihunu are Highly Fractured Limestone and the base sandy-shale and clay. Moving southward from Loihunu towards Viqueque, the hills comprise the Baucau Limestone Formation, where the eastern two-thirds of Viqueque is underlain by the Bobonaro Scaly Clay Formation, whilst the western third is underlain by the Viqueque Formation (Worley Parsons, 2012).

127. Moving south from Viqueque city, the terrain develops into a broad coastal plain with hills that extend to the coastline at intervals. Rivers are numerous and mainly without water, and there are large drainage areas between rivers. Soil erosion is high, especially within drainage basins.

#### 5.1.2. Climate

128. The Viqueque city experiences typical tropical monsoonal climate characterized with southern bimodal rainfall pattern leading to a 7 to 9 months wet season with two peaks in January and May (ALGIS, 2020). Annual rainfall totals in the Viqueque Municipality usually exceeded 1000 millimetres in low level areas, and can be as high as 1700 millimetres, in the mountain regions (Seeds of life, 2012). The temperature varies very little throughout the year, maximum temperature range between 28°C to 32 °C and minimum range between 18°C to 23°C (ALGIS, 2020).

##### 5.1.2.1. Climate Change Projection

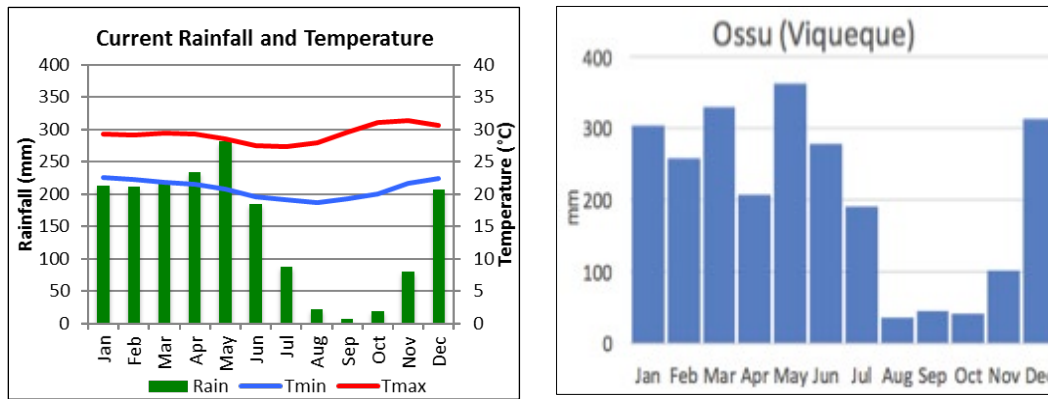
129. From 2000 - 2050, there is an estimated 3.18% decrease in average annual rainfall (1768 mm to 1708 mm) and a 5,11% increase in average annual temperature (26.05°C to 27.45°C) in Viqueque. This climate change predicts dryer and hotter periods and less frequent rain events but with higher intensities of rainfall, leading to high-risk probability of flash-floods occurrences.

130. Timor-Leste and its community are vulnerable to climate change, with significant variability of rainfall and temperature due to El Niño/El Niña frequent oscillations. The overall impact could lead to land degradation and soil infertility, and damage of seedlings caused by extreme storms.

131. The projected increase in temperature for Viqueque (increase of approximately 1.0-1.4 °C across the project sucros, based on 2050 IPCC4 CSIRO A2A Projection) may come to cause the farmers to i.e. suffer from yields decline of 10% for every 1°C increase in temperature (GovTL, 2010).

Figure 76 - Average Temperature and Rainfall Patterns Throughout 2000 in VIQUEQUE (CCCB - TL, 2018) and Average Rainfall Pattern for Viqueque from 2010 to 2018 ( (ADP/Engidro, 2020)





### 5.1.3. Geology

132. The Ossu administrative post area, to the north of the project site, is surrounded by Mount Mundo Perdido (1,763m) to the west and Mount Builo (1,234m) to the East (ADB, 2016).

133. The geologic formations present in the area around Loihunu are Highly Fractured Limestone and the base sandy-shale and clay. Moving southward from Loihunu towards Viqueque, the hills comprise the Baucau Limestone Formation, where the eastern two-thirds of Viqueque is underlain by the Bobonaro Scaly Clay Formation, whilst the western third is underlain by the Viqueque Formation (Worley Parsons, 2012).

134. Moving south from Viqueque city, the terrain develops into a broad coastal plain with hills that extend to the coastline at intervals. Rivers are numerous and mainly without water, and there are large drainage areas between rivers. Soil erosion is high, especially within drainage basins.

### 5.1.4. Water Resources and Hydrology

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

136. These watersheds produce an estimated 22,300 million m<sup>3</sup> of water per year (mm<sup>3</sup>/yr), with a total internal renewable water resources of 8,215 mm<sup>3</sup>/yr or 6,932 mm<sup>3</sup>/yr per inhabitant, ranking 63 out of 179 countries on renewable water resources availability per capita (WorldBank, 2018). This lower potential derives from a dry tropical climate characterized by long dry seasons. Based on 2004 available data, water withdrawal was 14% of the total country’s renewable water resources, of which 91% was used for irrigation and livestock and 9% for domestic use.

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

138. Figure 87 shows that the Northern catchments tend to be larger than those located in the south. Most of catchments in the northern coast generate semi-permanent (i.e. seasonal) flows during the wet season after heavy rainfall events. On the other hand, the southern coast benefits from higher rainfall and thus is able to supply larger permanent river systems in the wet season and several rivers with a permanent base flow in the dry season.

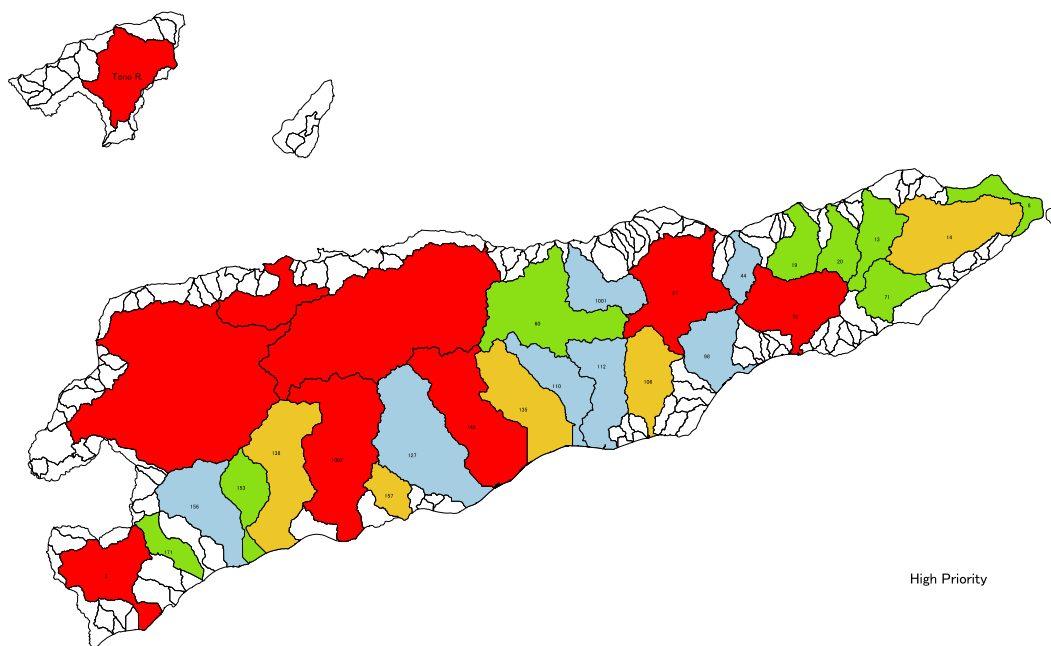
## Water Resources in the Project Area

### A. Surface and Groundwater

139. The hydrological system in Viqueque falls into the Sungai (River) Cuha Watershed (300 Km<sup>2</sup>), considered a High Priority [Yellow] (JICA, 2017), composed of several secondary water

body elements (streams) draining southwards by the river into the coast in the Timor Sea (ADB, 2016).

Figure 87 Important Watersheds in Timor-Leste (JICA 2017)



140. The main river, Cuha River, is located upstream in Northern Viqueque, North of Viqueque city. Along the higher end of the watershed, Natural groundwater springs appear (seasonally) and are considered the primary source of water for domestic and agricultural uses for most villages. Water from the various springs is used for domestic water are Loihunu 1, Loihunu 2, and Loihunu 3 (Permanent River), emerging from a limestone aquifer. Located in close proximity to one another but at approximately 10 km northward from the Uluk Leu Rua Tank, they supply water to the urban area of Viqueque (ADB, 2016).

141. The Loihunu 2 spring is on the foothill of Mount Builo, a declared protected area under the Decree Law 5/2016. Westward from Loihunu 2, there is Loihunu 1 and further upstream of Loihunu River, there is Loihunu 3, where the water comes from Mundo Perdido (also a declared protected area in Timor-Leste under Decree Law 5/2015).

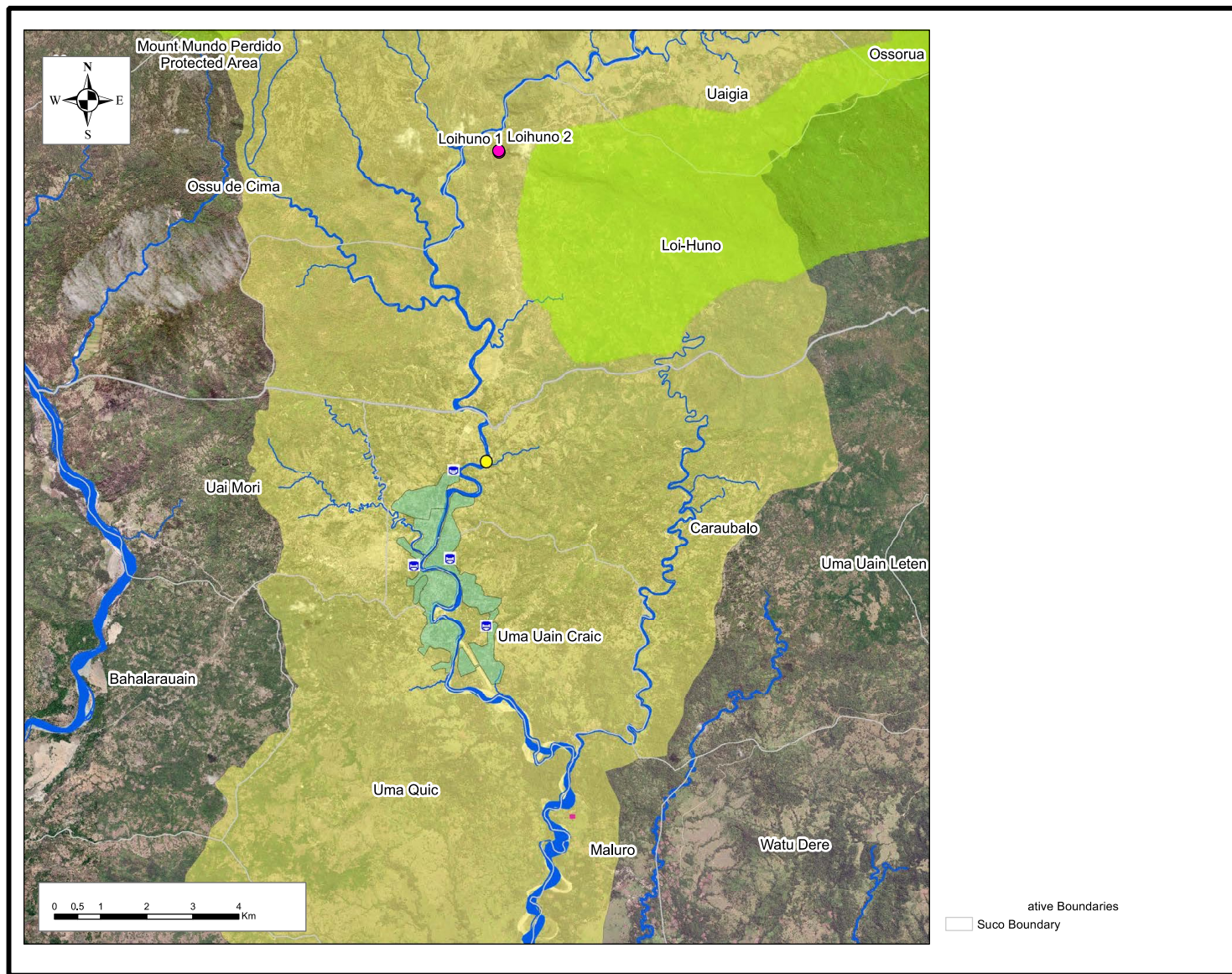
142. In Loihunu 1, the water is being used primarily for sanitation purposes, including washing clothes, bathing, and crop watering but not for drinking and cooking given the water is contaminated with E.coli due to livestock practices. Loihunu 3 is also being used privately to provide water for the aquaculture activity (i.e. fishponds).

## B. Water Quality

143. Several water quality studies have been carried since 2000 up to 2019, to several water sources in Viqueque, particularly those used for the Water Distribution system and during the Master plan in 2014 (ADB, 2016). These have been evaluated and assessed in Chapter 4.2. – Water Quality Investigations.

144. Throughout the years, the overall quality of the sources have indicated that, in general, most of the indicators are within the World Health Organisation (WHO) limits for water consumption use of the water, despite several occurrences of higher level turbidity in certain cases, that could be attributed to rainy season or other. However, there is a historical trend of occurrence of water contamination results regarding Total Coliforms and E.coli which may relate to the common agricultural husbandry activities and therefore, contaminating the water.

Figure 98 River and Spring System in Viqueque Project Area





## 5.2. Biological Profile

145. Situated within the Wallacea Biodiversity Hotspot (defined as the islands in the Indonesian archipelago and Timor-Leste between the Sunda and Sahul continental shelves), Timor-Leste hosts a number of globally significant ecosystems and endemic species, originated from Asia and Australasia and spread through the Wallacea region but through long isolation have developed very high levels of endemism (G-RDTL, 2010), many of which are threatened with extinction by IUCN.

146. Additionally, according to NEGA (2010), Timor-Leste is also part of the Coral Triangle, harbouring many important species, such as: "...76% of the world's coral species; six of the world's seven marine turtle species, more than 3,000 reef fish species, whale sharks, manta rays and a diversity of marine mammals, such as 22 dolphin species and a variety of whale species".

147. In general, natural ecosystems in Timor-Leste have been severely depleted in the last century, through intensive deforestation, forest degradation, loss of soil due to 'slash-and-burn' agricultural methods and heavy rains, mangrove destruction, pollution of waters and sedimentation of rivers. Native vegetation is a fundamental element of ecosystems, encompassing most of its biomass and has therefore been equally affected.

### 5.2.1. Flora, Fauna and Protected Areas

#### 5.2.1.1. Protected Areas, National Parks or sensitive ecological areas

148. Timor-Leste has a total of 49 declared Protected Areas (PA), according to Decree-Law no. 05/2016 – Protected Areas Network in Timor-Leste, containing the majority of the country's remaining primary forest cover. The majority of these areas are mountainous and have high species endemism. The first and most established Protected Area in the country is Nino Konis Santana National Park (NKSNP), composed of three main areas, namely, Jaco Island Marine Park, the Lake Iralalaru Park, and the community led marine protected area in vicinity of Com Village. Below is the list of protected areas in Timor-Leste according to the DL 05/2016, NEGA (2010) and GIS documentation and boundaries of the protected areas for the year 2018, from the Ministry of Agriculture and Forestry (MAF).

Table 14 - List of Protected Areas in Timor-Leste

No	Name	Area (Ha)	Ref	Remarks
1	Nino Konis Santana National Park	126249.619	GR 08/2007	Area REDUCED to 123600 ha in DL 5/2016
2	Mount Legumau	10035.876	NEGA 2010	Area INCREASED to 35967 ha in DL 5/2016
3	Lake Maurei	200.312	NEGA 2010	Area INCREASED to 500 ha in DL 5/2016
4	Be'e Matan Irabere	0	DL 5/2016	New proposed protected area, area not defined
5	Mount Matebian	10340.534	NEGA 2010	Area INCREASED to 24000 ha in DL 5/2016
6	Mount Mundo Perdido	4168.339	NEGA 2010	Area INCREASED to 25000 ha in DL 5/2016
7	Mount Laretame	896.449	NEGA 2010	Area INCREASED to 16429 ha in DL 5/2016
8	Mount Builo	6987.437	NEGA 2010	Area INCREASED to 8000 ha in DL 5/2016
9	Mount Burabo	3927.136	NEGA 2010	Area INCREASED to 18500 ha in DL 5/2016
10	Mount Aitana	4236.951	NEGA 2010	Area INCREASED to 17000 ha in DL 5/2016
11	Mount Bibileo	4545.537	NEGA 2010	Area INCREASED to 19000 ha in DL 5/2016
12	Mount Diatuto	9897.168	NEGA 2010	Area INCREASED to 15000 ha in DL 5/2016
13	Mount Kuri	1766.019	NEGA 2010	Area not defined in DL 5/2016
14	Kay Rala Xanana Gusmao National Park	18000	DL 5/2016	New proposed protected area
15	Ribeira de Clere	9926.638	NEGA 2010	Area INCREASED to 30000 ha in DL 5/2016
16	Lake Modomahut	22	DL 5/2016	New proposed protected area
17	Lake Welenas	20	DL 5/2016	New proposed protected area, part of Mt. Cablaque
18	Mount Manucoco	1773.192	NEGA 2010	Area INCREASED to 4000 ha in DL 5/2016
19	Cristo Rei	1810.001	NEGA 2010	Area REDUCED to 1558 ha in DL 5/2016
20	Lake Tasitolu	378.195	NEGA 2010	Area not defined in DL 5/2016
21	Mount Fatumasin	1412.862	NEGA 2010	Area INCREASED to 4000 ha in DL 5/2016
22	Mount Guguleur	6962.938	NEGA 2010	Area INCREASED to 13159 ha in DL 5/2016

No	Name	Area (Ha)	Ref	Remarks
23	Lake Maubara	0	DL 5/2016	New proposed protected area, area not defined
24	Mount Tatamailau	14418.235	NEGA 2010	Area INCREASED to 20000 ha in DL 5/2016
25	Mount Talobu/Laumeta	15000	DL 5/2016	New proposed protected area
26	Mount Loelako	1078.986	NEGA 2010	Area INCREASED to 4700 ha in DL 5/2016
27	Mount Tapo/Saburai	3767.788	NEGA 2010	Area INCREASED to 5000 ha in DL 5/2016
28	Lake Be'e Malae	0	DL 5/2016	New proposed protected area, area not defined
29	Korluli	0	DL 5/2016	New proposed protected area, area not defined
30	Mont Lakus/Sabi	0	DL 5/2016	New proposed protected area, area not defined
31	Mount Taroman	5888.429	NEGA 2010	Area INCREASED to 19155 ha in DL 5/2016
32	Tilomar	4731.239	NEGA 2010	Area INCREASED to 7000 ha in DL 5/2016
33	Mount Cutete	8590.356	NEGA 2010	Area INCREASED to 13300 ha in DL 5/2016
34	Mount Manoleu	10844.206	DL 5/2016	Area INCREASED to 20000 ha in DL 5/2016
35	Area Mangal Citrana	1000	DL 5/2016	New proposed protected area
36	Oebatan	300	DL 5/2016	New proposed protected area
37	Ek Oni	700	DL 5/2016	New proposed protected area
38	Us Metan	200	DL 5/2016	New proposed protected area
39	Makfahik	0	DL 5/2016	New proposed protected area, area not defined
40	Area de Mangal Metinaro	0	DL 5/2016	New proposed protected area, area not defined
41	Area de Mangal Hera	0	DL 5/2016	New proposed protected area, area not defined
42	Lake Hasan Foun & Onu Boot	12	DL 5/2016	New proposed protected area
43	Lake Bikan Tidi	110	DL 5/2016	New proposed protected area
44	Samiksaron	0	DL 5/2016	New proposed protected area, area not defined
45	Batugade	112.59	DL 5/2016	New proposed protected area
46	Atauro Island	10897.131	NEGA 2010	Area REDUCED to 50.85 ha in DL 5/2016
47	Lamsanak	15064.143	NEGA 2010	Not included in DL 5/2016
48	Mount Cablaque	12623.434	NEGA 2010	Not included in DL 5/2016 (Substituted by #14)
49	Behau	27491.337	NEGA 2010	Not included in DL 5/2016

### Protected Areas in and around the Project Area

149. Of the 46 declared Protected Areas (PA) in the country, Viqueque has within it the Mount Mundo Perdido PA, the Mount Laretame PA and the Mount Builo PA, the latter the closest one to the Project components. The Mount Builo PA has a total span of 8,000 ha encompassing Sucos Loihunu, Uaguia, Ossu Rua (Ossu Post Administrative) and Matahoi (Uatu Lari Post Administrative), while the Monte Mundo Perdido (at 16,100 hectares) covers part of the project relevant suco Ossu de Cima. Within the 15 km diameter project limit for the Municipal Water Supply and Sanitation Project (see **Error! Reference source not found.**) only Suco Loihuno reaches into the Mount Builo protected area at its northeastern border.

150. None of the project components overlap or border the PA, as they are planned to be implemented in Sucos Caraubalo, Uma Uain Craic and Uma Quic, within the urbanised area of Viqueque, with the closest component to the protected area being the Loihunu I Spring (approximately 700m away from the PA boundary). The overlapping seen in Figure 1019 represents only project border overlapping and not physical overlapping of project components within or close to the PA or KBAs.

151. The team met with Mr. João Antalmo, (National Director for Protected Areas) on the 12<sup>th</sup> September 2020, to procure updated GIS documentation on the National Protected Areas Borders. Whilst at the time these were not available, the team further complemented this consultation with a meeting with the General Director for Forestry, Mr. Raimundo Mau (on the 10th December 2020), where it was confirmed that the 2018 boundaries should be used as the most current PA boundary reference. Updated GIS data were supplied which have made it possible to define the areas of the project that may be in and out of the PA.

152. The environmental features, flora, fauna, etc, regarding this new National Park are reflected in the following chapters.

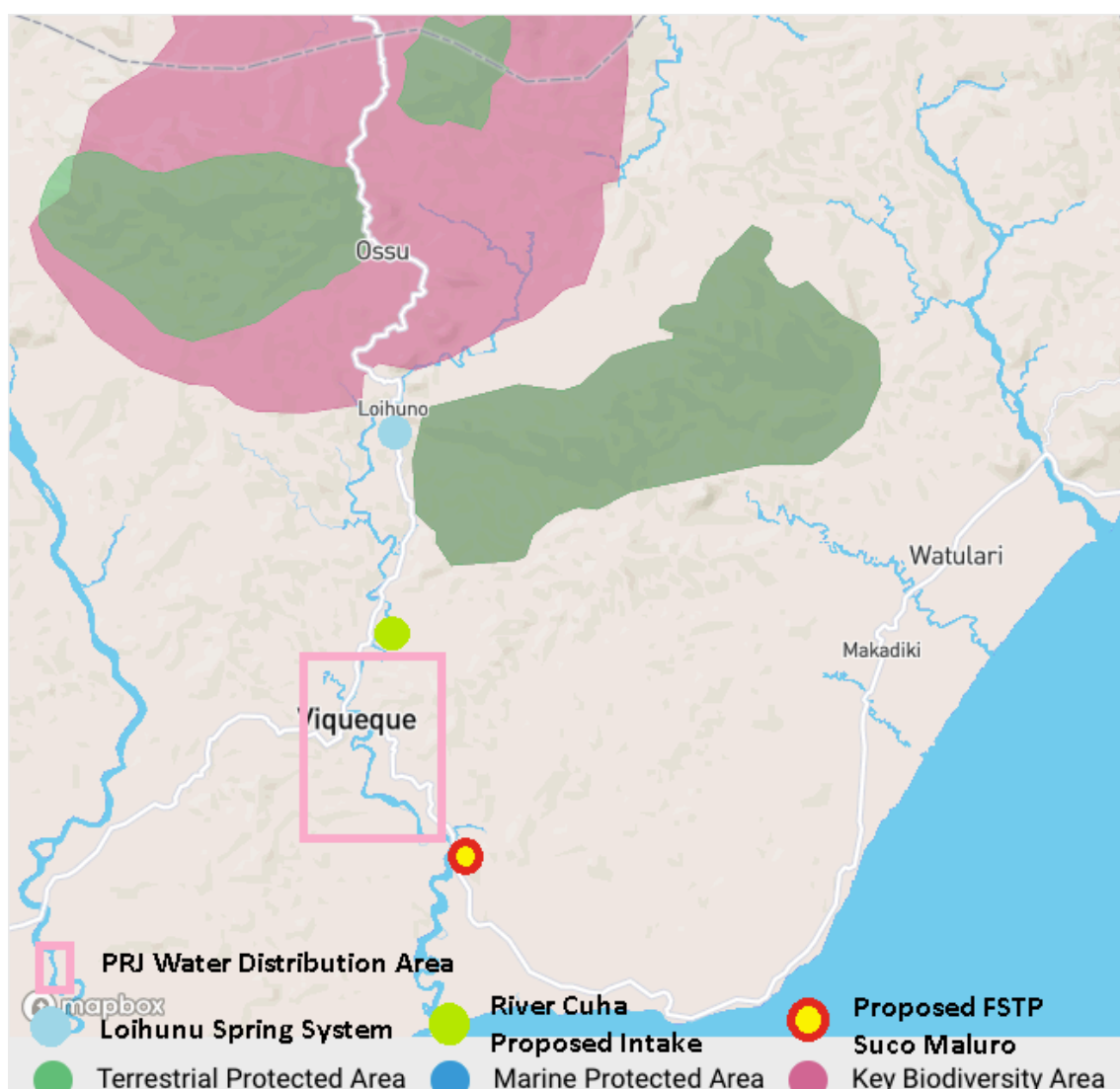
### 5.2.1.2. Flora and Forests

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

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

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

Figure 19 IBAT mapping of Protected Areas and Key Biodiversity Areas near Viqueque Project (Source: [www.IBAT-alliance.org](http://www.IBAT-alliance.org), accessed 06.01.2021)



156. Altogether, the area of sparse forest is almost 1.8 times the size of the area of dense forest. Between municipalities, in general, forest cover does not markedly differ. Based on these national forest maps, only 1.7% of the total land area of Timor-Leste is still covered by primary

forest; significant areas can be seen in Lautem and Covalima municipalities. The last major stretches of old primary forest are mainly located in the Tutuala sub-municipality of Lautem.

157. The Malesian region, where Timor-Leste is located, is a region of high plant biodiversity with an estimated 41,000 plant species, including 70 per cent of species endemic to the region (GovTL, 2015)

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

### **Flora and Forests around and in the Project Area**

159. The vegetation of Viqueque, consists of sparse moist lowland forest and dense moist highland forest. The vegetation characteristics in the spring area are not as dense as those springs in Viqueque, in the Manufahi District. This is due to intense slash and burning for subsistence agricultural purposes and urban expansion. The location of the springs was previously reported vacant, however, verified as occupied during the brief inception visit, where presumably the trees have been cut down to free the land for housing and other activities.

160. The Forest Transition Report prepared by the National Directorate of Forests, in collaboration with the Japan International Cooperation System (JICS), have shown that Viqueque is the district that has most significantly decreased its forest cover from 2003 to 2010 (20.9% of its total forest cover, loss of 31,265.87 ha), followed by Manufahi (29.6% of its total forest cover, a loss of 30,978.72 ha), (JICA, 2017). The loss in dense forest has occurred in all of municipalities in Timor-Leste and deforested areas are higher than sparse forest areas.

161. The Loihunu 2 spring area is the only one with denser vegetation compared to other identified water sources in Viqueque. At least 8 keystone tree species and herbaceous plants and perennials were seen on site, such as dita bark tree (*Alstonia scholaris*), hazel stericula (*Stericula foetida*), cottonwood tree (*Ceiba petandra*), breadfruit (*Artocarpus communis*), taro plant (*Colocasia esculenta*), candlenut (*Aleurites molucana*), palm tree (*Corypha utan*), and black sugar palm (*Arenga pinnata*), etc.

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

163. Several of these species are of economic or local importance, primarily for timber, fruit harvesting as food crops or for firewood or household use for cooking. Vetiver grass (*Chrysopogon zizanioides*) is also abundant at roadsides, which is good news for erosion control and slope protection (ADB, 2016).

#### **5.2.1.3. Fauna**

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



species. New species of bats, frogs, geckos and skinks have been discovered with evidence indicating high levels of endemism.

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

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

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

#### **Fauna around and in the Project Area**

168. Previous studies have concluded that fauna dispersion and variety is generalized throughout the Southern coast of Timor-Leste (Worley Parsons, 2012) and many existing IBAs and Pas scattered throughout the South coast, provide significant foraging and nesting habitat potential for vertebrate fauna species and in particular species of conservation significance such as the Yellow-crested cockatoo (*Cacatua sulphurea*), as well as others such as the Slaty Cuckoo Dove (*Turacoena modesta*), Pink-headed Imperial Pigeon (*Ducula rosacea*) or Olive-shouldered Parrot (*Aprosmictus jonquillaceus*), or more common species including the Spotted Dove (*Streptopelia chinensis*), the Barred Dove (*Geopelia maugei*) and the Streak-breasted Honeyeater (*Meliphaga reticulata*) (Trainor, 2007).

169. Reptiles also follow this tendency, including: Tokay (*Gekko gekko*), Asian House Gecko (*Hemidactylus frenatus*), Fat-tailed House Gecko (*Hemidactylus platyurus*), Common Wolf Snake (*Lycodon capucinus*), Indonesian Water Python (*Liasis macklotti macklotti*) and Saltwater Crocodile (*Crocodylus porosus*).

170. In Viqueque, the mammals commonly existing in south coast are *Macaca fascicularis* (crab-eating macaque), *Phalanger orientalis* (Northern common cuscus), *Cervus timorensis* (Javan rusa), *Rattus Timorensis* (Timor rat), *Sus scrofa* (Wild boar), *Rhinolophus philippensis montanus* (Large-eared Horseshoe Bat) and *Paradoxurus hermaphroditus* (Asian palm civet), the Indonesian Short-nosed Fruit Bat (*Cynopterus titthaechilus*), Domestic Dog/Dingo (*Canis familiaris*), Domestic Pig (*Sus scrofa*), Bali Cattle (*Bos javanicus*), Domestic Cattle (*Bos taurus*) and the Domestic Goat (*Capra hircus*), amongst others, all not included in the IUCN list of endangered species (Santana, 2006).

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

#### 5.2.1.4. Coastal Resources

172. Timor-Leste has approximately 700 km of coastline, holding many coastal and marine resources including fish, sea grasses, seaweeds, coral reefs, mangrove forests and pristine beaches (very suitable for recreation and with a high tourism value). These coastal habitats vary from region to region around the country, with areas such as lagoons, fringing coral reefs, sea grass beds and steep cliffs with adjacent deep-water drop-offs, mangrove stands, beaches and shallow bays. These coastal habitats are places of varying abundance and diversity of fish stocks, some representing spawning grounds whilst others a transition area between onshore and offshore habitats or seasonal migratory pathways to many mega fauna species.

173. Thus, the coastal zone (and habitats) of Timor-Leste are<sup>[SEP]</sup> subject to a high degree of human dependency and impact on<sup>[SEP]</sup> said resources, be it for Tourism or socioeconomic activities i.e. mangrove forests, have been reduced at an alarming rate throughout decades since 1940, due to timber harvesting, fuel wood, and opening up spaces near the mangrove forests for shrimp and fish ponds.

174. Being part of the Coral Triangle (CT) also befits Timor-Leste of a rich Marine fauna, since it is estimated the CT harbours 76 per cent of the world's coral species, six of the world's seven marine turtle species, more than 3,000 reef fish species, whale sharks, manta rays and a diversity of marine mega fauna, such as saltwater crocodiles, 22 dolphin species and a variety of whale species, namely "...76% of the world's coral species; six of the world's seven marine turtle species, more than 3,000 reef fish species, whale sharks, manta rays and a diversity of marine mammals, such as 22 dolphin species and a variety of whale species" (G-RDTL, 2010).

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

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

#### Coastal Resources in and around the Project Area

177. The coastal resources around the Viqueque District cover the Southern Coast and boast special importance in marine richness and diversity. However, as they are well outside the 15 Km Project scope Area, and are substantially far from any possible impacts from any of the project activities and/or components, they have not been considered in this characterisation.

### 5.3. Socio-Economic and Cultural Environment

#### 5.3.1. Economic Development

178. **Agriculture development.** Human interaction within this setting results in several land-uses in the country such as agricultural, forestry, settlements, industrial and dry lands land use.

179. The project is situated in the Viqueque Municipality and its population was projected, in 2015 to be at 76,033 persons and the population of Loihunu to be 1,272 persons, of Carabalu to be 6,594 persons, of Uma Uain Craic to be 4,454 persons and of Uma Quic to be 1,981 persons (General Directorate of Statistics, 2015).

180. This Suco population is the primary receptor of the water supply services from this project, which, in 2015, counted with 2,315 private households.

181. The predominant form of livelihood for households in the project area is mostly near subsistence swidden agriculture for the production of primary staple crops such as i.e. maize, cassava, etc for farmer households, whilst a larger proportion of livestock activities i.e. buffalo, spread out towards the lower land areas towards Viqueque.

182. The majority of the population is mostly composed of self-employed farmers (25% of the municipality population, representing 76% of the total employed population in the Municipality, and water has been an important source for securing their activity so as to have a sustainable income. Agriculture is heavily dependent to the amount of rainfall in a given year, followed by harvesting water from the nearest water stream.

183. **Transportation.** Public transportation in Viqueque city varies comparing to Dili city with access only to *microlet* service for rural and urban destination. For travelling outside Municipality, public vehicles such as bus heading to Dili and vice versa is commonly used by the community.

184. Viqueque Municipality also has a rudimentary runway for aircraft landing located in the northern part of Suco Uma Uain Craic. The mentioned site is said to be included for future expansion and re-functioning implementation as in accordance with the urban planning design.

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

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

187. Likewise, the coastal plain of southern Timor-Leste has largely been cleared in association with swidden agriculture, sandalwood harvesting, plantation estates and timber plantations. Remnant vegetation exists as highly fragmented and secondary vegetation communities, mostly dominated by invasive weeds, particularly Siam weed (*Chromolaena odorata*) and Cogon Grass (*Imperata cylindrica*), common in the area and results from repeated cycles of 'slash and burn' or swidden agriculture. Grasses are extensively grazed by cattle, water buffalo, pigs and goats.

188. **Power sources and transmission.** Energy consumption increased since the number of clients also increased. In Viqueque, in 2015 there were 4,264 clients and in 2018 increased to 5,032 clients (DNE, 2018).

### 5.3.2. Social and Cultural Resources

189. **Population and Communities.** The project is situated in the Viqueque Municipality and its population was projected, in 2018 to be at 78,265 persons and the aggregated population of Suco Carabalu, Uma Uain Craic and Uma Quic are estimated to be 14,784 persons (DGE Viqueque, 2018).

190. **Health Facilities.** In terms of facilities in Posto Administrativo of Viqueque, there are 14 Health Centres and private clinic with 66 Health professionals (DGE Viqueque, 2018).

191. **Education Facilities.** In 2018, Basic Education counts with a total of 100 schools, 917 teachers and a total of 20,675 students. On the other side Secondary Education only has 11 schools, 167 teachers and a total of 4,057 students (DGE Viqueque, 2018).

192. **Socio-economic Conditions.** Despite being a 95% Catholic country, there is an underlying and very vast animistic culture in all the ethno-linguistic communities of Timor-Leste, maintaining institutional forms associated with the importance of the “Sacred” or *Lulik* beliefs in contemporary social life. Society and households in Timor-Leste engage with in a variety of ways, engaging in exchange relationships and customs that maintain narrative stories and founding myths, ancestral regalia and inherited knowledge, as well as landed property and ritual practices.

193. These extend to the ritual of agriculture management and seasonal monsoons, life cycle ceremonies (birth, marriage and funerals), clan group rituals of solidarity and, more importantly, as a traditional approach to land management.

194. **Physical or Cultural Heritage.** Viqueque society follows (with slight local variation e.g. local dialect) in line with the general indications of those practiced in Timor-Leste, where the sacred or *Lulik* plays a central role in their contemporary social relationships and community, especially in what regards agricultural management and conservation of resources and *lulik* areas appear in more disperse but nevertheless important symbols such as trees or water sources.

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

196. Traditional regulations and customs in Timor-Leste also contribute to conserving the natural resources such as forests and crops, a communal protection system known as Tara bandu. It is an agreement within a community to protect a special area or resource for a period of time, usually carried out for the harvest of agricultural produce, cutting of trees or collecting of forest products, and hunting or fishing but is also currently being used to regulate social behaviour or protection of cultural locations.

197. There are several types of symbolic actions used for this practice. In agriculture, objects may be hung near or a piece of rattan tied around the trunk of specific trees or next to a garden to indicate custodianship of the resource. It is also widely believed that people who steal the goods subject to Tara bandu may suffer from an accident, misfortune or illness, while the Tara Bandu itself also provides for mediation of land disputes.

198. Viqueque Municipality has various physical or immobile material objects that are registered and conserved by the Secretary of State of Arts and Culture<sup>7</sup> and are widely known by their heritage value. As for Viqueque in particular there are a few objects and sites that are immaterial and sensitive, that are protected not only by the State but also by the community itself. Therefore, during site visit, the team made sure that the referred features were identified diligently within the distribution zones. Information was also collected with help from the local authorities for the site identification to be more efficient and accurate.

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<sup>7</sup> The team had previously requested for data regarding to the cultural heritage sites for all the 4 Municipal Capitals of Water Supply and Sanitation Project to the National Department of Cultural Patrimony, Secretary of State of Arts and Culture. The SEAC provided the Consultant team hardcopies of lists available from current studies in which all of the referred sites are located outside the project area. Thus, site visit was conducted to fortify the said necessity for further assessment of environmental impact and monitoring plan. Minutes of meetings are provided in Appendix 9.

199. All 6 locations are within 10m to 20 m of one of the borders of these assets, while below are the cultural heritage sites listed by the team and Figure 100. All sites will require approval from the local and national Culture Directorate, regarding protection during the Construction Phase.

Table 15 - List of Cultural Heritage Sites in Viqueque

No.	Name of the Site	Types	Coordinates	Distance from Site ROW
1.	St. Cruz Cemetery	Socio-cultural Heritage	8° 51.184'S / 126° 21.953'E	ROW Parallel to East boundary (<10m)
2.	Chapel	Socio-cultural	8° 51.588' S / 126° 22.068' E	ROW Parallel to East boundary (<30m)
3.	Administration Office During Portuguese Time	Historical & Socio-Cultural	8° 52.041' S / 126° 21.922' E	ROW Parallel to NW and SW boundary (<20m)
4.	Cathedral	Socio-cultural & Touristic	8° 52.102' S / 126° 21.944' E	ROW Parallel to NE boundary (<10m)
5.	Residence of Sede Suco during Portuguese Time	Historical & Socio-Cultural	8° 52.183' S / 126° 22.006' E	ROW Parallel to NW boundary (<10m)
6.	Cemetery 2	Socio-cultural	8° 52.561' S / 126° 22.105' E	ROW Parallel to NW boundary (<10m)

200. **Current use of lands and resources for traditional purposes by indigenous peoples.** Tara bandu also includes temporary prohibitions on resource extraction such as cutting of trees, including mangroves, and the designation of specific areas as sacred i.e. a water source or spring or a location such as Jaco Island and its surrounding reef, which are considered sacred by the local community. Fines for violations are prescribed and certain selected villagers are responsible for ensuring that village laws are followed.

#### 5.4. Site-Specific Environmental & Social Features

201. Table 16 summarizes site-specific conditions of the component locations/sites/alignments.

Figure 100 Viqueque Cultural sites within Project Area

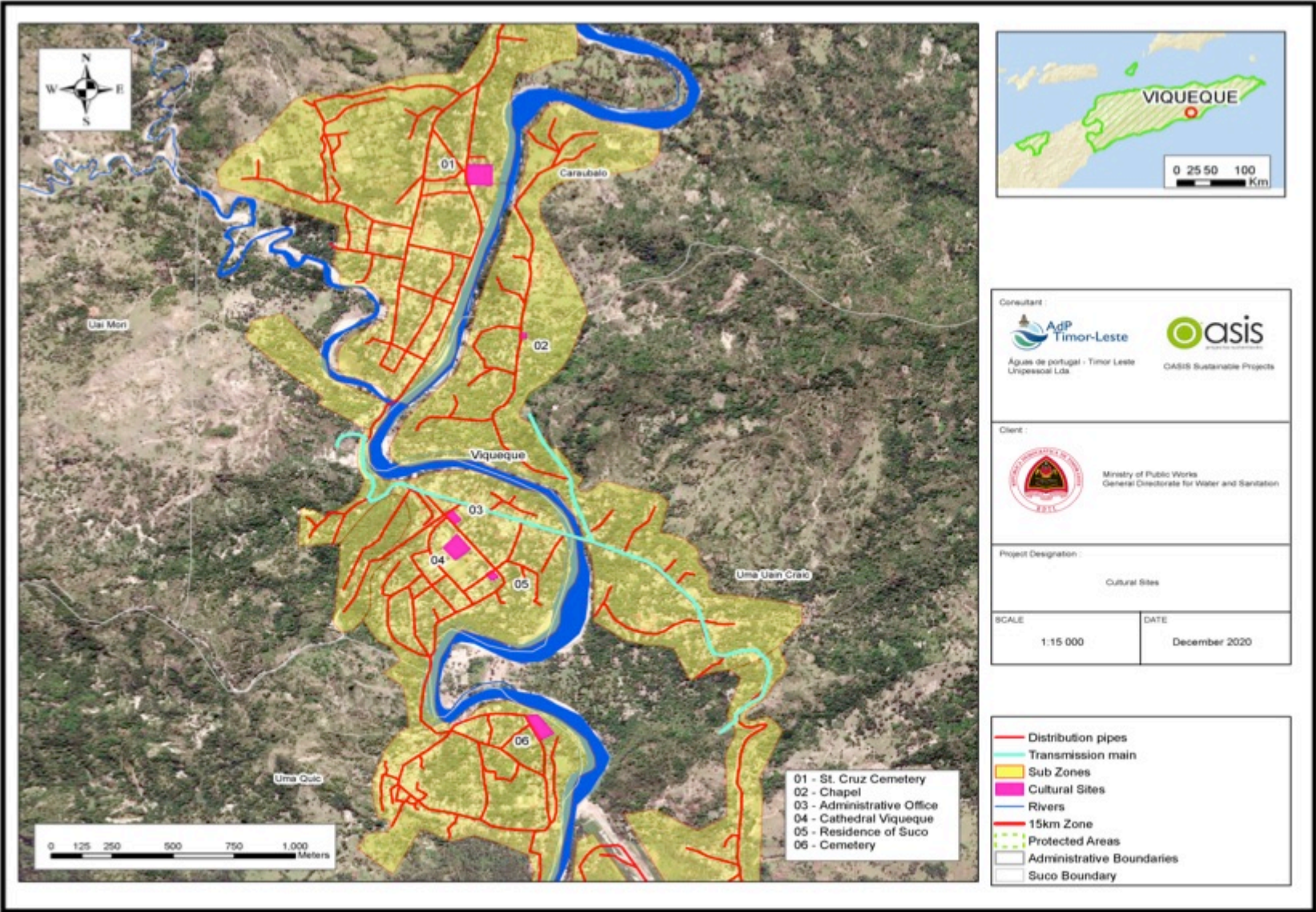






Table 16 - Project Site Environmental and Social Features

Components and Site Salient Features	Site Photographs
<p><b>1. Intakes</b></p> <p><b>A. Loihuno spring</b></p> <ul style="list-style-type: none"> <li>Loihuno 1 (Builua) is located in Aldeia Samaleu, Suco Ossorua and is used for public supply, which includes four private outlets (1/2" pipe and natural outlet) and an approximate yield of 48 L/s (as per flow measurement on the 26th October 2020). Access road to spring goes through the middle of the dwellings in Aldeia Uatolana.</li> <li>700m Upstream of the spring is Mount Builo Protected Area, with dense vegetation and medium forest cover, with mature and sturdy tree species, herbaceous plants and perennials in an ecosystem that is more intact and has limited human intervention.</li> <li>During dry season the water is reported to have very low flow causing difficulty towards the inlet structure to allow water to enter the distribution system. According to the chefe suco Loihunu, there has been a drought occurrence at the end of 2015 during 4 months where the Loi Huno (2) spring could not produce and provide water to the community surrounding it.</li> <li>Historically has had upstream forest degradation due to shifting agriculture and deforestation by community, which is believed by the community to have reduced the spring flow at the time. Some upstream activities (subsistence agriculture) still occur.</li> <li>Loihunu 1 spring is surrounded by 23 households (around 200 people) and only 8 houses that have cement but permeable septic holding tank, while 15 households have hole-in-the-ground WC. This has caused water quality reduction and E.coli contamination in the downstream Loihunu 2 (Loihunu) spring, only used for agriculture and fish farming by the community.</li> <li>Directly within 50m downstream the community's has small agriculture plots and small-scale fish pond plots that benefit from this water source as well as using the water for animal husbandry and public washing/laundry purposes, which has led to contamination of the spring overflow and the next spring water source downstream.</li> <li>The springs have a cultural sacredness, considered <i>lulik</i> or sacred by the local community, and a yearly cultural ceremony is provided by DNSA and local authorities to guarantee the continuous provision of water provision services, as per the local community.</li> </ul>	<div> </div> <div>Loihunu I (Buibau) Spring</div> <div> </div> <div>Spring and Downstream usage</div> <div> </div> <div>Animal Husbandry and Dwellings Nearby Loihunu 1 Spring</div> <div> </div> <div>Fish Farms downstream of Loihunu System</div>

Components and Site Salient Features	Site Photographs
<p><b>B. Cuha River Intake</b></p> <ul style="list-style-type: none"> <li>• Located in Suco Carabalu, 1.2Km North of Viqueque city limit.</li> <li>• Site recommended by SMASA, identified as state-owned land.</li> <li>• River curves South to SE and provides for a deeper section for abstraction.</li> <li>• Flat, grassland area with several tree patches and small agricultural gardens within the RoW of future access road, with gentle slope Northwest towards the National road.</li> <li>• Distance to the national road to Viqueque is about 340meters and 450 meters from nearest dwelling.</li> <li>• River flows year round to South Coast, 8Km away.</li> <li>• Adjacent to agricultural areas to the North (sludge reuse).</li> <li>• No sacred or cultural sites or tara bandu in the surroundings or in river area.</li> </ul>	 <p>Cuha River (Aerial photo 2019, specific intake area photos not available)</p>
<p><b>2. Proposed FSTP location #3 – Suco Maluro</b></p> <ul style="list-style-type: none"> <li>• Located in Suco Maluro, 5.0Km South of Viqueque city limit.</li> <li>• Site recommended by SMASA, identified as state-owned land.</li> <li>• Flat, grassland area with gentle slope Southwest towards the river Cuha.</li> <li>• Distance to the national road to Viqueque is about 340meters and 450 meters from nearest dwelling.</li> <li>• River (year round) 200 meters away, flowing year round to South Coast, 5Km away.</li> <li>• Adjacent to agricultural areas to the North and South (sludge reuse).</li> <li>• No sacred or cultural sites or tara bandu in the surrounding site.</li> </ul>	 <p>Proposed FSTP site (North view)</p>



## 6. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

### 6.1. Overview of Impacts

202. The Water Supply and Sanitation Investment Project for Lospalos, Same and Viqueque is expected to produce numerous beneficial and negative impacts towards the environmental and social aspects due to various project activities.

203. A characterization study of existing origins and pilot well testing areas was conducted during a site visit (24 to 26 June 2020) aiming to identify specific protected biodiversity, sacred site, water usage, land status, and activities downstream and upstream and the main objective of the Assessment was to evaluate the impacts based on the characterization study and the site visits, as well as the social safeguards impacts evaluation from the Social Specialist and stakeholder and public consultations carried out during the IEE survey.

204. The potential impacts and mitigation measures assessment for each project city were assessed within the respective city IEE, based on each of the project components, namely: 1) water sourcing; 2) treatment and storage; 3) distribution networks; 4) and sanitation sector (public toilets and FSTP), and the analysis followed the project cycle (Design phase, Construction phase, Operational and Maintenance phase, and Decommissioning phase), as well as information gathered from applying the ADB REA (Rapid Environmental Assessment) checklist (see Appendix 1).

205. The assessment was an analysis of the existing situation (information gathering - using existing information) and the identification of the social, economic and biophysical resources, impacts or others that should be maintained, enhanced, prevented and/or mitigated under the project scope, providing for an identification of the biophysical and socio-economic opportunities and constraints, potential environmental “no-go areas”, red flag areas, potential environmental impacts including potential cumulative environmental impacts, potential health risks and water related risks, as well as the identification of “alongside-project” considerations which will be included in the preliminary E&S impact analysis and will seek to identify what pros and cons may exist within each of the proposed project components.

206. An environmental management plan (EMP) has been developed (see Chapter 9) to provide mitigation measures to help control and/or reduce all negative impacts to acceptable levels, presented in the form of an Environmental Management Plan (EMP) matrix, to be used by SMASA (for monitoring purposes) and the Contractor (for management) prior, during and post-construction activities.

### 6.2. Impact Analysis

207. An Impact evaluation was carried out for all project components and activities by applying an evaluation matrix (see example in Table 18) and impact assessment rating applied for the Pre-construction, Construction, Operation and Decommissioning Phases of the Project. The significance of the impacts was assessed according to the condition of the affected environmental and social component's present condition and the scale of impact should the impact persist, at the time of evaluation.

208. “S(+/-)” denotes a positive/negative significant impact whereas “MS(+/-)” represents moderate significance and “IS(+/-)” is insignificant. Priority should be given to significant negative impacts, emphasised in the EMP.

209. These classifications are the result of the product between “Scale of Present Condition” and “Scale of Impact”, based on the criteria in Table 17 - Scales for Present Conditions and Impacts, where present condition has three classifications, treated independently from the scale of impact, according to the present condition of the affected component. On the other hand, the

scale of impact accounts for the nature of the impact whether it will have a minor, moderate or strong impact and whether the impact would be temporary or permanent.

Table 17 - Scales for Present Conditions and Impacts

Scale of Present Condition	
3	Good = Sensitive Environmental/Social conditions of the location and surrounding area, with little to no impact sources
2	Moderate = Moderate Environmental/Social conditions, and with pre-existing sporadic (temporary or permanent) impact sources not related to the project.
1	Bad = Deteriorated Environmental/Social conditions, and with large numbers of pre-existing (temporary or permanent) impact sources (other than the project).
Scale of Impact	
1	<b>Minor, temporary:</b> Inside Project Boundary - Zero or minor Environmental/Social impact/damage, temporary Outside the Project Boundary - No Environmental/Social impact
2	<b>Moderate, temporary:</b> Inside Project Boundary – Release/Impact with limited Environmental/Social damage/impact, temporary Outside the Project Boundary: Minor Environmental/Social impact/damage, temporary
3	<b>Strong, temporary</b> Inside Project Boundary – Release/Impact with major damage, temporary Outside the Project Boundary - Strong Environmental/Social impact/damage, temporary
4	<b>Minor, permanent</b> Inside Project Boundary – Release/Impact with minor Environmental/Social damage/impact, permanent Outside the Project Boundary: Minor Environmental/Social damage/impact, permanent
5	<b>Moderate, permanent</b> Inside Project Boundary – Release/Impact with limited Environmental/Social damage/impact, temporary Outside the Project Boundary: Moderate Environmental/Social damage/impact, permanent
6	<b>Strong, permanent</b> Inside Project Boundary – Major Environmental/Social impact/damage, permanent Outside the Project Boundary – Major Environmental/Social impact/damage, permanent
Conclusion	
S	Significant Impact
MS	Moderate Significant Impact
IS	Insignificant impact

The product of the scale of present condition and the scale of impact is used to assess whether the impact is significant (S), Moderate Significant (MS) or insignificant (IS). Table 18 - Impact Assessment Rating, presents the matrix for the assessment of impacts based on the values for the scale of importance and the scale of impact.

Table 18 - Impact Assessment Rating

		Scale of Impact					
		1	2	3	4	5	6
present	1	1	2	3	4	5	6
	2	2	4	6	8	10	12
	3	3	6	9	12	15	18

	Insignificant (+/-)	IS
	Moderately Significant Impact (+/-)	MS
	Significant Impact (+/-)	S

### 6.2.1. OVERALL BENEFICIAL (POSITIVE) IMPACTS

210. Clean, adequate drinking water is a basic human need and developing drinking water supply facilities has numerous beneficial impacts to individuals and communities. Furthermore, when coupled to sanitation improvement, there is a substantial increase in the quality of life within the project area. Some of the major beneficial impacts of the proposed project and suggestions to achieve these benefits are described below and the numbering is related to the EMP.

211. **C3.2.1. Local Employment Generation.** This project will directly generate employment opportunities either skilled or non-skilled work for the local people. Their earnings will consequently affect the local economy, given the employment process will prioritize local people, reducing the need for in-migration (S+ = Positive Significant). Recruitment of unskilled workers from affected community within the project area, in coordination with local authorities i.e. Municipality, Suco, etc, and in accordance with Timor-Leste Law, will be the most effective mitigation measure.

212. **C3.2.2. Skill Enhancement.** Employment opportunities will increase the skill of the workforce in terms of technical proficiency. This kind of enhancement will be an investment for individuals to implement in the future, as well as to augment incomes and improve their economic status (S+ = Positive Significant). The contractor must prepare a training program i.e. “on-the-job” for all workers and, equally important, training on the Environmental and Social management plan and its Mitigation Measures, particularly to create the competency, skills and abilities of all the relevant staff to ensure they are aware and apply the provisions of the EMP effectively.

213. **O3.1.1. Improved Health and Hygiene.** This project is aimed at improving water supply and sanitation to the community, improving people’s hygiene and public health and consequently reduce waterborne disease occurrence. A regular maintenance of the project’s components will provide continuous benefits to the local people (S+ = Positive Significant).

214. **O3.1.2. Women Empowerment.** Women play an important role in the family: they manage the household, bear children and expect to live a healthy menstrual cycle. Having good access to improved water and sanitation will result in a significant health improvement, reduce mortality and balance family and at an individual level, it will improve their working performance which will lead to a more advanced economical condition in the household daily life (S+ = Positive Significant).

## **6.2.2. IMPACTS IN DESIGN/PRE-CONSTRUCTION PHASE**

215. The pre-construction works involve field survey and investigation, development of design and detailed drawings, carrying out cost estimate etc, as well as the evaluation of water availability and competing uses. A characterization study of existing origins and pilot well testing area was conducted during site visit (2 to 4 June 2020) for the preliminary design, aiming to identify specific protected biodiversity, sacred sites, water usage, land status, and competing activities downstream and upstream.

### **6.2.2.1. PC1. Water Sources**

#### **PC1.1. Location and Sensitive Areas**

##### 1.1.1. Loihunu 1 Spring - Nuisance to the biodiversity (flora, fauna, water ecosystem)

216. The Loihunu Spring and Intake are located in a sensitive environmental and cultural area. The Loihunu system has been supplying water for Viqueque for at least 40 years, pre-existing to the project i.e. “brownfield projects”, already have working water distribution infrastructure and surrounding the spring there are dwellings and housing with agricultural activities and a road within a 100m radius. The environmental assessment of these components shows that it is not likely the project activities have significant adverse environmental impacts that are irreversible, diverse, or unprecedented and unlikely to affect areas larger than the sites or facilities subject to physical works. These impacts are site-specific and few if any of them are irreversible (MS- = Negative Moderate Significant).

217. Irrespective of this situation, it is important that the proponent provides for an induction to the constructor regarding these sensitive areas, specifically to apply more stringent forms of implementing the mitigation measures identified in C3 that may prevent and manage the

activities of the project when working in the ROW and accessory areas of the rehabilitation of the Loihunu Intake and Springs.

218. While there are no official lists of Mitigation Measures to be applied by Projects in Sensitive areas, previous measures in past project should be the closest applicable measures for the construction phase, such as (but not limited to) the following:

- (i) The contractor, his employees or subcontractors are prohibited to carry out the following activities:
  - Kill, injure, damage, remove, handle, disturb or interfere with any endangered species or existing animals under any circumstances;
  - Bring domesticated animals on-site;
  - Poaching on-site or the surrounding forests;
  - sell endangered species or derivatives of these species;
  - export endangered or derivatives of these species.
- (ii) Trees that will be cleared should be inspected for nesting birds prior to cutting. The nest will be transferred carefully to another tree safe from project activities. Trees with nesting birds near the trees to be cut will be marked and the direction of fall should be inclined away from the trees with nests. If chicks are already present felling must take place, where possible, > 50 m distance from the nest. All activities must be supervised and decided upon by a Forest Guard or representative of the National Directorate for Protected Areas (DNAP);
- (iii) A detailed layout of clearing will be presented by the contractor before clearing of vegetation is carried out. The site clearing will be confirmed by the contractor before clearing starts. Clearing will be limited in accordance to the project layout/design and the extent will be limited with relevance to the project. The Contractor is prohibited to deface, paint, mark natural and pre-existing vegetation even if of no relevance to the project.

219. All tree species will not be harmed and will be protected throughout the lifespan of the project. If an endangered tree is to be cut, under special circumstances and technically justified, DNAP must approve the felling and guarantee that the planting of the Viqueque tree species at a quantity to be determined will be conducted at pre-defined and approved site.

1.1.2. Cuha River Intake and access road construction - Nuisance to the river biodiversity (water ecosystem), Impact on surface water (silt runoff), Impact to local dwellers (land reclamation, dust, noise and vibration, etc.)

220. The Cuha River Intake is located in a water ecosystem, considered naturally as a sensitive environmental area. There are dwellings and housing with agricultural activities and a road within a 100m radius.

221. The area will require access and thus opening of an access road from the national road to the construction site, which will have land use impacts wherever soil is not Government owned, as well as the customary construction associated impacts (see C.3).

222. The environmental assessment of these components shows that it is not likely the project activities have significant adverse environmental impacts that are irreversible, diverse, or unprecedented and unlikely to affect areas larger than the sites or facilities subject to physical works. These impacts are site-specific and few if any of them are irreversible. The only major significance will be from the sensitivity of the river site itself (S- = Negative Significant).

223. Given the variability and various competing water uses in the Loihunu system and that no groundwater was found during the borehole exercise, Cuha river has been brought forward as an option for water sourcing. From a quick Landsat satellite imagery evaluation (1987 to 2020), it was concluded that the river's volume of water is undervalued, as there is evidence of

water in the dry months when the width of the river section is smaller. This capture could be done through wells in the alluvium or by direct intakes of river water through screened tubes that capture the water to a sealed well.

224. It is important that the proponent follows all the indications as in PC1.1.2. especially in providing for an induction to the constructor regarding these sensitive areas, specifically to apply more stringent forms of implementing the mitigation measures identified in C3 that may prevent and manage the activities of the project when working in the ROW and accessory areas of the construction of the Cuha River Intake.

## **PC1.2. Use of Water Sources (springs)**

### 1.2.1. Available Water for all users

225. Consumers in Viqueque have received insufficient water supply due to an increasing urban water demand and degradation of the existing water infrastructures over time, hindering optimal operation and distribution of water from a limited number of natural water sources available. The high incidence of illegal connections in the system also results in a weak and slim water distribution to each Viqueque consumer (S- = Negative Significant).

226. Preliminary production yield of the sources was carried out in October 2020 (in equivalent conditions to the end of the Dry Season) of existing springs through pump testing. The water demands versus October 2020 water flow investigation results, suggest that, under these numbers, and pending a long-term monitoring program, the current Loihunu spring and Cuha River sources may produce enough flow to contribute to the requirements of the distribution system for the bigger part of the Dry season.

227. For the Loihunu Spring System [Loihunu I (Buibau), Loihunu II (Moloco) and Loihunu III (Loihunu) springs, there is a need to guarantee a sharing of this area's resources to maintain source sustainability.

228. In this regard, Loihunu I will be earmarked as a dedicated source for the Distribution System to Viqueque, while Loihunu II and III will be left for social and ecological flow purposes. This overflow will be substantial for social use (agriculture and other) and especially an ecological flow, which now represents 100% - X [social use] in each of the remaining springs. In any case, it is suggested to maintain an ecological flow in Loihunu II and III of 30% of Wet Season Spring flow (November to May) and 10% of Dry Season Spring flow (June to October)) to compensate for the full abstraction of Loihunu I with much more volume in the wet season to cover the requirements for the whole ecosystem.

229. The increase in supply will be obtained from the refurbishment of the distribution network and increase in distribution efficiency (which will significantly reduce system losses from leakage), and the installation of a new metering system (which will improve leak detection and cost recovery). This is expected to both improve the supply of water to the consumer and reduce the decline in groundwater from over-abstraction in the Loihunu spring system as a whole.

230. However, if the Dry season spring flow reduces naturally, to guarantee the distribution system maintains service to Viqueque consumers throughout its lifetime, it is necessary that a Monitoring system is put in place to monitor daily flow in all operational sources and help estimate water production variability and decreases that may require other sources i.e. Cuha River to come online to support the water distribution, especially in the dry season. The Cuha River must also have a monitoring program to be able to track flow and aquifer performance.

### 1.2.2. Water User needs between Environment, Communities and Water Distribution System on water consumption

231. The issue of water benefits with source area communities has been raised by local authorities and Chiefs of Suco (Village) during the Public Consultation. This, together with a mixed urban/rural setting that has several different water consumptions beyond human

consumption alone i.e. agriculture and rice fields, etc, downstream of nearly all the existing and future sources, has brought discussions regarding source sustainability for all users, not only for the targeted urban areas, although no indications were given that water was scarce to the point of depletion (S- = Negative Significant).

232. Given the borehole attempts were unsuccessful, Loihuno I spring and Cuha River were identified as primary sources and have been concluded as sufficiently productive - total of 106 lps (2040 horizon year demand 54.2 lps, see Table 4), if abstraction is properly planned and managed, to guarantee continuous supply during natural season variability.

233. To provide for the social benefits, defining Loihunu II and III as sources for the surrounding communities (thus, the social and environmental flow) is the primary mitigation measure (thus avoiding possible user conflicts), in addition to the implementation of a sustainable water balance and feasible/fair environmental flow for each of these sources, which takes into account the seasonal variability of the project area (Wet Season 30% of mean monthly flow / Dry Season 10% of mean monthly flow).

#### 1.2.3. Social and cultural disruption due to tara bandu and lulik/sacred areas

234. Several National Laws i.e. Cultural Framework, Base Law for Environment, etc, as well as the requirements of the ADB SPS 2009 ADB are the project guidelines to protect and mitigate impacts to related cultural segments, as a project that involves, exploits, or associates with any type of natural resource use. However, the project also needs to follow customary Law regarding localised cultural customs applied by the community, aiming at the natural preservation, sustainability of the natural elements and social balance.

235. It is important to understand that almost all springs, new and currently in use i.e. Protected Spring and Stream area, are and have always been involved in and have a spiritual importance to the community, under cultural/animistic protection (S- = Negative Significant).

236. Therefore, it is important to involve the lia na'in i.e. cultural leader, and communities to lead in the preparation of cultural ceremony preparation i.e. "opening" and Tara Bandu for authorization to i.e. yearly ceremonies at Loihunu springs or while conducting investigations for existing and proposed water sources, their use, continuance of use and/or cultural/natural protection of the source water resource, to avoid conflicts and distribution interruptions.

237. Project activities during construction phase will be monitored by assigned personnel from the Culture Department. The springs will be demarcated with tapes to limit construction works outside the area and restrict access to the springs unless authorized by relevant authority.

238. Precautionary measures will be taken by all construction workers to prevent damage to the *Lulic* springs. After construction operations, the contractor shall seek clearance from relevant authorities that the springs are in its natural state prior to departure.

### **6.2.2.2. PC2. Water Treatment and Storage**

#### **PC 2.1. New Disinfectant and Storage Systems**

239. The storage and treatment of the water predicted activities encompasses generalised impacts, especially those related to the Water Distribution Network i.e. minor civil construction works of Water Reservoirs. However, there are a few design phases impact and mitigation measures worth noting for this project component.

#### 2.1.1. Waterborne Diseases towards consumers; and 2.2.1. Insufficient treated water due to poor infrastructure and lesser capacity of the water tanks

240. Insufficient water storage capacity and increasing water demand due to population increase and requirements for 2040 supply levels has pushed this project to upgrade the

proposed storage infrastructure in order to avoid interruption of quality water distribution to the current and future registered consumers (MS- = Moderately Negative Significant).

241. In general, the upgrade of the design of new treatment plant and storage facilities that apply a disinfection, chlorination or Calgon dosing system to the Water sources with lower quality and which are not in compliance with WHO standards, becomes the necessary mitigation measure to avoid waterborne disease towards consumers (S- = Negative Significant).

### **6.2.2.3. PC3. Water Distribution Network**

#### **PC 3.1. Identification of Cultural Heritage sites**

##### 3.1.1. Impairment of Cultural heritage properties

242. Cultural heritage refers to sites, structures and remains of archaeological, historical, religious, cultural and aesthetic value. Its identification and examination are helpful in understanding the significance of a site, according to its aesthetic, historic, scientific and social value. Several cultural heritage, touristic and other sensitive sites have been identified and mapped within the Project Area (6 in total) during the field visits in the Inception and Preliminary Design Phase, which are within <20m from and may be impacted by the construction activities, if precautions are not taken (S- = Negative Significant).

243. Preparation of the rehabilitation activity must be done together with the Directorate that represents the Secretariat of State for Culture at the Municipal level. Pre-construction, the contractor must review these and other immovable asset locations that may appear during construction and request approval of a Safeguard Plan for each of the assets, making sure that during the Construction activities, those sensitive heritage sites within 50 m radius of the construction activities should not be interfered with or impacted on, and the rules as mentioned in Decree Law No. 33 /2017 for Cultural Patrimony Protection are followed, with the request, by the contractor, of a license /authorisation for intervention in the area. In case a new cultural/historical heritage site is identified during the construction, the Contractor will notify the SMASA and follow the procedure regarding these sites.

#### **PC 3.2. Preparation of Project for Health & Safety and O&M**

##### 3.2.1. Risk to Health and Safety of Workers - General

##### 3.2.1.1. Health & Safety Plan

244. Workers will be exposed to many threats during construction works such a range of accidents in site due to earthwork activities, dehydration, communicable and transmittable diseases, exposure to hazardous substances, poor sanitation, poor handling and/or operation of the equipment.

245. The preparation of the Contractor for the project requirements is extremely important to guarantee that impacts are minimised and community perspective of the construction management is maintained at a "high" (S- = Negative Significant).

246. At contractor choice, there must be a requirement in the Bid Contract that compromises the contractor to develop a Health and Safety Plan, taking into account all occupational health and safety requirements, such as: i) Install cautionary signage; ii) Ensure sufficient visibility and safety instructions in the work areas; iii) Construction site free of drugs and alcohol; iv) Use of personal protection equipment (PPE) by all workers, etc.

247. It is also fundamental that the contractor provides the name, details of qualifications and experience of the person on the contractor's team who will be responsible for the environmental compliance requirements of the EMP.



248. The Health and Safety Plan must be in accordance with National Law, IFC EHS 2007 and ADB SPS 2009 guidelines to ensure the following:

- a. Train all site personnel on environmental health and safety;
- b. Provision of PPE and proper utilization;
- c. Health and safety training and toolbox meeting, including the communicable diseases and operational system of the equipment;
- d. Maintain records of reports and complaints concerning health & safety occurrences;
- e. Installation of sick bay in the base campsite including recruitment of medical staff (intermittent, on-call) for primary response prior delivering to the hospital or closest clinic;
- f. Emergency plan and collection of all contacts in Viqueque related to accident response;
- g. COVID-19 prevention and response (as per C3.3.7 and Appendix 2 of the EMP).

249. The contractor will provide all handling and safety equipment to all his/her staff to ensure their safety during construction works. The employer shall permit only those employees qualified by training or experience to operate equipment and machinery.

#### *3.2.1.2. HSE Manuals and documentation in Tetum.*

250. This project is concentrated on rehabilitation of existing structures only and therefore there are minimal projected negative effects on construction, which will only occur as a result of the proposed activities, since improvement works are generally aimed at improving benefits to surrounding communities.

251. However, workers and Communities will be moderately exposed to impacts on air and water quality, ambient noise level; mobility of people, goods, and services; accesses to properties, economic activities, and social services; service disruptions, etc. and this impact may be enhanced if manuals and signage are not properly prepared and understood (S- = Negative Significant).

252. Catalogues, manuals and signage shall be prepared in Timorese with sketches on community health and safety and potential occupational health and safety impacts to help explain and avoid occurrence of said impacts.

#### *3.2.2. Risk to Health and Safety of Community – Traffic Accidents and Communicable Diseases*

253. While the volume of vehicles that will be operated from the simultaneous construction fronts at project component sites may not be very large, the condition and characteristics of the roads in Viqueque City i.e. narrow access roads and particularly in market areas, can create traffic jams and hinder the mobility of people, good, and services and people may be exposed to safety hazards from the constricted road space. Communities are also a potential actor in the spreading of communicable diseases (S- = Negative Significant).

254. Apart from the applicable mitigation measures, proper coordination with relevant local authorities, social service institutions and businesses should help mitigate these impacts.

255. Therefore, mitigation measures to be taken are as:

- a. Prepare a Traffic Management Plan;
- b. Proper traffic or road signage and warning signs with good quality of shining barriers to restrict access to the site and minimize road accidents to the local community;
- c. The Contractor to ensure that all vehicles that may be required to pass through villages and transport equipment and materials are operated safely without endangering these communities;

- d. Protect the community by applying the H&S Plan and distancing them from physical, chemical or other hazards associated with sites under construction and decommissioning;
- e. Disseminating information through flyers or others regarding communicable and transmittable diseases (including COVID-19 prevention and response (as per C3.3.7 and Appendix 2 of the EMP)).

#### **6.2.2.4. PC4. Sanitation (Public Toilets & FSTP)**

##### **PC 4.1. Improvement of Water Distribution**

###### 4.1.1. Increase of Groundwater pollution from poor sanitation in Viqueque city

256. With water availability at home comes the increase of and the need to treat the resulting wastewater (Ind S- = Indirect Negative Significant).

257. Viqueque will thus have a two-step wastewater treatment system, consisting of 1) a first stage with a septic tank system at each dwelling; and 2) a second stage treatment through the FSTP supplied by the Government. However, for the wastewater to be treated in an optimum way and to avoid soil and water contamination in the urban area, it is recommended that a widespread communication plan and program is prepared to influence construction license-related Government entities and the public to upgrade existing or construct their new septic tanks in the households according to the standards provided by the MPW.

##### **PC 4.2. Location for Proposed FSTP**

###### 4.2.1. Several impacts due to FSTP project nature

258. In terms of location, the requirements to select a proposed FSTP site considered the specific social, environmental and technical aspects, such as: a) Flat terrain; b) Far from the community's residence; c) Land status to be preferred as Government land; d) No landslide and flooding risk in the selected site; e) an existing water medium as the receptor of the final effluent; f) good road access; g) within range of agricultural areas; and h) outside of and/or no impact to sensitive environmental areas. The choice of the best location with the least possible associated impacts is, in itself, the mitigation measure (S- = Negative Significant).

259. These conditions are aimed to avoid several impacts i.e. inundation and erosion, traffic accidents, emergence of odour and noise towards the nearby community. In particular, instead of occupying unnecessary space in a landfill, the treated dried sludge from the FSTP may contribute to agriculture production as compost and the existing good access to the FSTP avoids impacts from the construction of new road access.

###### 4.2.2. Possible location in Private Land

260. At present, albeit all effort put forward by the DED consultants, there is no official indication on land ownership. Copies of the preliminary locations, with the layouts of the infrastructure to be built (reservoirs, FSTPs, WTPs, etc...) have been submitted both to the Department for Land & Property both at Municipal and National Level and MPW also pursued this issue without success.

261. The social component has conducted a land due diligence survey of the affected land and property on the 14<sup>th</sup> December 2020, in order to substantiate future compensations, if required. Members of the community who were present during the visit confirm reported that the area is communal land (S- = Negative Significant).

262. While almost all the mitigation measures in PC 4.2.1 were met, in terms of location choice, there is a possibility that the chosen location (Site 1) is included in private land. At least three (3) FSTP possible locations were identified and proposed due to their technical and

environmental characteristics, but due to the reasons below, Option1 was the location chosen and decided upon by MPW:

- a) Site 3 (the chosen site) in Suco Maluro – overall presented most of the required conditions, No sacred or cultural sites or tara bandu in the surrounding site, although there is still doubts regarding site's status, if it is government or Private land. (S- = Negative Significant).
- b) Sites 1 in Suco Uma Uain Craic – overall presented all the requirements except for the site bordering a Lulik area (Lamasu Hillside 1) surrounded by the edge of a forest area, and the access road is not established and would need to be rehabilitated, increasing the impacts, therefore not a feasible option; and
- c) Site 2 in Suco Uma Uain Craic – This site is located on a slopped area with sedimentary and erosion prone soil conditions, in a Lulik area (Lamasu Hillside 1&2) surrounded by a forest area with no road access (would have to be constructed) and therefore is not a feasible option.

263. Therefore, if site 3 is indeed in private land, resettlement and compensation measures will have to be defined for the owner of the land, in order to guarantee that the locational environmental and social impacts in 4.2.1. are minimized.

#### **PC 4.3. Sludge Disposal from FSTP**

##### **4.3.1. Soil and Groundwater Pollution**

264. Faecal Sludge Treatment entails that the wastewater at the end of the process must be of a level that it will not impact the receiving environment after treatment, namely surface, groundwater or soil (S- = Negative Significant).

265. Designing an effective sludge treatment is key to achieve this objective and thus, taking into account the constraints in Timor-Leste regarding operation and maintenance or human resource know-how, the project has proposed to implement a system of earthen lagoons for biological treatment of the sludge, with Primary (2+1 facultative lagoons) and Secondary (3 aerobic lagoons) treatment. At the end of this process, the effluent will be directed to a final treatment, namely an irrigation cropping area with a vegetative and permeable soil medium in order to absorb the last remaining nutrients in the effluent and devolve the water up to an acceptable standard into the receiving environment.

#### **6.2.3. IMPACTS IN THE CONSTRUCTION PHASE**

266. As mentioned previously, the construction activities will likely produce more negative impacts towards environmental stability and the local community. Other than the pipe laying works (new and/or rehabilitation), the rest of the construction activities will be restricted to their respective confined area, thus the interference with the public and surrounding community should be minimal. Negative impacts to be generated are predicted as mostly temporary, such as noise and air pollution (that causes disturbance to the nearby dwellings and commercial buildings), construction waste (solid and liquid), increased traffic (especially in narrow roads), as well as health and safety risk to workers, declining of water quality, soil erosion, etc.

267. These are all general impacts of construction in urban areas, but it is important to remember there may be serious impacts that jeopardize private and public properties if the contractor does not implement the proposed mitigation measures. Therefore, methods of mitigation have been developed and suggested, adapted to Viqueque city, in order to prevent negative impacts, and are all established in the EMP.

268. The above-mentioned impacts, albeit in different scales, are common to all four project components i.e. water a) sources; b) treatment and storage; c) distribution; and d) sanitation, in regards to the construction of all these infrastructures. Therefore, in this subchapter (and in the EMP), they are described in general in Section C3. Water Distribution, since this component is the most significant regarding the construction phase, while only the specific impacts to the other components will be described in each of their subchapters.

### **6.2.3.1. C1. Water Sources**

#### **C1.1. Inadequate protection of intake/bore structures during rehabilitation**

##### 1.1.1. Intake overflow to cause erosion

269. The spring and river intakes will require minimal protection during their rehabilitation so as to avoid any overflow into unplanned areas, and possible erosion of adjacent areas (MS- = Moderate Negative Significant).

270. It is important that the intake has adequate land for perimeter fencing and connection to a temporary drainage that shares the overflow with pre-existing neighbours, thus avoiding any unnecessary erosion or impact to adjacent communities.

271. For the river intake, the constructor must ensure that no spoils or obstacles are left in the river that may cause ripples or current that cause erosion in embankments of other.

##### 1.1.2. Socio-Cultural Impact

272. Just as in PC 1.2.3, the spiritual opening of the construction activity is extremely important to avoid conflicts with the local communities, particularly in locations as sacred as the springs (S- = Negative Significant).

273. Thus, it is important to involve the lia na'in i.e. cultural leader, and communities to lead in the of cultural ceremony of i.e. "opening" for the continuance of use and/or cultural/natural protection of the source water resource, to avoid conflicts and distribution interruptions.

### **6.2.3.2. C2. Water Treatment and Storage**

#### **C2.1. Upgrading activities to Water Treatment and Storage**

##### 2.1.1. Worker exposure to disinfection chemicals during installation

274. During construction there may be some risk of contact with the disinfection chemicals, on the part of the workers that are installing and/or storing the first batch of disinfection equipment and materials (S- = Negative Significant).

275. For this activity in particular, it is fundamental that the contractor provides and obligates the use of PPE to handle these substances, such as i.e. mask, gloves, and safety boots and restrict access to a minimal number of authorised persons.

### **6.2.3.3. C3. Water Distribution**

#### **C3.1. Induction of Contractor**

##### 3.1.1. Enhanced impacts because of lack of knowledge of the EMP

276. Clear understanding of the EMP, by the Contractor, is paramount to avoid enhancement of potentially adverse impacts in the project area (S- = Negative Significant).

277. Therefore, after selection of the Contractor, SMASA and the PMU will meet the Contractor's HSE responsible staff prior to contract commencement and on-site to explain and confirm understanding of the EMP conditions. After SMASA and the PMU are confident that the contractor understands and can comply with the EMP, SMASA will give the "go-ahead" for the

Contractor to commence work. During construction, the Contractor will work according to the requirements of the project EMP.

### **C3.2. Construction Activities – Macro Benefits**

278. See 5.2.1. Overall Beneficial Benefits

### **C3.3. Construction Campsite**

#### 3.3.1. Campsite Location, Community and Landslide Risk

279. Typical construction camps cannot be established on the sides of the roads of the alignments as most of the sites are surrounded by housing, private property or buildings and therefore there isn't sufficient space to accommodate the campsite (MS- = Moderate Negative Significant).

280. Thus, basecamp and work site camps sites are proposed to be established in central locations, preferably in Government land that are flat and landslide and floodplain risk free and shall not be located near settlements, water supply intakes or sites that affect local access to drinking water. All sites must apply mitigation measures to prevent impacts to surrounding community and environment i.e. wastewater, waste, dust, noise, etc. After use, sites shall be cleared and restored to status as they were and, if required due to their surroundings, to near natural or stable conditions with vegetative cover.

281. There is also a need to perform an assessment of compliance of proposed camp with the workers' camp siting and management - mitigation measures for H&S and COVID-19.

#### 3.3.2. Wastewater and soil/water contamination

282. Throughout the duration of the project, the campsite will house many personnel and facilities in the campsite will need to be available for those who do not lodge in the area. A suitable latrine is a primary facility for a construction camp, which also brings wastewater issues (S- = Negative Significant).

283. Good housekeeping practices, maintenance of latrines, and protection from surface runoff provides favourable hygienic conditions for the workers. This will also prevent the accumulation of flies in the area, which are vectors for transferring food-borne illnesses.

284. The latrines must include a proper septic tank design (at a minimum) and should be located in an area at least 30 m from any domestic well, to minimize the risk of contamination or downhill of wells within 30 m distance. It will be elevated to prevent surface water from flooding the sanitation facility especially during rainy season.

#### 3.3.2. Water Source for Campsite may compete with Community Sources

285. While some water distribution exists currently in Viqueque, the campsite may require to be established in an area where the distribution system does not exist yet. The communities, under these conditions, may experience shortages in water supply during the dry season and thus sourcing water for the campsite locally from tap water/pipe line/boreholes may create conflict with the adjacent community (MS- = Moderate Negative Significant).

286. The campsite should establish a water tank large enough to provide for the campsite requirements, to be filled with water purchased to SMASA from authorised water sources. Also, purchasing sufficient potable water supply in the form of water litre bottles and/or gallon containers will ensure the health safety of the workers and prevent disturbances to the communities in their utilization of public water from taps.

### 3.3.4. Storage of Hazardous chemicals, waste and construction materials may bring spills, fire hazards and H&S problems

287. Improper storage and handling of construction materials may have the potential to impact the surrounding areas (S- = Negative Significant).

288. Properly stored chemicals will minimize human contact, thus providing a healthy environment for the workers. Fuel and lubricants for construction machinery will be stored as delivered in steel drums in the work areas and properly handled to prevent contamination of nearby water bodies. Allocating appropriate containment for hazardous materials will reduce vulnerability to fires and health effects of exposure to chemicals like cement and hydrocarbon-based products.

289. In the event of conflagration, fire protection facilities such as fire extinguishers, water tanks with available buckets and stock of sand to cover fuel spill will be provided. Also, containing flammable materials in a fire-resistant enclosure will prevent the spread of fire and provides additional fire safety measures for the workers and the public.

290. When identified, Asbestos Containing Materials (ACMs) i.e., used pipes must be handled under controlled conditions (with gloves, mouth and eye protection and under moist conditions so as to not break the materials and risk inhalation. The contractor must coordinate with the DNCP on solution for deposition of these materials. The CEMP must include ACM management plan to detail how to identify, remove, and safely dispose of ACMs. When Asbestos Containing Materials (ACMs) are identified:

- (i) First confirm ACM status. Send a carefully extracted and properly wrapped sample to an approved laboratory for testing.
- (ii) Cordon off the area, control access, and provide clear signage of the ACM risk.
- (iii) Provide all staff with correct PPE:
  - Clothing -> personal protective clothing to prevent skin contact / long sleeve + disposable.
  - Respirator -> min P3 respirator, or N95 Dust mask.
  - Goggles, gloves and safety boots.
- (iv) Identify, mark, delineate the ACM that will be removed and do-not mix ACM with non ACMs.
- (v) Avoid cutting or breaking ACMs if possible. If cutting is required wet the ACM surface and add duct tape to reduce the risk of dust generation.
- (vi) Decontaminate equipment prior to and after use.
- (vi) Supervision + Sampling material (if any left), make sure all asbestos material has been removed. Prepare Site Clearance Report.
- (viii) Removed asbestos must be contained, wrapped or sealed, and placed into removal bags or bins and labelled. Use only durable container: double bag polythene, drum or bin.
- (ix) Asbestos waste should not be disposed of with other wastes. In countries where asbestos use is regulated, there will be special or hazardous waste disposal facilities. If special facilities are unavailable, asbestos waste should be sealed in double lined bags and disposed of at a secured waste site and kept separate from other types of waste. Work with the local government to identify a suitable and safe site and ensure that a record is kept of the location. If Asbestos is properly contained, buried, and remains undisturbed it will remain safe and pose no further environmental or health risk.

As there are no direct guidelines under Timor laws and regulations on ACMs refer to international standards and guidelines:

- US Environmental Protection Agency, Asbestos page: <http://www.epa.gov/asbestos/>
- WHO Occupational Health Publications, Asbestos: [http://www.who.int/occupational\\_health/publications/asbestosrelateddiseases.pdf](http://www.who.int/occupational_health/publications/asbestosrelateddiseases.pdf)
- The East Timor Transition Administration (ETTA), in cooperation with AusAid prepared a guideline on asbestos risk reduction; "Guidelines on Maintenance, Handling and Disposal of Asbestos Materials and Asbestos Waste" - September 2000. This provides: (i) guidelines on the maintenance of asbestos-cement products; (ii) guidelines on the handling of building rubble and other material containing asbestos; and (iii) guidance for the siting and management of asbestos disposal sites.

291. Materials for the works i.e. sand, gravel and cement, fuel and lubricants, will be planned duly to be hauled directly into the work sites and utilized as work progresses, with all haul trucks covered with tarpaulin, especially when hauling aggregates and sand.

### 3.3.5. Non-hazardous Solid Waste Improper handling and storage and vector diseases

292. Implementation of a Solid Waste Management System throughout the duration of the project will improve hygienic conditions of the workers. A clean environment is less vulnerable to disease carrying insects and less likely to be a source of health complication (MS- = Moderate Negative Significant).

293. Minimisation and proper handling and storage of solid waste in the campsite will maintain a pleasant environment for the workers and the local communities. Keeping non-hazardous waste in closed bins will prevent luring in scavengers such as rats, dogs, pigs and wild animals that could displace waste in the campsite.

294. Proper disposal of solid waste to authorized dump sites/landfills, referred and identified by the SMASA or DNCP-Viqueque will ensure that waste is not disposed in random areas of the forest where it may have implications to wildlife and local communities.

295. Also important is the inclusion of mitigation measures for COVID-19, in the form of a COVID-19 response plan, to comply with country-specific COVID-19 risk management regulations and directives including Government rules and guideline.

296. Conduct workplace risk assessment to identify low, medium or high exposure risk to COVID-19. Prepare an action plan for prevention and mitigation of the spreading of COVID-19. At a minimum, Screen on entry the temperature of each person entering the work site and record their contact details to facilitate tracking of infected persons should there be a need and PPE and inform workers of its correct use.

### 3.3.6. Food for construction personnel may compete with food supply for the local communities

297. To ensure that workers do not interfere with local food supply, adequate food supply will be provided by the contractor, sourced from local vendors (S- = Negative Significant).

298. This will also discourage poaching of wild animals and of communities' livestock grazing freely in the forest. In addition, prohibiting poaching will protect local *fauna* and livestock of the communities.

### 3.3.7. COVID-19 transmission risks between workers and community in Camp and Work sites

299. Construction Camps and work sites and access roads will necessarily mean OH&S risks not only to construction workers, but also to people living and working around the sites. These risks not only come from a range of activities including the use of heavy machinery, excavation and trench work, earth moving, and use of chemicals but also the risk of



transmissible diseases i.e. sexually transmitted diseases or the more current COVID-19, which may likely increase in the community if there is a significant influx of migrant workers (S- = Negative Significant).

300. It is important that mitigation measures are put in place that help the contractor minimize or prevent these occurrences. Information dissemination is extremely important for the management of the site regarding these diseases but COVID-19 has been the recent focus due to the ease of contamination. To help prevent and mitigate this threat, the Contractor will have to implement a COVID-19 Management Plan that focuses on (but not limited to) the following major tasks:

- Plan and execute work in compliance with country-specific COVID-19 risk management regulations and directives including directions of the General Department of Labour, Secretariat of State of Labour, and Vocational Training.
- Conduct workplace risk assessment to identify low, medium or high exposure risk to COVID-19. Include an action plan for prevention and mitigation of the spreading of COVID-19 in the COHSE Plan.
- Risk communication, training, and education. Training of workers in infection prevention and control practices.
- Adopt engineering, organizational and administrative measures, plan work so employees can keep distance from each other and minimize contact.
- Provide clear and visible guidelines on how to prevent infection at the construction site and initiatives taken.
- Screen on entry the temperature of each person entering the work site and record their contact details to facilitate tracking of infected persons should there be a need
- Promote personal hygiene (including hand and respiratory hygiene), make wash basins and sanitizers available at entry, break area, and washrooms. Regularly clean and disinfect.
- Provide PPE and inform workers of its correct use.
- Health surveillance and insurance.
- Review emergency preparedness plans.
- Review and update preventive and control measures as the situation evolves and involve workers/ occupational H&S groups in the review.

### **C3.4. Construction Materials**

#### **3.4.1. Sand and Stone Extraction and disturbances to environment**

301. Although most of the trenching will reapply the excavated soil from pre-existing alignments, there is still a need for a percentage of the trench to in-fill with sand and gravel for the cushioning of the pipe bed and support the top layer asphalt. This extraction activity can disrupt natural land contour, soil erosion, loss of vegetation, scouring of riverbeds, ponding, water logging or water pollution (S- = Negative Significant).

302. The Contractor will request licensing/authorisation for all extraction sites from the necessary authorities (ANPM), under MPW. The extraction activities for these materials must be done to the quantities required by the project only. The MPW weekly supervision will allow regulating the extent and volume of extraction based on the current conditions of the quarries and/or rivers (sand extraction) and allow authorities to monitor and ensure the quality and good condition of the extraction sites, ensuring that extraction activities will not have social or ecological disturbances, and that the quantities of extracted sand and stone conform to the project specifications, which will also reduce the generation of spoils in the construction site.

303. In such instance where additional sand and stone will be required, it should be based on technical reasoning, intended solely for the development of the project components. All non-

established extraction sites/borrow pits must be restored maintaining natural contours and vegetation.

### **C3.5. Construction Work Front: all Infrastructure (Inlet / Tank / WTP / Water pipes / FSTP)**

#### **3.5.1. Servicing and Fuelling of Construction Equipment and spills and pollution**

304. Hydrocarbon based products are toxic to humans and straying wildlife upon prolonged exposure and exposure to high quantities. It is also a possible source of fire (S- = Negative Significant).

305. Define rules from using unmaintained vehicles and ensuring that all equipment is in good condition prior to operation minimizes the likelihood of leaks and accidental spills. Prohibiting equipment and vehicle with leaks and causing spills prevents the accumulation of toxic contaminants in the forest, and minimize the probability of bush fires, thereby maintaining a safe environment for wildlife and local communities.

306. Maintenance and repair of vehicles such as washing, repairing leaks, changing parts etc. should be done in the central base camp site, confined within a designated area. This area should have a concrete surface or lined with an impermeable surface (ex. plastic) with built drainage to contain wastewater contaminants. The drainage may be built as a subsurface drainage for direct treatment. Otherwise, the drainage should channel wastewater to an infiltration trench system for treatment of wastewater constituents (hydrocarbon and metals) prior to infiltration to the subsoil. A fuel secondary containment must be available in the event of fuel spills and Removable Well Cap for monitoring and sampling purposes.

#### **3.5.2. Excavation, Cutting and Filling and safety hazards to Public and workers**

307. Construction sites, especially those with trenching, have a high risk for low height/high impact accidents for workers and the community (S- = Negative Significant).

308. Placing adequate visual signage in excavated, cut and filled areas will reduce safety risk of the workers and the public. Installation of light reflecting road signs will provide safety measures for people and vehicles accessing the road during night-time. Vivid and readable Warning signs maintained on sites of construction, especially haphazard zones will inform public of danger sites and caution to take precautions. This will reduce the likelihood of construction and road accidents.

#### **3.5.3. Stockpiling and Storage of Construction materials and dust, water runoff damage to existing utilities, buildings and drainage blockage**

309. Improper storage and handling of construction materials may have the potential to contaminate the surrounding areas (S- = Negative Significant).

310. Periods of high wind events may disperse stockpiles, generating airborne dust particulates, particularly during dry season. Covering stockpiles with impermeable material will minimize the generation of fugitive dust or wastewater runoff in the surrounding areas. Where possible, it should be stored in the campsite, otherwise utilized at once when stored on-site. Easily accessible storage areas will minimize interferences to water runoff into drainage and the movement of vehicles and personnel in the campsite and will allow fast transport of materials.

#### **3.5.4. Excavation, Cutting and Filling and Soil Erosion and Land Disturbance**

311. Excavation activities have the potential to cause soil instability, erosion and silt runoff especially during wet season, and spoil materials from earthwork activities that are not being managed properly can disturb the construction work and/or traffic, and decrease the aesthetic and economic values of the area. This resulting activity may also impede the access to the community's houses and other buildings (MS- = Moderate Negative Significant).

312. Mitigation measures to be taken should be: a) Proper backfilling trenches; b) Earthworks targeted for dry season as soil erosion vulnerability is high during wet season, thus, stockpiles (sand, cement and aggregates) will not be situated at or near steep areas; c) Exposed soil will be stabilized and re-vegetated to prevent further soil erosion; d) Provide for temporary access and diversion to dwellings and buildings where these are impeded, to avoid traffic accident or others.

#### 3.5.5. Construction and Noise Disturbance to surrounding communities and sensitive areas

313. The project will include heavy machinery and vehicles activity during this phase, such as demolition works, movement of trucks and equipment, earthworks, concrete mixing, loading and unloading construction materials. These types of activities may have a potential impact in noise-sensitive areas i.e. residential or buildings such as government, health care or educational facilities. Noise level will be done in adherence to WHO Community noise level guidelines (S- = Negative Significant).

314. The Contractor must implement a Noise Management System with the following Mitigation measures: a) Limit and/or no unnecessary engine idling duration in construction area, as well as use of power horns; b) Reduce speed limit in the work site and all road-worthy project equipment must not circulate above 40 Km/h in residential areas and 50 Km/h in urban areas; c) Construction Monday to Friday (7:00 am to 7:00 pm), Saturday (7:00 am to 1:00 pm if inaudible at residential premises), No construction works during night-time (7pm to 7am), Sundays and Holidays; d) No construction works on a particular time wherein cultural and religious practices are carried out.

#### 3.5.6. Construction and Dust (Air quality decrease) to the community

315. No major air quality concerns are projected to occur during the project implementation as the planned works require small scale and not much equipment, confined excavation to be undertaken and it is not projected to result in a significant increase in particulates matter in the area, only dust generation which can affect the respiratory and eye systems (S- = Negative Significant).

316. The Contractor must apply an Air Quality and Dust Management System with mitigation/control measures such as watering and sprinkling of the excavated ground surface, to suppress dust from becoming airborne (at least twice a day or whenever visual inspection/monitoring or GRM complaint require immediate dust suppression), especially required frequently during dry season, or near residential and built-up areas. Covering stockpiles will protect them from wind and will contain light particulates to the surface. Minimising the movement of vehicles to 40 km/h in residential and 50 Km/h maximum in urban area will also reduce the generation of fugitive dust.

#### 3.5.7. Construction and Impact on Ecological Resources

317. During the implementation for the rehabilitation project, attention must be given to protect and minimize negative impacts on environmental sensitive areas and ecosystems, or the natural environment. Overall, the project area is in urban area and the trenches and trenchless works will not have direct impacts since the work will be done within the ground adjacent to the road (ROW) or confined to the planned area of construction.

318. Nevertheless, the project only has 2 locations that are deemed sensitive (see PC1.1.1. Loihunu and 1.1.2. Cuha River) and should other areas be encountered during the construction activities, the contractors must ensure to establish a Sensitive Areas Management Plan to make sure no impacts occur in this regard (S- = Negative Significant), namely vegetation and trees removal are avoided and no fauna is destroyed.

319. However, if some of the construction works must forcefully remove roadside trees under the supervision of the NDPA and SMASA, the contractor is required to compensate with trees replanting and re-vegetation. It is also important to limit noisy activities within these areas, in

order to stabilize the fauna's mobility, and restrict permanent campsite location, clearing, parking, and movement of heavy vehicles and equipment stockpiling.

### 3.5.8. Impacts on Socioeconomic Resources, Infrastructure, Utilities and Cultural Sites

#### 3.5.8.1. Reducing impact on established Businesses activities and others

320. Large numbers of shops, businesses, industries, and other economic activities may be affected by the network improvement works, as most of the components are located in an urban area, with ROWs in roadways, although the work will be carried out on individual short lengths of the network, thus the period of construction in each section area will not last long.

321. No major impacts will be expected on the economy of the city or its citizens given the installation of distribution pipes will be conducted by trenchless methods as much as possible, which require small-scale excavation, conducted the road in right-of-way (RoW), not requiring land from private owners. Additionally, the proposed FSTP is located far from the community's households and commercial buildings.

322. Nevertheless, there can be economic impacts if roads have to be closed for short periods and customers are unable to gain access to shops, or if trenches are constructed near the sides of roads, and customers are impeded by the presence of trenches, excavation, workers and machineries. Resulting losses in income are expected to be small (or inexistent) and short-lived (S- = Negative Significant).

323. Applicable mitigation measures would be planning and making available temporary access ways to all businesses and activities affected and, in extreme cases, determine compensation to the affected business that have justifiably been impacted and demonstrate reduction of income due to the project's direct construction activities.

#### 3.5.8.1. Reducing impact on established Businesses activities and others

324. Cultural sites and infrastructure can be impacted if the constructor does not apply caution to the construction ROW (S- = Negative Significant).

325. Constructor must follow the precautionary measures and rules in the Construction Protection License (see PC 0.5.2) and his/her own Safeguard Plan (see PC3.2.1) for each site, in order to avoid any impact and/or degradation of these sites.

### **C3.6. Construction Work Front: all Infrastructure (Inlets / Tank / WTP / Water pipes / FSTP)**

#### 3.6.1. Site clean-up and rehabilitation of locations

326. The project should endeavour to return the project sites to their original state, where possible, in order to guarantee the constructed infrastructure blends with its surroundings and does not impact communities or the environment (MS- = Moderate Negative Significant).

327. The contractor must remove all his/her materials, facilities, etc, as the completion of the project components occur. Excess rocks and sand as a result of excavation activities are not to be dumped next to surface waters and left prior to departure and proper coordination with local authorities must be done of appropriate sites where mass load are needed. This had to be spread in natural looking manner and left in a stable state.

328. At campsites, besides all equipment, all evidence of the project being there must be retrieved and the latrines and septic tanks must be filled with a soil mixed of dry plant matter soil prior to departure.

#### **6.2.3.4. C4. Sanitation**

All construction activities for this component are reflected in 6.2.3.3 C3. Water Distribution.

### **6.2.4. IMPACTS IN THE OPERATION AND MAINTENANCE PHASE**

329. The operation and maintenance phase is a stage where the constructed facilities are ready to be used and how SMASA, as the responsible agent, is going to manage them properly so that they can function accordingly with the O&M manual as a foundation for all the related procedures. The EMP will guide SMASA with some provided mitigation measures aiming to minimize or inhibit possible impacts from occurring. This too, enables SMASA to resolve the anticipated issues as fast as possible.

330. Various activities in this phase generate both positive and negative impacts originally come from each component of water sources, treatment and storage, distribution up to sanitation which are described below.

#### **6.2.4.1. O1. Water Sources**

##### **O1.1. Protection of the Water Source Quality**

331. The existing condition in the Loihuno water source in Viqueque is concluded as not well protected and according to the field observation, the upstream and surrounding area of Loihuno system has intensive human activities such as agriculture or housing areas with no proper sanitary infrastructure, as previously cited in Chapter 3.2.3.

332. Given the circumstance that the existing conditions needed to be upgraded with more advance designs and programs to maintain a good quality of potable water for the community's consumption, therefore, it is mandatory for the SMASA operators to be duly consistent on implementing programs as mentioned below as part of mitigating such impacts.

##### 1.1.1. Declining of the Water Source Quality

333. As the population number ascends, there will be more houses built adjacent to where the water sources are located (upstream) as the community's main target, especially when the sanitation facilities in each household are built inadequately. The more intense human activities intervention in that specific area, the more polluted the water quality will be. The said impact is likely to be indirect significant (IS-).

##### *1.1.1.1. Implementation of Upstream Watershed Protection Programs*

334. Protecting the upstream zones and area encompassing the water source such as restriction to slash and burn activity, animal husbandry, other typical deforestation activity, irresponsibly disposing household chemicals, etc. Information also needs to be disseminated to the community regarding to watershed protection in order to expand awareness which can thus trigger them for the implementation, promptly as possible. The responsible agent i.e. SMASA and Municipality should be able to encourage the local leaders such as Suco Chiefs, Aldeia Chiefs, and also the community to take part in this program.

##### *1.1.1.2. Improvement Program for all Existing and Future Dwelling Sanitary Infrastructure*

335. Community in the district either in the urban, semi-urban, or rural areas, particularly the low-income family, are proven to scarcely own sanitation infrastructure of septic tanks with any further preliminary treatment process and de-sludging activity. It is considered very crucial because the untreated sewage that's being generated from the households would flow directly to the water bodies and even to the ground, which can then cause water and soil contamination. The presence of water stored in the ground is easily to be impacted with this sort of condition mentioned above.

336. Improving the existing and future private sanitary facility is also part of the Watershed protection program aiming to conserve the underground water volume and its quality. The such program that can be offered and applied for is to promote the SMASA septic tank design template to the community in a comprehensive way, but also to mainly focus on the community surrounding the water source and other upstream watershed area.

*1.1.1.3. Involve the Lia Na'in and Communities for Cultural Ceremony Preparation and Tara Bandu Protection of the Source*

337. The programs mentioned above will not be successfully attained if they are not fortified by the establishment of Tara Bandu (local regulation) and the cooperation and involvement between the local Lia Na'in with the community. The local community and its culture play important contribution on managing the resources, although SMASA will be the one responsible for all the requirements to prepare for the Cultural Ceremony.

## **6.2.4.2. O2. Water Treatment and Proposed Storage**

### **O2.1 Mishandling of Chlorine**

338. Water quality tests in Viqueque have shown that some water sources are commonly contaminated by E. Coli and Total Coliform contamination. To ensure the potable water conveyance to the consumers and due to the design analysis, some of the water tanks to be reconstructed will be designed with treatment facility i.e. disinfection type by injecting Sodium Hypochlorite into the proposed tanks with stored water.

339. After the construction phase, the SMASA operators will still have to encounter some risky tasks e.g. dealing with operating chemical hazards which subsequently may threaten the workers' health and safety. The impact of chemical exposure is adverse and significant (S-) towards the workers and some mitigation measures should be seriously taken into account, as described below.

#### 2.1.1 Health Hazards towards the Operators

340. When it comes to mishandling of hazardous substance, the impact will directly and solely effect on the workers. Chlorine, hypochlorous acid and hypochlorite ion exposures can result in irritation of the oesophagus, a burning sensation in the mouth and throat, and spontaneous vomiting.

##### *2.1.1.1. Ensure Proper Storage and Handling Practices for Chemicals*

341. Chemicals either they are imported or not, should be placed properly in an indoor warehouse, avoidance of sun exposure and room temperature control, in order to maintain the chemical composition in its original state, and diverting fire and explosion from occurring.

##### *2.1.1.2. Ensure the Knowledgeable and Skilled Person is in Charge of Chlorine Handling*

342. Operators still need to be provided with training skills with simulation performances and equipment if any, in order to improve their capacity in the working field especially on handling the Chlorine.

##### *2.1.1.3. Ensure use of PPE while Using Chemicals*

343. Workers or operators are obligated to use PPE as part of HSE procedures during working hours. Face masks, safety boots & jackets, gloves and goggles are examples of equipment that workers must wear to protect themselves from any undesirable accidents.

344. Supervisor needs to do monitoring in each of the water storage location and do registry of workers who are or are not in compliance with the usage of PPE, as a mechanism for the workers working performance and their consistency.

### **6.2.4.3. O3. Proposed Distribution Network**

#### **O3.1. Sound Operation of Clean Water Distribution System**

##### 3.1.1. Improved Health and Hygiene

345. This project is aimed to improve water supply and sanitation sectors to the community. This project will result in improvement of local people's hygiene and public health and thereby reduce the waterborne disease. A regular maintenance of the project's components will provide continuous benefits to the local people. The impact is therefore direct in nature, local in extent, high in magnitude and long-term in duration (S+).

##### *3.1.1.1. Proper Operation of the Distribution System*

346. This mitigation measure is aimed on providing an adequate and reliable supply of safe water to its users. Operation includes monitoring the system state, running the system and enforcing policies and procedures.

#### **O3.2. Drinking Water Supply System**

347. Monitoring activity conducted by operators is to ensure the water distribution components are operating properly and consequently can guarantee the necessity to the users in terms of quantity and quality of water. Although, there will be certain impacts expected to occur, similar as other water supply projects e.g. pipe leaks and bursts, and changes in the water quality due to natural phenomena, inadvertent negligence or non-incompliance of O&M manual.

348. Nevertheless, this phase will not anticipate any illegal connections in the sources and other locations because mitigation measures are already established previously in the design phase in terms of water sources protection of the rehabilitated intakes and boreholes area, and additionally water pipelines are designed to be implanted under the ground. However, impacts that are constituted in the EMP matrix particularly on water delivery system are described below along with their mitigation measures.

##### 3.2.1. Delivery of Unsafe Water

349. This refers on the diminishing of the water quality and volume with a rating impact of moderate significant (MS-) because they can be quickly mitigated and somehow the duration will only be temporary without causing any acute effect on the environment and public health.

350. The water quality that is affected depends on the activities upstream contaminating the immediate area of the sources and also pipe leaks along the distribution line.

##### *3.2.1.1. Prepare Operations and Maintenance Plan*

351. The referred manual is prepared by the selected Contractor for this project and should provide detailed information on the related matter. The O&M manual will then be used by the SMASA as a guideline during operating and maintaining the quality of the facilities from impairments.

##### *3.2.1.2. Implement a Water Quality Control Program (WQCP)*

352. The WQCP should be drafted based on the requirements of Decree-Law no. 31/2020 – Water Quality, in order to ensure the system monitors and distributes safe drinking-water to prevent contamination of water sources, to treat water, to reduce or remove contamination that could be present to the extent necessary to meet the water quality targets in Timor-Leste, and to prevent re-contamination during storage, distribution and handling of drinking-water.

##### *3.2.1.3. Monitor Water Quality*



353. The SMASA as the responsible agent should plan its sampling schedule for water quality testing as per Decree-Law no. 31/2020 – Water Quality, specifically under the requirements of Annex II of said regulation, daily at each WTP exit and monthly in all sampling points defined in the WQCP.

### 3.2.2. Detection and Repair of Leaks and Pipe Bursts

354. Pipe bursts are commonly happened in the water distribution systems. Detection of pipe burst events usually comes from direct visual observation or customer report, although this sort of method is not efficient and time-consuming. Leaks and pipe bursts should be solved accurately and quickly to reduce water loss and further damages to the pipes (MS-).

#### *3.2.2.1. Ensure Leak Detection and Restoration Time is Minimized to the Extent Possible*

355. To mitigate leaks and pipe bursts, there should be an advance design with time-efficient method for burst detection techniques either equipment-based method or software-based methods. Not to mention that giving trainings to the workers in regards to implement those methods is also essential.

### 3.2.3. Excessive Algal Growth in Tanks

356. The presence of algal in reservoir can affect in deteriorating water quality because it releases toxins that often lead to several disruptions e.g. health concerns, water taste and odour problems. Water that is contaminated with algae can endanger the whole water supply system, since not all water tanks or reservoirs will be installed with treatment facilities. This kind of impact is likely to be moderately significant (MS-).

#### *3.2.3.1. Water Tank Maintenance and Cleaning Schedule*

357. Mitigation measures to be taken: a) Close Water Tanks All the Time; b) Clean Reservoirs as per the O&M Schedule.

## **6.2.4.4. O4. Sanitation (Public Toilets & FSTP)**

### **O4.1. Sanitation Facilities (Toilets & Sludge Disposal Site)**

358. Community toilets are used by the public with numerous people coming in and out every day to utilize the facility. The absence of operation and maintenance is a frequent cause of failure of service. This general impact also applies to primary treatment on-site septic tanks of each household.

#### 4.1.1. Contamination of Land or Waterways due to Overflow of Septic Tanks and the Uncontrolled Dumping of Sludge

359. Contamination of land and waterways and dumping of Sludge may generate odours and nuisance to the community and the environment such as health problems and soil contamination (S- = Negative Significant) if not properly addressed.

##### *4.1.1.1. Further Septic Tanks Design*

360. The design of the septic tanks' dimensions should be able to ensure maximum retention to avoid overflow of the wastewater. In addition, routine maintenance and health of the system should be associated in one part of the process to have a smooth operational progress and sustain the facilities in good condition, such as scheduling and implementing de-sludging and cleaning activity regularly. Septic tanks will be emptied at the required frequency of minimum every 3 years. Households will also be educated to reduce the likelihood of septic tanks overflows and uncontrolled dumping of sludge.

### **O4.2. Operation of FSTP**

361. Sludge is composed of by-products collected from different household on-site septic tanks to the wastewater treatment process. It contains both compounds of agriculture value and pollutants which usually consist of heavy metals, organic pollutants and pathogens.

#### 4.2.1. Soil and Groundwater Contamination

362. Uncontrolled nutrient introduction in soils from the mistreatment effluent from the FSTP is a major environmental concern. Transport of the nutrients through the soil may eventually lead to groundwater contamination significant impact (MS- = Moderate Negative Significant).

##### *4.2.1.1. Treated Dried Sludge Distributed for Farming Activities and Effluent to Irrigation Cropping Area*

363. Treatment and disposal of sewage sludge and effluent are major factors in the operation of the specific faecal sludge treatment plant. Treating sludge before final disposal is aimed on reducing its volume and stabilizing the organic materials, nitrogen, phosphorus and potassium. The treated dried sludge will derive from the maintenance cycles of the primary treatment and may be contributed for surrounding agriculture activities, while the effluent will be discharged into a horizontal planted gravel filter for final treatment before absorption into the soil medium. Stabilized sludge does not have an offensive odour and can be handled without causing nuisance or health hazard.

##### *4.2.1.2. FSTP Malfunction*

364. There are also certain environmental risks from the failure of properly operating the FSTP, most notably disposal of untreated faecal material or incompliant wastewater pollutant levels to soil and groundwater, which can damage human health and contaminate both soil and groundwater.

365. It will be important therefore that the SMASA follows O&M manuals and ensures all the components are maintained as per specifications, and establishes a procedure to routinely check the operation and integrity of the FSTP, particularly when beds are (nearly) full and during the rainy season, to implement rapid and effective repairs where necessary.

366. Additionally, and while downstream from the FSTP site no dwellings or activities were identified, there is a need for frequent effluent testing (3 monthly) just before the horizontal planted gravel filter, to guarantee that the facility's effluent complies with the wastewater guidelines in effect in Timor-Leste.

367. In the event of a malfunction and sludge maintenance must be carried out, then the SMASA must coordinate with the Municipality of Viqueque and the Municipal Environmental Directorate to follow their instructions regarding a final safe and correct sludge deposition location.

#### 4.2.2. Community and Occupational Health & Safety risks of the FSTP infrastructure

368. Uncontrolled access and proximity of both staff and community may bring increased risks for their health and safety (MS- = Moderate Negative Significant).

##### *4.2.2.1. Health & Safety Manual as Part of the Operation & Maintenance Manual*

369. The contractor will be required to prepare an Operations & Maintenance Manual that includes a Health & Safety Manual and at commissioning, provide a signed commitment from the operator to a) understand and b) comply with IFC Environmental Health and Safety guidelines (2007), as well as provide for and conduct training programs for workers in workplace safety of FSTP operation and safety orientation trainings including regular safety drills for workers. It is also important that the operator provides appropriate and adequate PPE for all operational staff and workers (including regular training and drills on the use of PPE and other emergency equipment).

370. Equally important is the need for the operator to implement fencing and appropriate signage to prevent public access to the FSTP infrastructure, as well as cover as much standing water as possible and regularly treat for mosquitoes during seasons of high incidence of mosquito-borne diseases such as dengue.

#### 4.2.3 Odour Occurrence

371. It is important that the FSTP is performing as designed and constructed so that odour perception around the plant is within acceptable limits. This odour may also occur due to the frequent dumping of truckloads of faecal sludge in and around the FSTP (IS- = Negative Insignificant).

372. However, the FSTP is located in a gently sloping area and with distance from the highway about 350 meters and 220 from the river. Additionally, the closest dwelling is 400m away from the site.

373. Nevertheless, good practice will be instituted in the FSTP operation procedures and proper maintenance of the facility must be upheld, including avoidance of pools of dirty stagnant waters and spills in the FSTP area and surroundings i.e. access road.

374. Odour monitoring will be practiced by the FSTP operators and maintain procedures for recording and managing complaints from the public, as well as consult with residents to identify record odour or nuisance issues – preferably date, time and duration of odorous events.

#### **6.2.5. DECOMMISSIONING PHASE**

375. The decommissioning phase is the dismantling of the project's facilities due to the incapacity of the facilities to be operating. The SMASA will be responsible for evaluation on whether or not the facilities should be improved. Distribution pipes which are no longer used will be removed and exchanged with new pipes, while the older pipes will be buried in the ground or moved to a final disposal area depends on the technical design. Smaller water tanks that are no longer functioning will be decommissioned.

## 7. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

### 7.1. Consultation and Participation under the IEE process

376. The IEE procedure for Category B projects, under Decree-Law no. 05/2011, requires the proponent to undergo a full Public Consultation. Likewise, the project follows ADB's Safeguard Policy (ADB, April 2009), which requires borrowers/clients to perform meaningful consultation with affected people.

#### 7.1.1. Viqueque Public Consultation (10<sup>th</sup> October 2020)

377. The ADB IEE (ADB, 2020) undertook Public Consultation for Viqueque in the Municipal Administrative Assembly Room on the 10<sup>th</sup> of October 2020, participated by local government agencies and authorities (Chief of Suco and Village), and representative members of the communities within the project area, where the issues of significant social concern, predicted environmental impacts and proposed mitigation measures were presented, in order to collect all useful and relevant inputs from them, for the project construction phase.

378. The stakeholders presented their concerns, suggestions and recommendation for the project implementation, focussing mainly on issues such as Coverage area of the project, Design of the public Toilets, Water distribution system that does not cover or serve all villages, Misuse by consumers (and direct impact on water availability in the distribution system and Cultural sites and new constructions within project area (see Appendix 5 for Viqueque Public Consultation Notes).

379. In general, during the consultation, no issues of significant social concern or objections about the proposed project were raised and stakeholders were positive about the proposed project and expecting for this project to be implemented as soon as possible, since they are facing crucial issues on water for daily consumption and don't want to repeat uncertain schedule for water delivery into the households in the future.

Figure 111 Viqueque Public Consultation; participation of the Local Leadership and Other Stakeholders



### 7.1.2. Suco Social Public Consultation (12<sup>th</sup> and 13<sup>th</sup> December 2020)

380. In addition, 4 other Public Consultations, carried out under the social component in Suco Caraubalu (12<sup>th</sup> December 2020), Suco Loihuno (12<sup>th</sup> December 2020), Suco Uma Quic (13<sup>th</sup> December 2020) and Suco Uma Uain Craic (13<sup>th</sup> December 2020). All PCs registered a significant attendance especially with a strong female participation. After the non-technical presentation of the project, the floor was given to the attendees to discuss water supply and sanitation issues related to the project. Suco community deliberated on the location and the layout of the future Public Toilets. The list of participants are in Appendix 15.

381. The Suco community members present deliberated on the location and the layout of the future Public Toilets. A layout with gender segregation was generally accepted by the community.

382. The community acknowledges the lack of proper water supply and sanitation system. Specifically, for the water component it is a time-consuming activity to transport water from the source to the household. To make potable, water is then boiled before being used which entails in an additional cost for fuel (mainly wood).

383. It was observed that the community in general is willing to extend their cooperation as the activities are proposed to enhance the infrastructure service levels and their living standards. Thus, they are supportive of a paid water distribution system and the use of Public Toilets. The creation of a water users association that would support SMASA teams is also generally accepted. The community welcomes the opportunity to be part of the project either in the construction phase or in the operation and maintenance stage, reinforcing the role of SMASA employees.

384. The results of these Public Consultations further confirmed the expectations and worries stated in the previous general Viqueque Public Consultation and reassured the team that there is very little risk of any water conflicts or impacts felt by the community during implementation and operation of the future system.

Figure 122 Suco Caraubalu Public Consultation





Figure 133 Suco Loihunu Public Consultation



Figure 144 Suco Uma Quic Public Consultation



Figure 155 Suco Uma Uain Quic Public Consultation



## **7.2. Consultation in upcoming Project Phases**

### **7.2.1. Consultation during the SEIS/EMP Domestic process**

385. As required by the national environmental licensing law, the PDC, together with the MPW and PMU, will conduct a Public consultation regarding the SEIS/EMP of the project, with the objective to receive final comments and questions regarding the project's environmental safeguards, from the communities and their local leaderships. A tentative agenda for said meeting is below: (i) general overview of the projects; (ii) project benefits, positive impacts and outcomes; (iii) potential environmental impacts from the projects; (iv) proposed measures to mitigate them; (v) existence & implementation of the SEIS Environmental Management Plan (EMP) that includes environmental mitigation and monitoring; (vi) the construction phase and the obligation of the Constructor Environmental Management Plan (CEMP); (vii) existence and observance of a grievance redress mechanism during project implementation; and (viii) compliance with Timor-Leste and ADB environmental safeguard policies.

### **7.2.2. Consultation during Construction**

386. Prior to the start of construction, the contractor, MPW and the PSC will conduct information dissemination sessions and request support of the local community leaders to encourage the participation of the people to discuss the various environmental issues. At each Aldeia, focus group meetings will be conducted (lead by MPW and the constructor) to discuss and plan construction work with local communities and thus reduce disturbance and other impacts, as well as provide a mechanism through which stakeholders can participate in project monitoring and evaluation.

387. Constant communication will be established with the residents and communities to redress the environmental issues likely to surface during construction and operational phases and also regarding the grievance redress mechanism. The Municipality, together with MPW and PSC will organize public meetings and will appraise the communities about the progress on the implementation of the EMP. Meetings will also be organized at potential hotspots/sensitive locations before and during the construction i.e. Water Sources and/or close to cultural sites.

## **7.3. Information Disclosure**

388. For disclosure and information purposes, a copy of the IEE/SEIS/EMP with the Executive summary translated into Tetum (local language) will be distributed to SMASA and one copy to each of the Chiefs of Aldeia, for local public access to information, creating wider public awareness. As MPW does not have an active website, additional copies will be made available to the public, on request.

389. An Electronic version of the IEE/SEIS/EMP in English and Executive Summary in Tetum will be placed in a website indicated by the MPW (ADB, Consultant or other) and the stakeholders will be made aware of the grievance register and redress mechanism.

390. Public disclosure meetings will be conducted at key project stages to inform the public of progress and future plans. Prior to construction start, MPW will issue a Notification on the start date of implementation.

391. A board showing the details of the project will be displayed at the construction site for general public information.



## 8. GRIEVANCE REDRESS MECHANISM

392. The Grievance Redress Mechanism's main objective is to provide a transparent mechanism for the stakeholders and public to voice their social and environmental concerns or issues linked to the project, arising during the pre-construction, construction and development of the Project, with the objective of ensuring that concerns and potential conflicts can be satisfactorily addressed.

393. The function of GRM is to receive, evaluate and facilitate resolution of affected persons' concerns, complaints, and grievances related to social, environmental and other concerns on the project in a form of forum which can be accessible to other related parties with a provision of Complaint Registry Form (See Appendix 2) by the Contractor as described below on the Grievance Procedure.

394. The proposed mechanism for grievance redress of environmental matters in construction and operation of the project's infrastructure subcomponents uses existing Suco ("village") and Aldeia ("Hamlet") administrative structures (affected persons/ village committees/ village groups), any of which can be complainants.

395. The benefits contribute to the project itself and also the affected persons and other stakeholders. The benefits of the project will resolve any relative disputes before they escalate to a higher level, help building trust and confidence to the related community members, create productive relationships between the parties, and helps avoid project delays and increasing of costs, thus will improve the quality of work. Other benefits that can contribute to the affected persons and stakeholders are easing and facilitating access to information and providing an effective way to report their grievances and complaints.

396. Every grievance shall be registered by the Contractor with careful documentation process. The MPW will also be involved in the clients' complaints and establish a good network with the chiefs of suco and aldeia for cultural facilitation purposes. The environmental and social safeguards officer will be fully responsible on the overall grievance redress issues particularly on the environmental and social issues using a combination mechanism.

### 8.1. Grievance Procedure

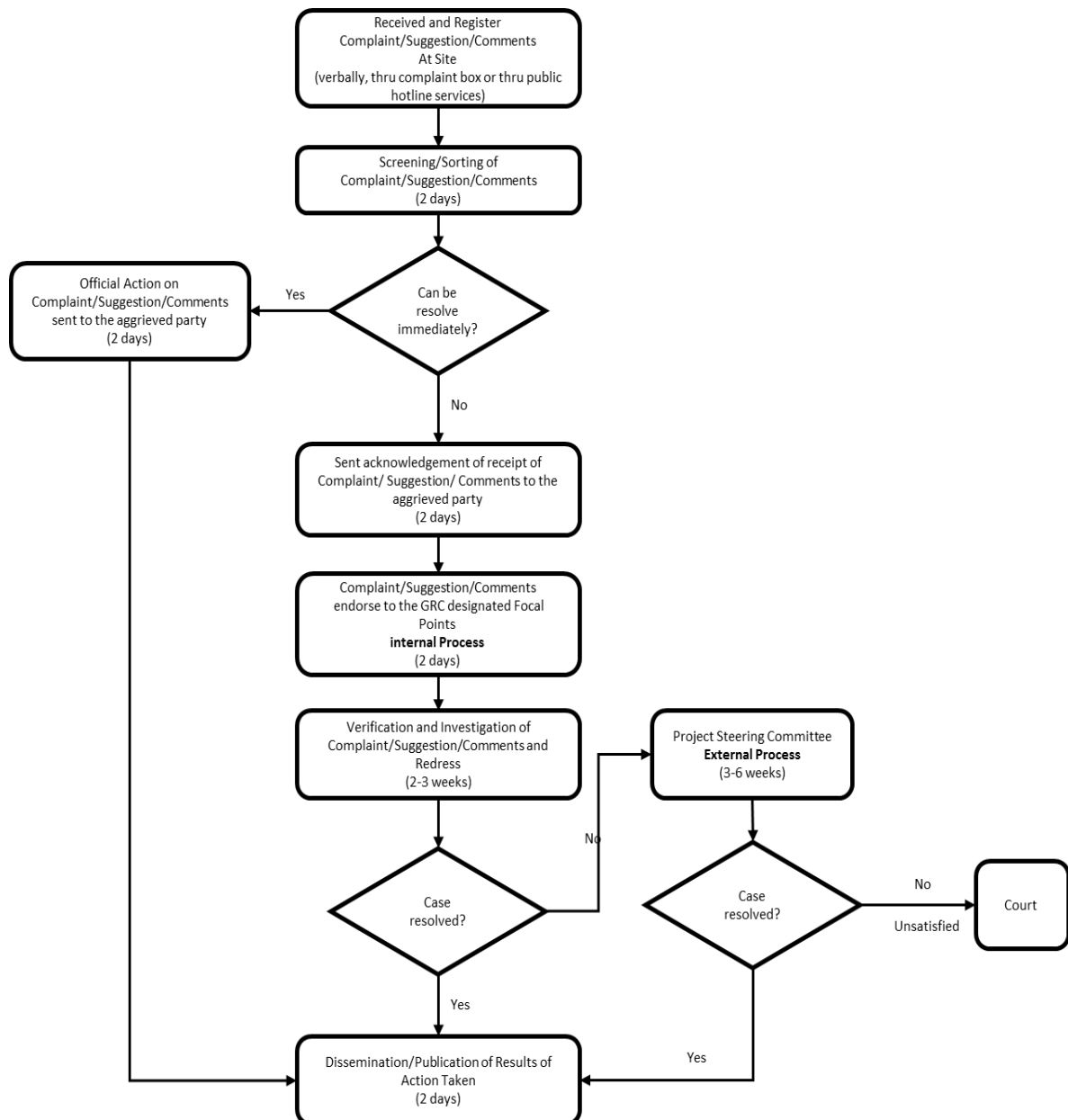
397. Grievance regarding the process can be redressed at two levels, which are during the construction, and during Operation of the project, following the process in Figure 166.

398. At the project level, a complaint registry shall be set up in the project work area, under the responsibility of the contractor, identifying a staff member that is management level and whom, due to the nature of his/her function, will always be available on site and people shall be informed of his/her presence.

399. The contractor representative shall accept complaints on environmental safeguards issues during the rehabilitation works, by registering them in the Complaint Template, identifying the name of the complainant and the date of receipt. For a verbal complaint the contractor must make written records properly and record them in a complaint register.

400. The contractor representative will inform the MPW representative of the occurrence and review the nature of the complaint with MPW to make sure it is environment related. MPW performs an internal review of the issue, contacting the safeguards specialist for technical support to solve the grievance, if required, and after will agree with the Contractor on the necessary action and reasonable timeframe for correction/response to the grievance.

Figure 166 - Grievance Redress Procedure for the Project



401. If the grievance requires local mediation, MPW and contractor representatives should consult quickly with local Chefes de Suco and Aldeia (in the area of related grievance) and the affected stakeholder/person to arrive at a conclusion on the correction of the grievance. MPW must follow up on the corrective measure, within the agreed timeframe.

402. If the Contractor has not taken any satisfactory corrective action within the defined timeframe, MPW will take action in accordance to environmental legal and contractual clauses in effect.

403. If the Grievance cannot be solved at the project level, by MPW, the case will be referred to the court of law to adjudicate the matter.

404. Complainants can also file a direct complaint to MPW, under their official Department for Client Support (Address: MPW, Caicoli, Díli; Telephone: 331 71 57), who will follow up directly with the project complaint registry at the construction level.

405. This MPW Department for Client Support is the official grievance redress representative for water supply purposes, when the operation phase of the project comes online.

## 9. ENVIRONMENTAL MANAGEMENT PLAN

406. The Environmental management plan (EMP) ensures all the project activities are in compliance with technical designs, environmental legislation (GovTL, 2010) and guidelines applicable in Timor-Leste and within the ADB SPS 2009. The activities shall be undertaken responsibly without decrementing or jeopardizing the environment and social aspects. Objectives of the EMP are: i) To provide a feasible and practical working tool to enable the measurement and monitoring of environmental performance on-site; ii) To guide and control the implementation of findings and recommendations of the environmental assessment conducted for the project; iii) Detailing specific actions deemed necessary to assist in mitigating the environmental impact of the project; iv) To ensure that safety recommendations are complied with.

407. The EMP is based on the type, extent and duration of the identified environmental impacts for Viqueque Municipal Capital and has been prepared following best practice and by reference to the ADB Safeguard Policy Statement (2009). It includes detailed requirements for: a) Mitigation and monitoring measures; b) Institutional arrangements and project responsibilities; c) EMP budget for implementation d) Capacity building and training requirements e) Public consultation and information disclosure f) GRM including timescale and responsibilities.

408. A detailed EMP is provided for the project in a separate document, where the detailed mitigation measures are included per each of the activities and Project Phases.

409. The overall responsibility for EMP implementation and compliance with loan assurances lies with the Implementing Agency, the Ministry of Public Works (MPW). The MPW will establish a Project Management Unit (PMU) based in Dili, responsible for general project implementation with the support of a Project Supervision Consultant (PSC).

410. The costs for the EMP implementation are summarised in Table 19 and are regarding the construction period (4 years) and an initial 2 year operation phase (under the contractor support), of a 14 year total operation phase up to the year 2040:

Table 19 EMP Estimated Cost

Particulars	Stages	Unit	Total Number	Rate (\$)	Cost (\$)	Cost covered by:
<b>A Mitigation Measures</b>						
1 Mitigation Measures per Project Activity	Construction and Operation	N/A	N/A	To be defined in Bid	To be defined in Bid	Contractor
2 Contractor's HSE Officer	Construction	Person	1	\$1,500 / month	\$72,000	Contractor
<b>Subtotal (A)</b>					<b>\$72,000</b>	
<b>B Environmental Monitoring Measures</b>						
1 Water Quality (upstream and downstream of Loihunu Spring, Cuha River intake and FSTP Suco Maluru)	Construction	(as in DL31/2020)	16	\$900	\$14,400	Contractor
2 Noise (if complaint at sensitive/residential location)	Construction	dBA	4	\$1,500	\$6,000	Contractor
3 Water Quality (FSTP discharge before Gravel Filter)	Operation	(as in IFC Guidelines)	8	\$500	\$4,000	Contractor
<b>Subtotal (B)</b>					<b>\$24,400</b>	
<b>C Capacity Building and Training</b>						
1 EMP Development and Implementation	Before and during Construction	Training Session	2	\$1,000	\$2,000	Contractor
2 Consultation with Affected People	Before and during Construction	Training and PC Sessions	16	\$1,000	\$16,000	Contractor
3 Grievance Redress Mechanism	Before and during Construction	Training Session	2	\$2,000	\$4,000	Contractor
4 Environmental Protection	Before Construction	Training Session	1	\$1,000	\$1,000	Contractor
5 Environmental Monitoring	Before Construction	Training Session	1	\$1,000	\$1,000	Contractor

Particulars	Stages	Unit	Total Number	Rate (\$)	Cost (\$)	Cost covered by:
6 FSTP Operation and Maintenance	Before and during Operation (2 years Contractor)	Training and on-the-job Sessions	3	\$12,600	\$37,800	Contractor
<b>Subtotal (C)</b>					<b>\$61,800</b>	
<b>TOTAL (A+B+C)</b>					<b>\$158,200</b>	

411. A summary of the key functions for project implementation and therefore environmental safeguards is presented in Table 20:

Table 20 – EMP general roles and responsibilities

Role	Abbreviation	Location	Summary of Functions
MPW and Project Management Unit	MPW/PMU	Díli and Viqueque	Responsible for general project implementation and reporting; clearance of environmental due diligence documents; approval of the CEMP.
Project Supervision Consultants	PSC	Díli and Viqueque	Project final design and implementation, support and capacity development Engineering supervision for all construction and reporting; environmental safeguards trainings; training to be provided by the PSC to contractors on EMP requirements; updating of environmental safeguards due diligence documentation under implementation; review of the CEMP for approval by the PMU; review of monthly contractor monitoring reports; supporting the PMU with the environmental safeguards inputs for the quarterly progress reports to ADB, as well as for the semi-annual environmental monitoring reports to ADB.
Project Design Consultants	PDC	Díli and Viqueque	Prepare and finalize PD, SEIS and EMP Reports based on the IEEs and EMPs, for domestic Licensing purpose.
Contractor and respective Environmental, Health and Safety Officer	Contractor / HSE officer	Viqueque	. Preparation of the CEMP for approval of the PMU; Mitigation measures implementation and reporting, capacity building and training as per Table 19; monthly reporting to the PSC/PMU; implementation of environmental safeguards corrective action measures.
Local and National Authorities	ANLA / Chefes Suco and Aldeia	Díli and Viqueque	Review, comment, approve and monitor the SEIS and EMP compliance and implementation; Supervise Contractor employment mechanism, community awareness programs and Grievance Redress Mechanism.
Asian Development Bank	ADB		Review and clear IEE/EMP, Bid documents, and SEMRs and any resulting corrective action plans. Review missions. Due diligence documents disclosure on the ADB website.

## 10. CONCLUSION AND RECOMMENDATIONS

412. This IEE study was carried out at the planning stage of the project, where primary and secondary data have been used to assess the potential environmental impacts in a comprehensive manner. This report provides a picture of all potential environmental impacts associated with the Project and recommended suitable mitigation and monitoring measures.

413. Assessment of the project characteristic and details with the existing conditions revealed that, although the project traverses a relative number of residences along its route, the proposed works will be very temporary and of short duration, as well as the impacts.

414. The EMP (already prepared as a separate document so as to be able to go as part of the bidding documents, subject to a final round of updating once the domestic environmental license has been secured, and any other final DED changes), if implemented as directed, will mitigate impacts on the natural environment and affected people to an acceptable level. The extent of adverse impacts is expected to be local, confined within the projects' main areas of influence, quarry or burrowing sites, waste disposal sites, and the routes to and from these sites. With mitigation measures in place and ensuring that the bulk of earthworks are completed before the onset of the rainy season, the potential adverse impacts during construction would be site-specific.

415. The few adverse impacts of moderate magnitude during construction will be temporary and short-term (i.e., most likely to occur only during peak construction activities). Noise, dust/emissions or indeed impacts on the natural hydrology or ecology are not anticipated and all the predicted impacts that have been identified can be mitigated and managed to minor levels.

416. During operation, the potential delivery of unsafe water can be mitigated with good operation and maintenance, prompt action on leaks, and complying with the required quality monitoring of supplied water as prescribed in the National Drinking Water Quality Standards Directives.

417. The mitigation measures, integral to socially and environmentally responsible construction practices, are commonly used at construction sites and are well known to Contractors. Hence, will not be difficult to implement.

418. The key parties for mitigation measure implementation are the construction contractors and the MPW. The implementation of the EMP will be closely monitored and reported on by the relevant stakeholders in the project.

## APPENDIXES

## Appendix 1. Rapid Environmental Assessment Checklist and Preliminary Climate Risk Screening Checklist

### Rapid Environmental Assessment (REA) CHECKLIST - WATER SUPPLY

#### Instructions:

1. This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
  2. This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
419. This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
420. Answer the questions assuming the “without mitigation” case. The purpose is to identify potential impacts. Use the “remarks” section to discuss any anticipated mitigation measures.

<b>Country/Project Title:</b>	Timor-Leste / Water Supply and Sanitation Investment Project
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<b>Sector Division</b>	<b>VIQUEQUE</b>
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SCREENING QUESTIONS	Yes	No	REMARKS
<b>A. Project Siting</b>			
Is the project area...	<input type="checkbox"/>	<input type="checkbox"/>	
▪ Densely populated?	<input type="checkbox"/>	X	Viqueque city holds a moderate population concentration with 40,4 persons per square kilometer.
▪ Heavy with development activities?	<input type="checkbox"/>	X	Some development (a R4D project: rural road being built) but basic infrastructure in Viqueque is generally done (i.e. Roads)
▪ Adjacent to or within any environmentally sensitive areas?			
• Cultural heritage site	✓	<input type="checkbox"/>	Loihuno 1 & 2 are conservatory springs, moreover an old ruined building used to be the residence of Dom Fransisco during the Portuguese occupation just 300 meters from the Loihuno 2 spring. The status is being conserved and used by the community for religious activity only. Other cultural sites along the distribution alignments which have been identified i.e the Cathedral, an abandoned building that used to be a residence of the suco during the Portuguese time, 2 cemeteries sites, and ultimately the administrator office.
• Protected Area	✓	<input type="checkbox"/>	A small part of the Northeast end of the project 15 Km Diameter (Loihunu) is inside the Mount Builo PA but no project component is within this PA.
• Wetland	<input type="checkbox"/>	X	No wetlands are identified in literature or were assessed during inception visit, in the project area. TBC during Field visit.
• Mangrove	<input type="checkbox"/>	X	Project location is within the upper range of the Viqueque Plateau, not at the coast.
• Estuarine	<input type="checkbox"/>	X	Project location is within the upper range of the Viqueque Plateau, not at the coast.



SCREENING QUESTIONS	Yes	No	REMARKS
<ul style="list-style-type: none"> <li>• Buffer zone of protected area</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	TBC with National Directorate for Protected Areas. Besides being declared under DL05/2016 – National System for Protected Areas, there hasn't been published (to date) any specific Buffer Zone limits beyond the Mount Bulio PA border. This is particularly relevant for all the project areas that are adjacent to the PA border, namely the Loihunu Spring System.
<ul style="list-style-type: none"> <li>• Special area for protecting biodiversity</li> </ul>	✓	<input type="checkbox"/>	Only 1 specific area with biodiversity i.e crocodiles appearing from the Kuha River in the southern part of the distribution system, Suco Uma Quic, according to the information received from the surrounding community. However, it will have small influence as the area will be expanded in regards to distribution network.
<ul style="list-style-type: none"> <li>• Bay</li> </ul>	<input type="checkbox"/>	X	Project location is within the upper range of the Viqueque Plateau, not at the coast.
<b>B. Potential Environmental Impacts</b>			
Will the Project cause...			
<ul style="list-style-type: none"> <li>▪ pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?</li> </ul>	✓	<input type="checkbox"/>	Yes. Construction materials and excavation works for the spring's infrastructure developments will cause sediments runoffs that also affects the surface water quality, flowing downstream. The Water at the spring sources already have some microbiological contamination before project proposed treatment, suggesting cattle/husbandry activities and/or lower sanitation levels upstream.
<ul style="list-style-type: none"> <li>▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?</li> </ul>	✓	<input type="checkbox"/>	Yes. In general the springs are considered sacred by locals for which proper handling and fulfilments in the culture ceremony before the development is required. The TA team also identified several important monuments/buildings and area of worship i.e Cathedral, cemeteries and 3 old buildings in the Distribution area, where some lie close to the proposed rehabilitation alignments. The future EMP will include measures to mitigate any impacts during the construction phase in compliance with the protection measures defined in the Cultural Policy/regulations of Timor-Leste.
<ul style="list-style-type: none"> <li>▪ hazard of land subsidence caused by excessive ground water pumping?</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	TBC - To be confirmed during existing and new borehole tests to understand if there is this particular risk.
<ul style="list-style-type: none"> <li>▪ social conflicts arising from displacement of communities ?</li> </ul>	✓	<input type="checkbox"/>	Some residential and agricultural land areas of private individuals and households will be affected and compensation for the affected land will be required
<ul style="list-style-type: none"> <li>▪ conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?</li> </ul>	✓	<input type="checkbox"/>	Yes. Communities currently share the benefit from the existing ground and surface. Maximum extraction rates to guarantee impact avoidance must be confirmed during borehole tests.
<ul style="list-style-type: none"> <li>▪ unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?</li> </ul>	<input type="checkbox"/>	X	Raw water is planned to be treated prior to distribution, both for pathogens and calcium carbonate. Resulting quality of treated water will comply with the Timorese Legislation and WHO standards for drinking water, improving the already contaminated water sources.
<ul style="list-style-type: none"> <li>▪ delivery of unsafe water to distribution system?</li> </ul>	<input type="checkbox"/>	X	The rehabilitated network will provide treated water through the substitution of old for new pipes, preferably under the city urban alignments to prevent illegal connections and consequent leakages and contamination.
<ul style="list-style-type: none"> <li>▪ inadequate protection of intake works or wells, leading to pollution of water supply?</li> </ul>	✓	<input type="checkbox"/>	Contractor to establish an integrated CEMP to take care of this issue during construction. The intake will be secured and only accessible to authorized persons. It will also be regularly monitored to ensure only treated water is distributed.
<ul style="list-style-type: none"> <li>▪ over pumping of ground water, leading to salinization and ground subsidence?</li> </ul>	<input type="checkbox"/>	X	N/A. No groundwater pumping is considered
<ul style="list-style-type: none"> <li>▪ excessive algal growth in storage reservoir?</li> </ul>	<input type="checkbox"/>	X	Not anticipated as the storage reservoirs are planned to be fully enclosed structures and the treated water will only be stored for a short period of time.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ increase in production of sewage beyond capabilities of community facilities?	<input type="checkbox"/>	X	The Project is indeed expected to increase the water consumption and, consequently the wastewater output. However, the Project scope includes pilot projects for 4 Public WC septic tank treatment within the city and the design of a decentralized Waste Water/Septage Treatment Plant. However, the septic treatment capacity of the households and the transport of their septage are not included.
▪ inadequate disposal of sludge from water treatment plants?	<input type="checkbox"/>	X	Currently Viqueque does not have an established Solid Waste Landfill/dumpsite but the project will consider providing treatment to reduce hardness and install a chlorination system to provide disinfection, therefore sludge production will not be possible.
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?	<input type="checkbox"/>	X	Not applicable
▪ impairments associated with transmission lines and access roads?	✓	<input type="checkbox"/>	Yes. Some established road infrastructure will have to be excavated and repaired thereafter. Anticipated during construction activities but impacts are temporary and short in duration. The future EMP will include measures to mitigate the impacts.
▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.	<input type="checkbox"/>	X	Not applicable. The MPW storage facilities will be designed to guarantee enough space for the correct handling of the water treatment chemicals.
▪ health and safety hazards to workers from the management of chlorine used for disinfection and other contaminants?	<input type="checkbox"/>	X	Not applicable. The MPW storage facilities will be designed to guarantee enough space for the correct handling of the water treatment chemicals. Personal protective equipment will be provided to workers and training will be provided to ensure workers are aware of the potential hazards.
▪ dislocation or involuntary resettlement of people	<input type="checkbox"/>	X	No Involuntary resettlement is planned. However, some private residential and agricultural land areas and surface property will be affected and compensation will be required.
▪ social conflicts between construction workers from other areas and community workers?	✓	<input type="checkbox"/>	Yes. Priority/proportion in employment should be given to local residents if/when qualification requirements are reached for each work position, is in compliance with SEPOFE regulations.
▪ noise and dust from construction activities?	✓	<input type="checkbox"/>	Anticipated during construction activities but impacts are temporary and short in duration. The future EMP will include measures to mitigate the impacts.
▪ increased road traffic due to interference of construction activities?	✓	<input type="checkbox"/>	Anticipated during construction activities but impacts are anticipated as small scale, temporary and short in duration, given Viqueque does not have significant traffic flow in the project area. The future EMP will include measures to mitigate the impacts and the construction contractors will be required to coordinate with the local traffic police.
▪ continuing soil erosion/silt runoff from construction operations?	✓	<input type="checkbox"/>	Yes. Viqueque has steep topography and loose soil will be eroded if no mitigation measures established. Landslide risks in spring areas. During Construction, storage of topsoil can runoff and cause sedimentation in the raw water harvested by downstream community. The EMP still includes measures to mitigate the impacts. Construction contractors will be required to include soil management guidelines and procedures where required.
▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?	<input type="checkbox"/>	X	Not anticipated. Chlorine Monitoring is included in the proposed methodology for Water Monitoring during the Operation Phase.
▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?	<input type="checkbox"/>	X	Not anticipated
▪ accidental leakage of chlorine gas?	<input type="checkbox"/>	X	Not anticipated

SCREENING QUESTIONS	Yes	No	REMARKS
▪ excessive abstraction of water affecting downstream water users?	✓	<input type="checkbox"/>	Yes, current users of surface water will be impacted due to risk of over abstraction for water supply. Water sources either spring and boreholes should be protected adequately, moreover increasing number of tanks with sufficient capacity in order to avoid illegal connection and leakages. Water shortage and contamination in downstream can be solved.
▪ competing uses of water?	✓	<input type="checkbox"/>	Water shortage triggers the downstream water users to find alternative sources through river abstractions and private wells provision. The tendency of illegal connection in the upstream is also part of the mentioned case.
▪ increased sewage flow due to increased water supply	✓	<input type="checkbox"/>	The Project is expected to increase the water consumption and, consequently the wastewater output.
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	✓	<input type="checkbox"/>	The Project is expected to increase the water consumption and, consequently the septage output, including from kitchens.

### Checklist for Preliminary Climate Risk Screening

**Country/Project Title:** Timor-Leste / Water Supply and Sanitation Investment Project

**Sector:** VIQUEQUE

**Subsector:** Water Distribution Network

**Division/Department:** Ministry of Public works (MPW)

Screening Questions		Score	Remarks <sup>8</sup>
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	1	<i>The topography of the site is quite steep with risk of flash flooding and extreme weather occurrences and consequent landslides and so location and routing is considered to be a substantial problem, as the infrastructure will almost all require reinforced structure and support.</i>
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	<i>The project will require water-level metering monitoring regarding flow, as well as review of quantities variations to correlate with seasonal meteorological variations and estimate source productivity and possible climate change problems such as i.e. water supply source depletion</i>
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	1	<i>Given the area has 2 seasons with frequent extreme conditions, there may be a requirement to look into more climate resistant piping infrastructure and fill-in materials to guarantee the quality integrity of the distributed water quality and spring infrastructure.</i>
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	1	<i>Occasional extreme weather will interfere with planned maintenance schedule when/if extreme events may breakage in the established infrastructure.</i>
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	<i>No hydropower infrastructure identified</i>

<sup>8</sup> If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response will be categorized as high-risk project.

Result of Initial Screening (Low, Medium, High): Medium

## Rapid Environmental Assessment (REA) Checklist - SANITATION

### Instructions:

- A. This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- B. This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
421. This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
422. Answer the questions assuming the “without mitigation” case. The purpose is to identify potential impacts. Use the “remarks” section to discuss any anticipated mitigation measures.

<b>Country/Project Title:</b>	Timor-Leste / Water Supply and Sanitation Investment Project
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<b>Sector Division</b>	VIQUEQUE
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SCREENING QUESTIONS	Yes	No	REMARKS
<b>B. Project Siting</b> Is the project area...			
▪ Densely populated?	<input type="checkbox"/>	<input type="checkbox"/>	Viqueque city holds a moderate population concentration with 40,4 persons per square kilometer.
▪ Heavy with development activities?	<input type="checkbox"/>	<input type="checkbox"/>	Some rural roads being built and some semi urban areas with economic activities i.e services or commerce.
▪ Adjacent to or within any environmentally sensitive areas?			
• Cultural heritage site	<input type="checkbox"/>	X <input type="checkbox"/>	3 kilometers north from the proposed WWTP is a small religious cave on the left side of the national road but it will not be impacted by the presence of the WWTP construction and utilization activities in the future. No other apparent cultural heritage or sacred site identified in the proposed WWTP surrounding area.
• Protected Area	<input type="checkbox"/>	X <input type="checkbox"/>	The proposed WWTP is located southern part of the 15 km radius, away from the protected area (Mount Builo) which overlaps slightly in the northern part.
• Wetland	<input type="checkbox"/>	X <input type="checkbox"/>	Adjacent to the proposed location going north is a vast agriculture land with several small clusters. 500 meters to west from the project area is the downstream of the Kuha river. No potential of flooding according to information received from DNSA.
• Mangrove	<input type="checkbox"/>	X <input type="checkbox"/>	Project location is in the lower range of the Viqueque Plateau but is quite distant from the coast. No existing mangroves in the surrounding project area.
• Estuarine	<input type="checkbox"/>	X <input type="checkbox"/>	Project location is in the lower range of the Viqueque Plateau but is quite distant from the coast. No existing mangroves in the surrounding project area.
• Buffer zone of protected area	<input type="checkbox"/>	<input type="checkbox"/>	TBC with National Directorate for Protected Areas. Besides being declared under DL05/2016 – National System for Protected Areas, there hasn't been published (to date) any specific Buffer Zone limits beyond the Mount Builo PA border. This is particularly relevant for all the project areas that are adjacent to the PA border, namely the Loihunu Spring System.
• Special area for protecting biodiversity	X <input type="checkbox"/>	<input type="checkbox"/>	3 kilometers north from the proposed location on the west side is the natural habitat of the crocodiles, precisely on the downstream of the Kuha river.

SCREENING QUESTIONS	Yes	No	REMARKS
<ul style="list-style-type: none"> <li>Bay</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/>	Project location is in the lower range of the Viqueque Plateau but is quite distant from the coast. No existing mangroves in the surrounding project area.
<b>A. Potential Environmental Impacts</b>			
Will the Project cause...			
<ul style="list-style-type: none"> <li>impairment of historical/cultural monuments/areas and loss/damage to these sites?</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/>	There will be no impacts of the impairment on the religious cave since it is quite distant from the proposed location.
<ul style="list-style-type: none"> <li>interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/>	No blocking/interference with other utilities are expected, given the WWTP will have proper infrastructure and planned for regular emptying of the sludge and maintenance. Proposed WWTP is located in a non-urbanized area to minimize potential smells and avoid other said impacts and necessary measures included in the EMP for smooth operation and maintenance. WWTP site is in a predominantly agriculture area with only 2 houses within 500 meters distance radius. No interference is predicted.
<ul style="list-style-type: none"> <li>dislocation or involuntary resettlement of people</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/>	Some agricultural land areas of private individuals will be affected and compensation for the affected land will be required. WWTP are planned to be in Government Land.
<ul style="list-style-type: none"> <li>impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/>	Proposed WWTP will have Solid/Liquid Separation (sludge drying bed) and Post Sludge Percolate Treatment (Anaerobic Baffled Reactor Tank and Filter [secondary treatment], Planted Gravel Filter [Tertiary Treatment] and UV Treatment or Polishing Pond. Dried Sludge and/or Residual percolate may be used for Agriculture in the area. WWTP effluent discharges shall meet the norms laid out by the Government of Timor-Leste (WHO/IFC) and can also utilized for agriculture purpose.
<ul style="list-style-type: none"> <li>overflows and flooding of neighboring properties with raw sewage?</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/>	WWTP will be designed considering the population growth up to the project time horizon of 2040, to accommodate septage treatment for the long term. No impact is envisaged. It should be noted that this station will only receive effluent transported by tanker trucks and therefore it is not possible flooding due to the inflow of sewage. In addition, the following measures are planned: <ul style="list-style-type: none"> <li>During operation of the sludge/liquid separation bed, an extra margin up to the top of the earth bank would be kept to prevent overflow after a large rain storm.</li> <li>Furthermore, a shallow earth bank will be constructed along the perimeter of the total area to protect from the plant storm water.</li> <li>The earth bank is to be planted with grass and small trees to demarcate the area. The soil for construction of the earth bank comes from excavation of the ponds.</li> <li>Regular checking of the adequacy of the facility, particularly when beds are (nearly) full and during the rainy season.</li> <li>Timely heightening of the bund surrounding the facility and / or increasing the bed capacity.</li> </ul>
<ul style="list-style-type: none"> <li>environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?</li> </ul>	<input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/>	The proposed system is based on Domestic wastewater from septic tanks, collected and transported by truck to the WWTP. No industrial WW planned to be directed to this treatment system.
<ul style="list-style-type: none"> <li>noise and vibration due to blasting and other civil works?</li> </ul>	<input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	No blasting activities envisaged. Temporary nuisance/disturbance due to construction activities will be minimized with appropriate mitigation measures.
<ul style="list-style-type: none"> <li>discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/>	The proposed system is based on Domestic wastewater from septic tanks, collected and transported by truck to the WWTP. No industrial WW planned to be directed to this treatment system.
<ul style="list-style-type: none"> <li>inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?</li> </ul>	<input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	The proposed system is based on Domestic wastewater from septic tanks, collected and transported by truck to the DWWTP. Any impact from the collection is planned to be temporary. However, the WWTP will be fenced off to protect facilities and control access and provide for space to avoid these impacts.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ social conflicts between construction workers from other areas and community workers?	X <input type="checkbox"/>	<input type="checkbox"/>	Priority in employment should be given to local residents if/when qualification requirements are reached for each work position.
▪ road blocking and temporary flooding due to land excavation during the rainy season?	X <input type="checkbox"/>	<input type="checkbox"/>	Road blocking and Traffic re-routing may be required during construction stage of the WWTP, given the proposed area is close to national road. Proper traffic management will be taken into mitigation measures.
▪ noise and dust from construction activities?	X <input type="checkbox"/>	<input type="checkbox"/>	While the impact in the Septic tanks in the Public Toilet locations will be very reduced, the WWTP construction site may have these impacts in a larger scale and the EMP should define that all the construction activities should comply with the WHO noise standards, currently applicable for Timor-Leste. Sprinkling of water should be done along the construction area for dust suppression.
▪ traffic disturbances due to construction material transport and wastes?	<input type="checkbox"/> X	<input type="checkbox"/>	While the location of the WWTP is to be remote and out of the urban area, traffic management with re-routing of traffic during construction period will be required to avoid conflict of public transport with construction material / waste transport.
▪ temporary silt runoff due to construction?	<input type="checkbox"/> X	<input type="checkbox"/>	During construction phase, the excavation will be planned in such a way that it is avoided during heavy rains. During construction of FSTP especially during rainy season, this aspect will be kept in mind. The work would be undertaken in small pockets to avoid any silt runoff. Furthermore, earth strengthening measures would also be undertaken. All excavated spoil is expected to be reused in the construction of the WWTP and its protective measures. Any excess should be well managed through levelling or tipped into low lying areas or borrow areas which are no longer useful.
▪ hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	X <input type="checkbox"/>	<input type="checkbox"/>	Regular maintenances of the WWTP have to be carried out to avoid over flow and related impact of public health due to pollution. The design may be required to provide additional bunkering for overflow collection and re-pumping back into the system, as well as emergency shutdown procedures to avoid the possibility for groundwater pollution due to malfunction of WWTP system. <ul style="list-style-type: none"> <li>• Treatment units would be raised sufficiently to keep them clear of the highest predicted flooding level.</li> <li>• There are two concerns for ground water protection, these are the potential pathogen movement in the groundwater and the infiltration of soluble nutrients. Due to their size, the pathogens will adhere to the soil particles and not move very far. With a minimum safe distance of 100 m for ordinary soil, there will be no pathogens in the groundwater outside this distance.</li> <li>• The soluble nutrients, such as nitrate from urine, will move with the groundwater, but will be diluted to a level where there is no health risk. It is assumed that most of the nitrate has already infiltrated at the site of origin, that is near the households from the infiltration of liquid waste the septic tanks and pit latrines.</li> <li>• Close monitoring of the facility to ensure it functions as planned, this involves monitoring of ground and surface waters in the surroundings of the FSTP.</li> </ul>



SCREENING QUESTIONS	Yes	No	REMARKS																																																																																																																																																									
<div>▪ deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?</div>	<div>X</div> <div></div>	<div></div>	<div>Currently Viqueque does not have an established Solid Waste Landfill/dumpsite. Given the sensitivity of the National Park area downstream, the sludge treatment will be as complete as possible and dewatering of the sludge will be priority for further safe reuse of dry sludge in agricultural activities.</div> <div>Adequate measure of sludge disposal and prohibit discharge of untreated sludge from septic tanks need to be taken.</div> <div>In no way will septage be allowed to be discharged from FSTP without complete &amp; proposed treatment. Treated effluent will meet the WHO Standards as well as DL 236/98 (Portugal) as given below:-</div> <table><thead><tr><th></th><th colspan="2">BOD (mg/L)</th><th>NH<sub>4</sub>-N (mg/L)</th><th>Helminth eggs (No./filter)</th><th>FC ( N<sup>o</sup>./100 ml)</th></tr><tr><th></th><th>Total</th><th>Filtered</th><th></th><th></th><th></th></tr></thead><tbody><tr><td colspan="6">A. LIQUID EFFLUENT ( WHO Standards)</td></tr><tr><td colspan="6">A.1 - Discharge into receiving waters:</td></tr><tr><td>Seasonal stream estuary</td><td>100-200</td><td>30-60</td><td>Oct-30</td><td>≤2-5</td><td>≤10<sup>4</sup></td></tr><tr><td>Perennial river or sea</td><td>200-300</td><td>60-90</td><td>20-50</td><td>≤10</td><td>≤10<sup>5</sup></td></tr><tr><td colspan="6">A.2 - Reuse</td></tr><tr><td>Restricted irrigation</td><td colspan="2">n.c.</td><td>1)</td><td>≤1</td><td>≤10<sup>5</sup></td></tr><tr><td>Unrestricted irrigation</td><td colspan="2">n.c.</td><td>1)</td><td>≤1</td><td>≤10<sup>3</sup></td></tr><tr><td colspan="6">B: TREATED PLANT SLUDGE ( WHO Standards)</td></tr><tr><td>Use in agriculture</td><td colspan="2">n.c.</td><td>n.c.</td><td>≤3-8 g TS<sub>2</sub></td><td>3)</td></tr><tr><td colspan="6">1) ≤ Crop's nitrogen requirement ( 100-200 kg N/ ha-year)</td></tr><tr><td colspan="6">2) Based on the nematode egg load per unit surface area derived from WHO guidelines for wastewater irrigation ( WHO 1989) and on manuring rate of 2-3 tons of dry matter /ha-year</td></tr><tr><td colspan="6">3) Safe level if egg standard is met.</td></tr><tr><td colspan="6">n.c----not critical</td></tr></tbody></table> <table><thead><tr><th></th><th>BOD (mg/L )</th><th>TSS (mg/L )</th><th>N total (mg/L )</th><th>p total (mg/L )</th><th>TC ( N<sup>o</sup>./100 ml)</th><th>FC ( N<sup>o</sup>./100 ml)</th></tr></thead><tbody><tr><td colspan="7">A. LIQUID EFFLUENT ( DL 236/98)</td></tr><tr><td colspan="7">A.1 - Discharge into receiving waters:</td></tr><tr><td>Emission limit values (ELV) for wastewater discharge (Attachment XVIII)</td><td>40</td><td>60</td><td>15</td><td>10 (1)</td><td>n.c</td><td>n.c</td></tr><tr><td>Quality of surface fresh water for the production of water for human consumption (Attachment I)</td><td>200-300</td><td>60-90</td><td>20-50</td><td>n.c</td><td>2*10<sup>5</sup></td><td>2*10<sup>4</sup></td></tr><tr><td colspan="7">A.2 - Reuse ( DL 236/98)</td></tr><tr><td>Quality of water for irrigation (Attachment XVI)</td><td>n.c.</td><td>60</td><td>50 (2)</td><td>n.c</td><td>n.c</td><td>100</td></tr><tr><td colspan="7">1) ≤ 3 mg/L in waters that feed ponds or reservoirs</td></tr><tr><td colspan="7">2) nitrates (NO3)</td></tr></tbody></table> <div>It should be noted that to fulfill an irrigation water quality, bacteriological removal must be by UV</div>		BOD (mg/L)		NH <sub>4</sub> -N (mg/L)	Helminth eggs (No./filter)	FC ( N <sup>o</sup> ./100 ml)		Total	Filtered				A. LIQUID EFFLUENT ( WHO Standards)						A.1 - Discharge into receiving waters:						Seasonal stream estuary	100-200	30-60	Oct-30	≤2-5	≤10 <sup>4</sup>	Perennial river or sea	200-300	60-90	20-50	≤10	≤10 <sup>5</sup>	A.2 - Reuse						Restricted irrigation	n.c.		1)	≤1	≤10 <sup>5</sup>	Unrestricted irrigation	n.c.		1)	≤1	≤10 <sup>3</sup>	B: TREATED PLANT SLUDGE ( WHO Standards)						Use in agriculture	n.c.		n.c.	≤3-8 g TS <sub>2</sub>	3)	1) ≤ Crop's nitrogen requirement ( 100-200 kg N/ ha-year)						2) Based on the nematode egg load per unit surface area derived from WHO guidelines for wastewater irrigation ( WHO 1989) and on manuring rate of 2-3 tons of dry matter /ha-year						3) Safe level if egg standard is met.						n.c----not critical							BOD (mg/L )	TSS (mg/L )	N total (mg/L )	p total (mg/L )	TC ( N <sup>o</sup> ./100 ml)	FC ( N <sup>o</sup> ./100 ml)	A. LIQUID EFFLUENT ( DL 236/98)							A.1 - Discharge into receiving waters:							Emission limit values (ELV) for wastewater discharge (Attachment XVIII)	40	60	15	10 (1)	n.c	n.c	Quality of surface fresh water for the production of water for human consumption (Attachment I)	200-300	60-90	20-50	n.c	2*10 <sup>5</sup>	2*10 <sup>4</sup>	A.2 - Reuse ( DL 236/98)							Quality of water for irrigation (Attachment XVI)	n.c.	60	50 (2)	n.c	n.c	100	1) ≤ 3 mg/L in waters that feed ponds or reservoirs							2) nitrates (NO3)						
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SCREENING QUESTIONS	Yes	No	REMARKS
<ul style="list-style-type: none"> <li>contamination of surface and ground waters due to sludge disposal on land?</li> </ul>	X <input type="checkbox"/>	<input type="checkbox"/>	<p>Sludge reuse for agricultural activities will follow strict guidelines and information on best-use/restrictions of use will be given to potential re-users of the dried sludge.</p> <ul style="list-style-type: none"> <li>Inadequate sludge disposal on land can contaminate ground water and surface water and measures of adequate sludge disposal would be taken to avoid any environmental impact.</li> </ul> <p>For reuse of the dried faecal sludge from the facility, the operation will secure elimination of Ascaris eggs, for example by using a one year cycle for moving sludge from pond to the two drying beds (for odd and even year) giving a total three years retention time before final removal of the dry faecal material. After three years, the infection risk of Ascariasis is minimal.</p>
<ul style="list-style-type: none"> <li>health and safety hazards to workers from toxic gases and hazardous materials which maybe contained in sewage flow and exposure to pathogens in sewage and sludge?</li> </ul>	<input type="checkbox"/> X	<input type="checkbox"/>	<p>No significant impacts are expected from the septic tank systems in the 4 proposed Public WCs maintenance as their scale is much smaller and less dangerous that a fully reticulated sewer collection system.</p> <p>However, both for this and the WWTP site, personal protective equipment will be provided to workers and training will be provided to ensure workers are aware of the potential hazards.</p>

### Checklist for Preliminary Climate Risk Screening

**Country/Project Title:** Timor-Leste / Water Supply and Sanitation Investment Project

**Sector:** VIQUEQUE

**Subsector:** Sanitation

**Division/Department:** Ministry of Public works (MPW)

Screening Questions		Score	Remarks <sup>9</sup>
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	<p>Regarding the DWWTP, the choice of the site will have to be done in a location that is deprived of these hazardous conditions.</p> <p>The topography of the project site is quite flat and landslide risk free so location of the FSTP is not considered to be a substantial problem. It has been earmarked by DNSA Viqueque as the best potential location for the FSTP (faecal Sludge Treatment Plant) since it is deprived of hazardous conditions in the immediate surrounding area and is outside the flood plain risk area.</p> <p>The access road from the public road to the treatment plant site needs to paved, without steep gradients. It should preferably have sufficient width to allow two tankers to pass. Where this is not possible, frequent passing places should be provided.</p> <p>In addition, capacity of the proposed facility can be increased by shortening the time of each cycle for removal of semi-dried faecal sludge from the ponds to the drying beds, while still providing the secure storage time for a safe Ascaris egg-free waste</p>

<sup>9</sup> If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Screening Questions		Score	Remarks <sup>9</sup>
			<p>product.</p> <p>The planning of the operation of the faecal sludge treatment facility would take the weather into account when estimating the reasonable maximum capacity with regards to the number of cycles per year for emptying the sludge/liquid separation bed.</p> <p>The emptying should then be completed by the end of the dry and wet seasons.</p>
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	<b>1</b>	<p>Related to WW transport from Households to the DWWTP, only in what regards choice of routing of trucks and robust infrastructure and avoidance of dangerous or flood-prone river traversing, given an accident mid-river would be cause for immediate pollution to the waterway.</p> <p>May require reliable knowledge on peak river flow and water level. The existing river is constructed sufficiently high to avoid flood occurrences and interruption of faecal sludge collection services.</p> <p>In case the bridge continually remains submerged in water, this would definitely adversely impact regular transportation of septage to FSTP. An alternative route which is open during wet season from November to May needs to be explored.</p>
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	<b>1</b>	<p>Given the project area has 2 seasons with frequent extreme conditions and one is predominantly drought prone, there may be a requirement to look into guaranteeing water or wastewater constant supply to maintain optimum conditions for WW treatment and avoid lagoons to dry out.</p> <p>Construction material will be selected keeping in mind the climactic conditions existing in the area.</p>
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	<b>1</b>	<p>The proposed WWTP location is above floodplain levels but strong rain occurrences may require temporary delays. Infrastructure maintenance and contingency measures must be in place for i.e. extreme rainfall and possible overflowing of WWTP.</p> <p>The civil construction design would be undertaken so that structures can be maintained well without incurring unduly high expenditure.</p>
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	<b>1</b>	<p>Infrastructure maintenance and contingency measures must be in place for i.e. extreme rainfall and possible overflowing of WWTP. Possible options may be additional Bunding Areas with recirculation after extreme event occurrence. Under evaluation by the technical team.</p> <p>FSTP is going to produce dry solids in the form of compost which can be utilised by farmers having</p>

Screening Questions		Score	Remarks <sup>9</sup>
			<p>agricultural fields in the vicinity of FSTP. For reuse of the dried faecal sludge from the faecal sludge treatment facility, the operation must secure elimination of Ascaris eggs, for example by using a one year cycle for moving sludge from pond to the two drying beds (for odd and even year) giving a total three years retention time before final removal of the dry faecal material. After three years the infection risk of Ascariasis is minimal.</p> <p>Yes the storage for the compost needs to be adequately provided keeping in mind the very long rainy season of approx. 06 months.</p> <p>FSTP is going to produce liquid effluent which would meet the WHO standards for it to be used for agriculture purpose. Excessive rainfall effect on the design of FSTP has to be taken into account t as it would not only dilute the influent septage but would also lead provision of higher volumetric capacities of the treatment units.</p>

Options for answers and corresponding score are provided below:


Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response will be categorized as high-risk project.



Result of Initial Screening (Low, Medium, High): Medium

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## Appendix 2. Sample Grievance Redress Form



Democratic Republic of Timor-Leste  
Project RFP039- Consultancy Services for Detailed Engineering Design of Timor-Leste  
Four Municipal Capitals Water Supply and Sanitation

# COMPLAINT REGISTRY FORM

**DATE:** \_\_\_\_/\_\_\_\_/\_\_\_\_ (dd/mm/yy) **CRF: 001**

**Capital (please check) :** ☐ Lospalos ☐ Viqueque ☐ Same

**Complainant Profile**

<b>Name</b>	:		<b>Age</b>	:	
<b>Gender</b>	:	<input type="checkbox"/> Male	<b>Civil Status</b>	:	<input type="checkbox"/> Single
		<input type="checkbox"/> Female			<input type="checkbox"/> Married
					<input type="checkbox"/> Widow/er
<b>Address</b>		<u>Aldeia</u>			
		<u>Suco</u>			
		<u>Administrative Post</u>			

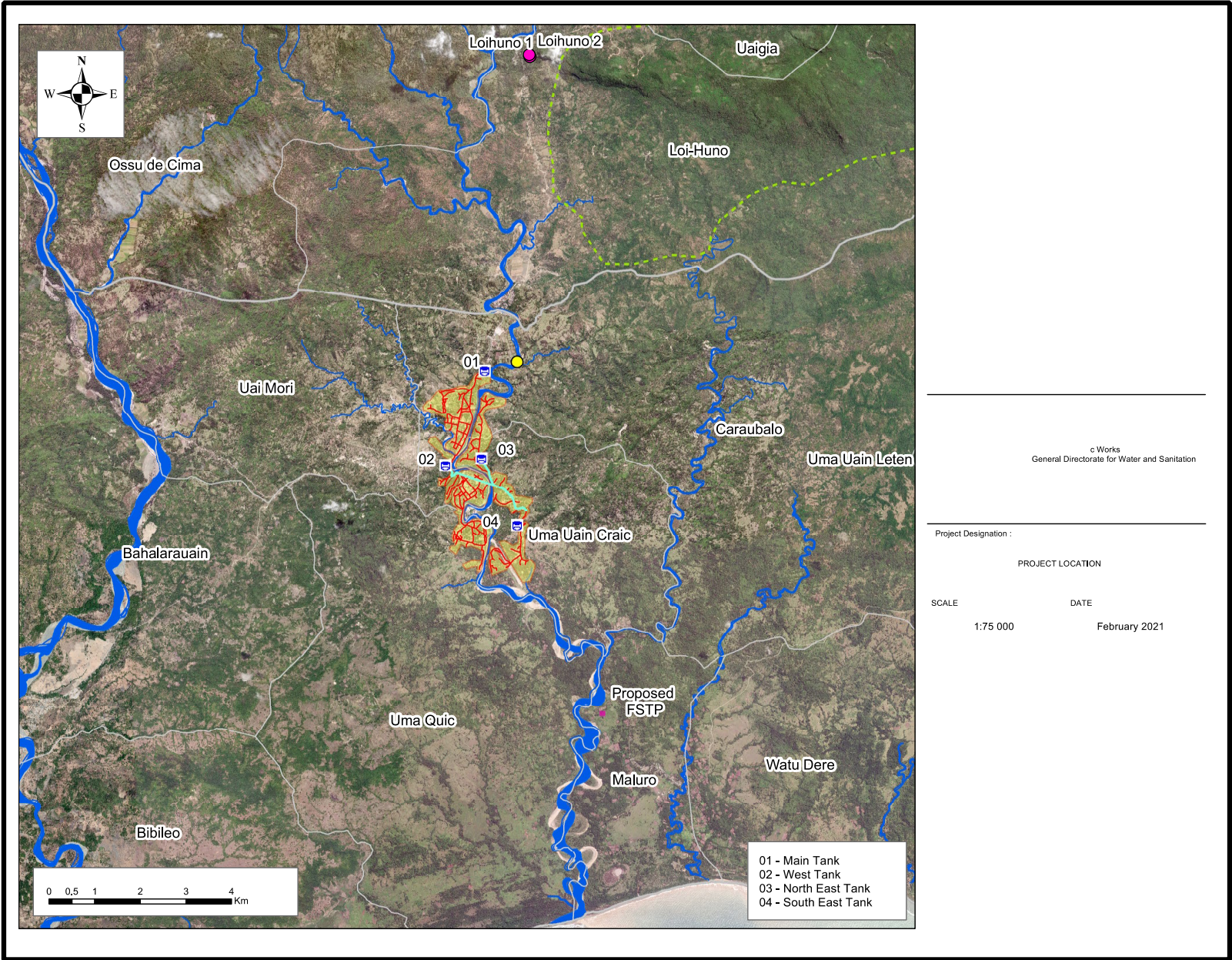
**Complaint Details**

<b>Attending Officer:</b>	
Name/Designation	Complainant Signature

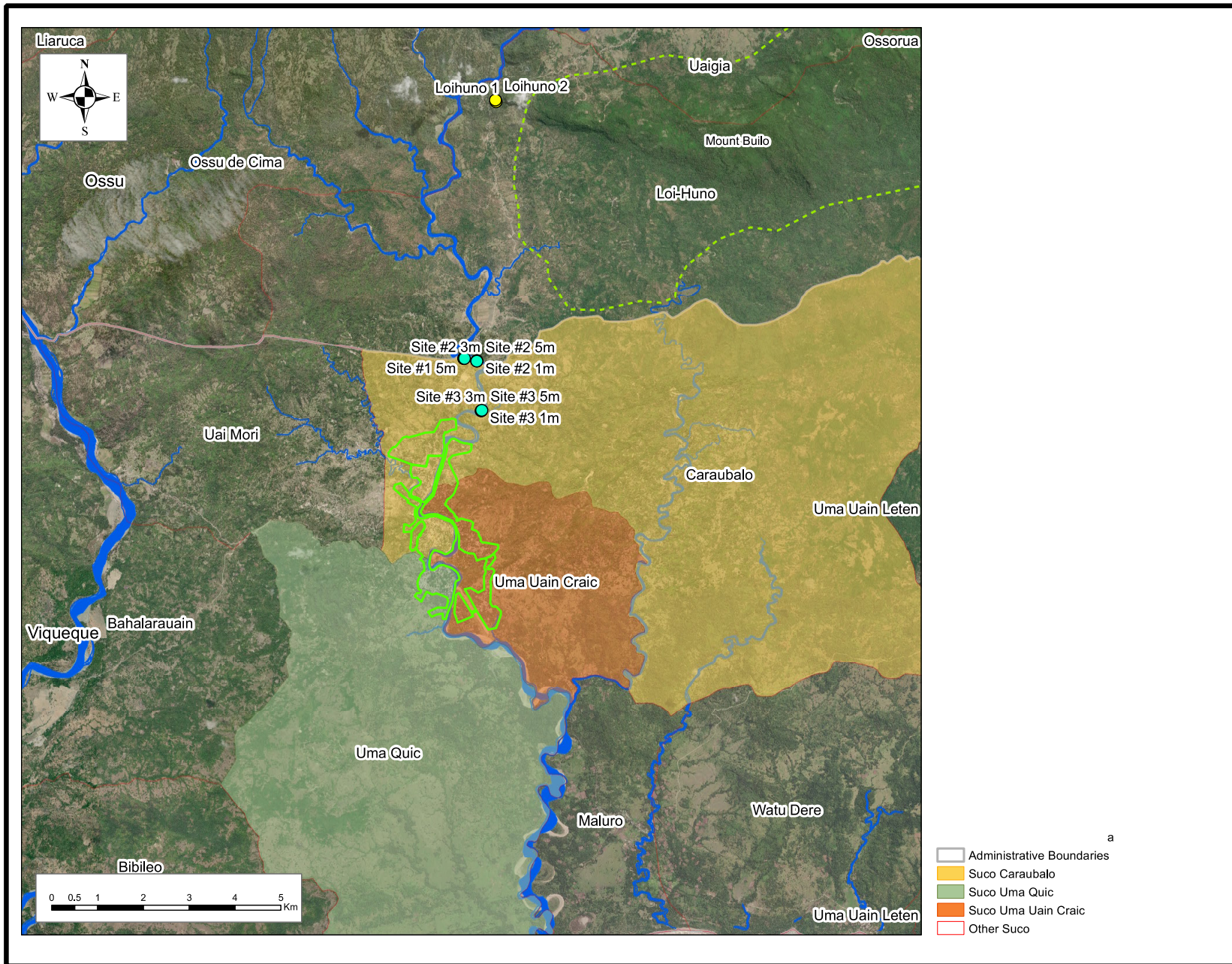
**Appendix 3. Maps for WSSIP – Viqueque City**

- 3.1 Location of the Project Components**
- 3.2 Water Sources vs Distribution Zones**









## Appendix 4. Water Quality Test Report (JICA & Master plan)

District : Viqueque

Town : Viqueque

Tested by: Alvaro Godinho, technician, OWS laboratory

No.	Sampling Point	Date		pH	Temp.	R.Cl <sub>2</sub>	Cond.	TDS	Salinity	Turbidity	NH <sub>3</sub> -N	Fluoride	Alkalinity	Hardness	NO <sub>3</sub> -N	NO <sub>2</sub> -N	Fe	Mn	T.Coli	G. Bacteria
		sample	test		(°C)	(mg/L)	(µ S/cm)	(mg/L)	(‰)	(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	CFU	CFU
	WHO Guideline Value			6.5-8.5	NS	0.5	NS	1000	NS	5.00	NS	1.50	NS	200	10.00	0.913	0.30	0.3	0	0
1	Loi Huno, intake	04/mai/00	05/mai/00	8.2	20.5	NT	457	221	0.2	1.05	0.2	1.07	239	NT	0.0	0.001	0.01	0.2	<30	<30
2	Break Pressure Tank	04/mai/00	05/mai/00	7.4	27.9	NT	551	267	0.3	0.53	ND	0.98	265	NT	0.0	0.003	0.00	NT	3	3
3	RSUD Viqueque, Hospital	04/mai/00	05/mai/00	7.7	28.1	NT	559	253	0.3	0.25	ND	1.12	NT	NT	0.0	0.003	0.01	NT	20	10
4	Beloi 1,PT	04/mai/00	05/mai/00	7.8	27.9	NT	548	265	0.3	0.21	ND	1.02	NT	NT	0.1	0.003	0.01	NT	10	10
5	Boramatan 3	04/mai/00	05/mai/00	7.6	27.8	NT	568	276	0.3	0.34	ND	1.16	NT	NT	0.1	0.002	0.00	NT	10	10
6	Beobe Area	04/mai/00	05/mai/00	7.7	27.9	NT	533	268	0.3	0.51	ND	1.18	NT	NT	0.1	0.003	0.01	NT	3	3
8	Beloi 3	04/mai/00	05/mai/00	7.6	26.3	NT	544	269	0.3	0.60	ND	1.10	NT	NT	0.1	0.002	0.00	NT	20	20
9	Aulatar, PT	04/mai/00	05/mai/00	7.5	27.1	NT	552	268	0.3	0.26	ND	1.24	331	NT	0.0	0.002	0.01	NT	10	10
10	Carabaro H.No.221	04/mai/00	05/mai/00	7.6	26.5	NT	548	265	0.3	1.45	ND	1.08	372	NT	0.1	0.003	0.01	0.2	3	3
11	Kabira, Boramatan 2	04/mai/00	05/mai/00	7.4	27.5	NT	545	264	0.3	1.68	ND	1.28	NT	NT	0.0	0.003	0.02	0.2	3	3

### Legend:

ND: not detectable

NT: not tested

NS: not set

CFU: colony formed unit

-: 0-3

±: 3-10

+: 10-20

++: 20-30

+++: more than 30

### Suggestions

Boil water before drinking

District : Viqueque

Town : Viqueque

Sampling Date :25/September/2001

Sampled by :Isak da Cruz DWSS Viqueque

Testing Date :26/September/2001

Tested by :Miguel Quintao WSS Laboratory

Received by :X.Wang

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	T.Coli form	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	CFU	CFU
East Timor Guidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	0	0
VQ-1	Loi Huno, intake	16:05	15:37	7.9	25.1	524	254	0.3	0.6	370	272	TNC	4
VQ-2	Break Pressure Tank	16:17	15:39	7.9	24.9	526	255	0.3	0.4	NT	NT	TNC	6
VQ-3	RSUD Viqueque	16:50	15:40	7.9	25.0	524	254	0.3	0.5	NT	NT	TNC	0
VQ-4	Beloi 1,PT	17:20	15:52	8.1	24.7	519	252	0.2	0.5	NT	NT	TNC	0
VQ-5	Boramatan 3	17:14	15:53	8.0	24.9	526	255	0.3	0.6	NT	NT	TNC	0
VQ-6	Bahafou PT	16:59	15:54	7.8	24.9	527	255	0.3	0.6	NT	NT	72	0
VQ-7	Beloi 3	16:48	16:02	7.9	25.0	529	256	0.3	0.5	NT	NT	TNC	2
VQ-8	Aulatar, PT	16:37	16:03	7.9	24.8	527	255	0.3	0.4	NT	NT	TNC	0
VQ-9	Carabaro H.No.261	17:06	16:04	7.9	25.0	528	256	0.3	0.3	NT	NT	88.0	2
VQ-10	Kabira, Boramatan 2	17:09	16:15	7.9	25.4	528	256	0.3	0.6	NT	NT	TNC	0
VQ-11	LoiHuno Spring	16:03	16:16	8.0	25.3	524	254	0.3	0.5	NT	NT	TNC	0

**Legend:**

( ND ) : not detectable      ( NT ) : not tested      ( NS ) : not set      ( CFU ) : colony formed unit      ( TNC ) : Too numerous to count  
 For Paper Slip      ( - ) : 0 - 3      ( ± ) : 3 - 10      ( + ) : 10 - 20      ( ++ ) : 20 - 30      ( +++ ) : more than 30

Weather Report: Sunny / Cloudy / Rain

**Recommendation**

Boil water before drinking

District : Viqueque

Town : Viqueque

Sampled and tested by: Mario Soares, WSS laboratory and T.ISHIHARA, JICA Study Team

No.	Sampling Point	Date		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Alkali.	Hdns.	Ca-Hdns	NH <sub>3</sub> -N	NO <sub>3</sub> -N	NO <sub>2</sub> -N	Fe	Fluoride	Mn	SO <sub>4</sub> <sup>2-</sup>	R.Cl <sub>2</sub>	T.Coli	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	CFU	CFU
Timor Loro sa'e Guidelines				6.5-8.5	NS	NS	1000	NS	5.0	NS	200	NS	NS	10.0	0.913	1.50	1.50	0.5	250	0.5	0	0
VQ-1	Loi Huno, intake	02/nov/00	03/nov/00	8.6	27.6	493	238	0.2	11.2	254	262	160	ND	ND	0.005	0.01	1.24	0.5	30	NT	TNC	TNC
VQ-2	Break Pressure Tank	No water		NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
VQ-3	RSUD Viqueque	02/nov/00	03/nov/00	8.0	31.8	561	272	0.3	0.3	NT	NT	NT	ND	NT	NT	NT	1.26	NT	NT	NT	75	0
VQ-4	Beloi 1,PT	02/nov/00	03/nov/00	8.2	30.6	556	269	0.3	0.3	288	278	184	ND	ND	0.006	0.01	1.10	0.3	29	NT	TNC	12
VQ-5	Boramatan 3	02/nov/00	03/nov/00	7.9	34.9	563	273	0.3	2.1	NT	NT	NT	ND	NT	NT	NT	0.91	NT	NT	NT	TNC	76
VQ-6	Bahafu PT	02/nov/00	03/nov/00	8.0	32.1	560	272	0.3	0.7	250	304	201	ND	ND	0.007	ND	1.14	0.3	30	NT	TNC	28
VQ-7	Beloi 3	02/nov/00	03/nov/00	8.0	30.8	560	271	0.3	0.5	292	296	200	ND	ND	0.005	0.01	1.31	0.1	30	NT	95	38
VQ-8	Aulatar, PT	02/nov/00	03/nov/00	7.9	31.4	560	271	0.3	0.5	288	290	198	0.1	ND	0.005	0.01	0.85	0.2	29	NT	60	32
VQ-9	Carabaro H.No.261	02/nov/00	03/nov/00	7.8	31.0	565	274	0.3	0.3	278	276	198	ND	0.1	0.005	0.01	1.17	0.2	29	NT	TNC	4
VQ-10	Kabira, Boramatan 2	02/nov/00	03/nov/00	7.8	32.4	566	274	0.3	2.0	NT	NT	NT	ND	NT	NT	NT	1.21	NT	NT	NT	TNC	6

**Legend:**

ND: not detectable

NT: not tested

NS: not set

CFU: colony formed unit

TNC: too numerous to count

**Recommendation**

Boil water before drinking

**District : Viqueque**

**Town : Viqueque**

sampled by : Izac Da Cruz,DWWSViqueque,Tesed by: Alvaro Godinho,Mario Soares,WSS Laboratory

No.	Sampling Point	Date		pH	Temp.	Cond.	TDS	Salinity	Turbid.	T.Coli	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	CFU	CFU
Timor Loro sa'e Guidelines				6.5-8.5	NS	NS	1000	NS	5.0	0	0
VQ-1	Loi Huno, intake	07/jan/01	09/jan/01	8.0	24.4	561	272	0.3	0.3	0	0
VQ-2	Break Pressure Tank	07/jan/01	09/jan/01	8.3	25.0	559	271	0.3	0.4	60	0
VQ-3	RSUD Viqueque	07/jan/01	09/jan/01	8.4	24.9	554	263	0.3	0.3	0	0
VQ-4	Beloi 1,PT	07/jan/01	09/jan/01	8.4	24.9	555	269	0.3	0.4	25	0
VQ-5	Boramatan 3	07/jan/01	09/jan/01	8.4	25.0	558	271	0.3	0.5	0	0
VQ-6	Bahafou PT	07/jan/01	09/jan/01	8.4	24.7	458	222	0.3	1.0	75	0
VQ-7	Beloi 3	07/jan/01	09/jan/01	8.6	25.0	557	270	0.3	0.3	TNC	20
VQ-8	Aulatar, PT	07/jan/01	09/jan/01	8.4	24.8	556	269	0.3	0.5	TNC	30
VQ-9	Carabaro H.No.261	07/jan/01	09/jan/01	8.4	24.6	558	270	0.3	0.3	15	0
VQ-10	Kabira, Boramatan 2	07/jan/01	09/jan/01	8.4	24.6	552	268	0.3	0.4	0	0

**Legend:**

ND: not detectable

NT: not tested

NS: not set

CFU: colony formed unit

TNC:Too numerous to count

**Recommendation**

Boil water before drinking



**District : Viqueque**

**Town : Viqueque**

Sample by Isac Da cruz DWSS Viqueque Tested by Alvaro G, Mario Soares WSS Laboratory

No.	Sampling Point	Date		pH	Temp.	Cond.	TDS	Salinity	Turbid.	T.Coli	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	CFU	CFU
Timor Loro sa'e Guidelines				6.5-8.5	NS	NS	1000	NS	5.0	0	0
VQ-1	Loi Huno, intake	31/jan/01	02/fev/01	8.2	26.7	553	268	0.3	0.4	TNC	0
VQ-2	Break Pressure Tank	31/jan/01	02/fev/01	8.2	25.8	553	268	0.3	0.4	25	0
VQ-3	RSUD Viqueque	31/jan/01	02/fev/01	8.2	26.8	550	266	0.3	0.8	15	0
VQ-4	Beloi 1,PT	31/jan/01	02/fev/01	8.2	25.6	550	267	0.3	0.7	60	0
VQ-5	Boramatan 3	31/jan/01	02/fev/01	8.2	25.2	555	269	0.3	0.6	10	0
VQ-6	Bahafou PT	31/jan/01	02/fev/01	8.2	25.4	553	268	0.3	0.5	0	0
VQ-7	Beloi 3	31/jan/01	02/fev/01	8.2	25.1	554	269	0.3	0.7	30	0
VQ-8	Aulatar, PT	31/jan/01	02/fev/01	8.2	25.3	553	268	0.3	0.6	55	0
VQ-9	Carabaro H.No.261	31/jan/01	02/fev/01	8.2	25.4	551	267	0.3	0.8	TNC	0
VQ-10	Kabira, Boramatan 2	31/jan/01	02/fev/01	8.2	25.5	555	269	0.3	0.7	0	0

**Legend:**

ND: not detectable

NT: not tested

NS: not set

CFU: colony formed unit

TNC: Too numerous to count

**Recommendation**

Boil water before drinking



**District : Viqueque**

**Town : Viqueque**

Sample by Isac Da cruz DWSS Viqueque Tested by Alvaro G, Mario Soares WSS Laboratory

No.	Sampling Point	Date		pH	Temp.	Cond.	TDS	Salinity	Turbid.	T.Coli	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	CFU	CFU
Timor Loro sa'e Guidelines				6.5-8.5	NS	NS	1000	NS	5.0	0	0
VQ-1	Loi Huno, intake	21/fev/01	22/fev/01	8.1	28.0	260	271	3.0	0.5	TNC	12
VQ-2	Break Pressure Tank	21/fev/01	22/fev/01	8.1	27.6	553	268	0.3	0.2	TNC	2
VQ-3	RSUD Viqueque	21/fev/01	22/fev/01	8.2	27.6	551	267	0.3	0.3	TNC	2
VQ-4	Beloi 1,PT	21/fev/01	22/fev/01	8.3	27.2	551	267	0.3	0.5	TNC	94
VQ-5	Boramatan 3	21/fev/01	22/fev/01	8.2	27.4	554	269	0.3	0.8	15	8
VQ-6	Bahafou PT	21/fev/01	22/fev/01	8.2	27.1	554	268	0.3	0.3	5	0
VQ-7	Beloi 3	21/fev/01	22/fev/01	8.1	27.3	558	271	0.3	0.4	TNC	70
VQ-8	Aulatar, PT	21/fev/01	22/fev/01	8.3	27.3	554	268	0.3	0.4	80	32
VQ-9	Carabaro H.No.261	21/fev/01	22/fev/01	8.2	27.2	551	267	0.3	2.0	0	0
VQ-10	Kabira, Boramatan 2	21/fev/01	22/fev/01	8.1	27.1	558	270	0.3	0.5	0	2

**Legend:**

ND: not detectable

NT: not tested

NS: not set

CFU: colony formed unit

TNC: Too numerous to count

**Recommendation**

Boil water before drinking

**District : Viqueque****Town : Viqueque**

Sampling Date : 22-May-2001

Testing Date : 25-May-2001

Received by : Alvaro Godinho

Sampled by : Isak da Cruz DWSS Viqueque

Tested by : Mario Soares WSS Laboratory

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Ca.Hardness	T.Coli	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	CFU	CFU
East TimorGuidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	0	0
VQ-1	Loi Huno, intake	10:20	09:45	8.3	20.6	577	280	0.3	0.7	290	NT	60	2
VQ-2	Break Pressure Tank	10:15	09:46	8.2	20.3	561	272	0.3	0.5	NT	NT	10	2
VQ-3	RSUD Viqueque	08:25	09:47	8.2	20.0	570	276	0.3	1.2	NT	NT	70	0
VQ-4	Beloi 1,PT	09:20	10:06	8.3	19.6	561	272	0.3	0.5	NT	NT	5	4
VQ-5	Boramatan 3	08:36	10:07	8.2	19.5	561	272	0.3	0.8	NT	NT	65	0
VQ-6	Bahafu PT	08:57	10:08	8.1	19.2	564	274	0.3	0.6	NT	NT	25	0
VQ-7	Beloi 3	08:10	10:25	8.1	19.1	564	274	0.3	1.1	NT	NT	5	0
VQ-8	Aulatar, PT	09:59	10:26	8.2	19.4	564	274	0.3	0.7	NT	NT	30	0
VQ-9	Carabaro H.No.261	09:05	10:27	8.3	19.9	561	272	0.3	1.3	NT	NT	5	0
VQ-10	Kabira, Boramatan 2	08:41	10:45	8.2	19.9	564	274	0.3	0.6	NT	NT	65	4
VQ-11	Loihuno Spring	10:20	10:46	8.1	20.9	566	274	0.3	0.4	NT	NT	25	0

**Legend:**

ND: not detectable

NT: not tested

NS: not set

CFU: colony formed unit

TNC: Too numerous to count

For Paper Slip

( - ) : 0 - 3

( ± ) : 3 - 10

( + ) : 10 - 20

( ++ ) : 20 - 30

( +++ ) : More Than 30

**Recommendation**

Boil water before drinking

District : Viqueque

Sampling Date :25/06/01

Sampled by :Isak da Cruz. DWSS Viqueque

Town : Viqueque

Testing Date :25/06/01

Tested by :Miguel Quintao &amp; Mario Soares WSS Laboratory

Received by :Mario Soares

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	T.Coliform	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	CFU	CFU
East TimorGuidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	0	0
VQ-1	Loi Huno, intake	06:05	15:03	8.3	26.1	570	277	0.3	0.7	2690	195	<30	<30
VQ-2	Break Pressure Tank	06:15	15:07	8.3	26.1	571	277	0.3	0.9	NT	NT	<30	<30
VQ-3	RSUD Viqueque	06:55	15:09	8.3	26.0	566	274	0.3	0.7	NT	NT	<30	<30
VQ-4	Beloi 1,PT	07:45	15:14	8.2	26.1	563	273	0.3	0.8	NT	NT	<30	<30
VQ-5	Boramatan 3	07:09	15:16	8.2	26.1	570	276	0.3	0.7	NT	NT	<30	20.0
VQ-6	Bahafou PT	06:15	16:12	8.2	26.2	568	275	0.3	1.0	NT	NT	<30	<30
VQ-7	Beloi 3	07:30	16:13	8.3	26.0	564	274	0.3	1.0	NT	NT	<30	<30
VQ-8	Aulatar, PT	07:25	16:14	8.2	26.0	566	275	0.3	0.7	NT	NT	<30	<30
VQ-9	Carabaro H.No.261	No Sample		NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
VQ-10	Kabira, Boramatan 2	07:40	16:30	8.2	26.0	571	277	0.3	0.5	NT	NT	<30	<30
VQ-11	LoiHuno Spring	07:54	16:31	8.2	26.1	568	275	0.3	1.0	NT	NT	20.0	20.0

**Legend:**

( ND ) : not detectable      ( NT ) : not tested      ( NS ) : not set      ( CFU ) : colony formed unit      ( TNC ) : Too numerous to count  
 For Paper Slip      ( - ) : 0 - 3      ( ± ) : 3 - 10      ( + ) : 10 - 20      ( ++ ) : 20 - 30      ( +++ ) : more than 30

Weather Report :

Sunny / Cloudy / Rain

**Recommendation**

Boil water before drinking

District : Viqueque

Town : Viqueque

Sampling Date : 22/07/2001

Sampled by : Isak da Cruz DWSS Viqueque

Testing Date : 27/07/2001

Tested by : Miguel Quintao &amp; Mario Soares WSS Laboratory

Received by : Mario Soares

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	T.Coliform	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	CFU	CFU
East Timor Guidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	0	0
VQ-1	Loi Huno, intake	15:07	10:08	8.4	12.0	425	205	0.2	2.1	260	286	NT	NT
VQ-2	Break Pressure Tank	15:11	10:11	8.4	8.7	568	275	0.3	2.1	NT	NT	NT	NT
VQ-3	RSUD Viqueque	15:54	10:14	8.4	10.1	558	270	0.3	0.8	NT	NT	NT	NT
VQ-4	Beloi 1,PT	15:41	10:17	8.5	13.5	538	261	0.3	1.9	NT	NT	NT	NT
VQ-5	Boramatan 3	16:01	10:20	8.4	11.6	559	271	0.3	0.7	NT	NT	NT	NT
VQ-6	Bahafou PT	16:04	10:24	8.3	12.9	557	270	0.3	0.7	NT	NT	NT	NT
VQ-7	Beloi 3	16:07	10:26	8.2	13.6	557	270	0.3	1.1	NT	NT	NT	NT
VQ-8	Aulatar, PT	15:29	10:28	8.3	13.8	552	267	0.3	0.7	NT	NT	NT	NT
VQ-9	Carabaro H.No.261	No Sample		NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
VQ-10	Kabira, Boramatan 2	16:11	10:30	8.2	12.6	571	277	0.3	1.1	NT	NT	NT	NT

**Legend:**

( ND ) : not detectable      ( NT ) : not tested      ( NS ) : not set      ( CFU ) : colony formed unit      ( TNC ) : Too numerous to count  
 For Paper Slip      ( - ) : 0 - 3      ( ± ) : 3 - 10      ( + ) : 10 - 20      ( ++ ) : 20 - 30      ( +++ ) : more than 30

Weather Report:      Sunny      Cloudy      Rain

**Recommendation**

Boil water before drinking

District : Viqueque

Town : Viqueque

Sampling Date :23/ 08/ 2001

Testing Date :24 / 08/ 2001

Received by : Mario Soares

Sampled by : Isak Da Crus DWSS Viqueque

Tested by : Mario Soares WSS Laboratory

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	T.Coliform	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	CFU	CFU
East TimorGuidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	0	0
VQ-1	Loi Huno, intake	04:44	15:50	8.1	23.8	657	320	0.3	0.6	280	246	14	0
VQ-2	Break Pressure Tank	04:37	15:52	7.9	23.3	508	246	0.2	0.5	NT	NT	2	0
VQ-3	RSUD Viqueque	05:23	16:04	8.0	23.4	506	245	0.2	0.5	NT	NT	6	0
VQ-4	Beloi 1,PT	0.5:53	16:05	7.9	23.7	504	244	0.2	0.6	NT	NT	2	0
VQ-5	Boramatan 3	05:32	16:06	7.9	24.1	504	244	0.2	0.8	NT	NT	8	0
VQ-6	Bahafu PT	05:41	16:22	7.9	23.3	504	244	0.2	0.6	NT	NT	4	0
VQ-7	Beloi 3	05:20	16:23	7.9	24.0	503	243	0.2	0.6	NT	NT	22	2
VQ-8	Aulatar, PT	0.5:12	16:24	7.8	24.0	503	244	0.2	0.5	NT	NT	48	0
VQ-9	Carabaro H.No.261	No Sample		NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
VQ-10	Kabira, Boramatan 2	05:35	16:38	7.9	24.0	503	243	0.2	0.8	NT	NT	0	0
VQ-11	Loi huno Spring	04:45	15:51	8.0	24.1	500	242	0.2	0.7	292	246	54	0

**Legend:**

( ND ) : not detectable

( NT ) : not tested

( NS ) : not set

( CFU ) : colony formed unit

( TNC ) : Too numerous to count

For Paper Slip

( - ) : 0 - 3

( ± ) : 3 - 10

( + ) : 10 - 20

( ++ ) : 20 - 30

( +++ ) : more than 30

Weather Report:

Sunny

Cloudy

Rain

**Recommendation**

Boil water before drinking

District : Viqueque

Town : Viqueque

Sampling Date : 16 / October / 2001

Testing Date : 17 / October / 2001

Received by : Mario Soares

Sampled by : Isak da Cruz DWSS Viqueque

Tested by : Miguel Quintao &amp; Mario Soares WSS Laboratory

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	Amonia	Nitrate	Nitrite	Fe	Mn	Fluoride	Sulfate	T.Coli	E.Col
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	CFU
East TimorGuidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	1.5	10	1	0.3	0.5	1.5	250	0	0
VQ-1	Loi Huno, intake	09:27	16:39	8.2	25.4	519	251	0.2	0.5	364	2668	ND	ND	0.007	0.01	NT	1.09	26	TNC	34
VQ-2	Break Pressure Tank	09:20	16:40	8.1	24.7	527	255	0.3	1.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	206	18
VQ-3	RSUD Viqueque	15:49	16:41	8.2	24.6	519	251	0.2	1.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	64	0
VQ-4	Beloi 1,PT	15:30	16:50	8.3	24.8	521	252	0.2	0.7	NT	NT	NT	NT	NT	NT	NT	NT	NT	TNC	2
VQ-5	Boramatan 3	15:56	16:51	8.2	24.6	525	254	0.3	0.6	NT	NT	NT	NT	NT	NT	NT	NT	NT	TNC	0
VQ-6	Bahafu PT	16:06	17:00	8.2	24.6	526	255	0.3	1.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	TNC	0
VQ-7	Beloi 3	15:32	17:01	8.2	25.6	526	256	0.3	0.6	NT	NT	NT	NT	NT	NT	NT	NT	NT	TNC	0
VQ-8	Aulatar, PT	16:45	17:02	8.2	24.7	525	254	0.3	1.1	NT	NT	NT	NT	NT	NT	NT	NT	NT	TNC	4
VQ-9	Carabaro H.No.261	No Sample		NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
VQ-10	Kabira, Boramatan 2	16:01	17:03	8.2	24.7	526	255	0.3	0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT	64	2
VQ-11	LoiHuno Spring	09:30	17:06	8.2	25.1	523	253	0.3	0.8	432	271	NT	NT	NT	NT	NT	NT	NT	TNC	24

**Legend:**

( ND ) : not detectable ( NT ) : not tested ( NS ) : not set ( CFU ) : colony formed uni TNC ) : Too numerous to count

For Paper Slip ( - ) : 0 - 3 ( ± ) : 3 - 10 ( + ) : 10 - 20 ( ++ ) : 20 - 3 ( +++ ) : more than

Weather Report : Sunny Cloudy Rain

**Recommendation**

Boil water before drinking

District : Viqueque

Sampling Date :22/11/2001

Sample by : Isak da Crus DWSS Viqueque

Town : Viqueque

Testing Date :23/11/2001

Tested by : Miguel Quintao and Mario Soares WSS Laboratory

Received by :Miguel Quintao

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	T.Coli	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	CFU	CFU
East TimorGuidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	0	0
VQ-1	Loi Huno, intake	11:16	15:16	8.1	24.4	526	255	0.3	0.6	310	285	TNC	6
VQ-2	Break Pressure Tank	11:25	15:17	8.0	23.7	525	254	0.3	0.5	NT	NT	TNC	4
VQ-3	RSUD Viqueque	12:15	15:18	8.0	24.4	527	255	0.3	0.4	NT	NT	TNC	16
VQ-4	Beloi 1,PT	12:01	15:29	8.0	24.9	527	255	0.3	0.8	NT	NT	TNC	18
VQ-5	Boramatan 3	12:20	15:30	7.9	24.8	527	255	0.3	0.7	NT	NT	TNC	4
VQ-6	Bahafou PT	12:25	15:31	8.0	24.6	526	255	0.3	4.2	NT	NT	TNC	20
VQ-7	Beloi 3	12:05	15:40	8.0	24.9	527	255	0.3	1.6	NT	NT	TNC	10
VQ-8	Aulatar, PT	11:50	15:41	8.0	24.9	525	254	0.3	1.0	NT	NT	TNC	18
VQ-9	Carabaro H.No.261	No Sample		NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
VQ-10	Kabira, Boramatan 2	12:10	15:42	8.0	24.7	528	256	0.3	3.4	NT	NT	TNC	2
VQ-11	LoiHuno Spring	11:15	15:50	8.1	24.8	523	253	0.3	0.8	345	315	TNC	4

**Legend:**

( ND ) : not detectable      ( NT ) : not tested      ( NS ) : not set      ( CFU ) : colony formed unit;      ( TNC ) : Too numerous to count

For Paper Slip      ( - ) : 0 - 3      ( ± ) : 3 - 10      ( + ) : 10 - 20      ( ++ ) : 20 - 30      ( +++ ) : more than 30

Weather Report:      Sunny      Cloudy      Rain

**Recommendation**

Boil water before drinking



**District : Viqueque****Town : Viqueque**

Sampling Date : 24/01/2002

Sample by : Marito da Costa DWSS Viqueque

Testing Date : 25/01/2002

Tested by : Miguel Quintao WSS Laboratory

Received by : Miguel Quintao WSS Laboratory

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	T.Coli	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	CFU	CFU
East TimorGuidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	0	0
VQ-1	Loi Huno, intake	05:51	10:04	8.0	25.0	527	255	0.3	0.6	225	315	TNC	66
VQ-2	Break Pressure Tank	05:40	10:05	8.0	25.0	527	255	0.3	0.6	NT	NT	TNC	TNC
VQ-3	RSUD Viqueque	05:10	10:06	8.1	25.2	497	240	0.2	0.5	NT	NT	TNC	36
VQ-4	Beloi 1,PT	05:17	10:20	8.1	25.3	499	241	0.2	0.7	NT	NT	TNC	4
VQ-5	Boramatan 3	04:56	10:21	8.1	25.2	527	255	0.3	0.4	NT	NT	TNC	12
VQ-6	Bahafou PT	04:50	10:22	7.9	25.0	528	256	0.3	0.7	NT	NT	38	4
VQ-7	Beloi 3	05:13	10:26	8.0	25.0	527	255	0.3	0.6	NT	NT	TNC	4
VQ-8	Aulatar, PT	05:23	10:27	8.0	25.1	525	255	0.3	0.8	NT	NT	TNC	14
VQ-9	Carabaro H.No.261	No Water		NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
VQ-10	Kabira, Boramatan 2	04:44	10:28	8.0	24.9	527	255	0.3	0.4	NT	NT	TNC	TNC
VQ-11	LoiHuno Spring	05:53	00:00	8.0	25.0	527	255	0.3	0.5	225	325	TNC	8

**Legend:**

( ND ) : not detectable

( NT ) : not tested

( NS ) : not set

( CFU ) : colony formed unit

( TNC ) : Too numerous to count

Weather Report :

Sunny

Cloudy

Rain

Inspected by :

**Recommendation**

Boil water before drinking

Mario Soares Laboratory Manager

District : Viqueque

Sampling Date : 24/01/2002

Sample by : Marito da Costa DWSS Viqueque

Town : Viqueque

Testing Date : 25/01/2002

Tested by : Miguel Quintao WSS Laboratory

Received by : Miguel Quintao WSS Laboratory

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	T.Coli	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	CFU	CFU
East TimorGuidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	0	0
VQ-1	Loi Huno, intake	05:51	10:04	8.0	25.0	527	255	0.3	0.6	225	315	TNC	66
VQ-2	Break Pressure Tank	05:40	10:05	8.0	25.0	527	255	0.3	0.6	NT	NT	TNC	TNC
VQ-3	RSUD Viqueque	05:10	10:06	8.1	25.2	497	240	0.2	0.5	NT	NT	TNC	36
VQ-4	Beloi 1,PT	05:17	10:20	8.1	25.3	499	241	0.2	0.7	NT	NT	TNC	4
VQ-5	Boramatan 3	04:56	10:21	8.1	25.2	527	255	0.3	0.4	NT	NT	TNC	12
VQ-6	Bahafou PT	04:50	10:22	7.9	25.0	528	256	0.3	0.7	NT	NT	38	4
VQ-7	Beloi 3	05:13	10:26	8.0	25.0	527	255	0.3	0.6	NT	NT	TNC	4
VQ-8	Aulatar, PT	05:23	10:27	8.0	25.1	525	255	0.3	0.8	NT	NT	TNC	14
VQ-9	Carabaro H.No.261	No Water		NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
VQ-10	Kabira, Boramatan 2	04:44	10:28	8.0	24.9	527	255	0.3	0.4	NT	NT	TNC	TNC
VQ-11	LoiHuno Spring	05:53	00:00	8.0	25.0	527	255	0.3	0.5	225	325	TNC	8

**Legend:**

( ND ) : not detectable

( NT ) : not tested

( NS ) : not set

( CFU ) : colony formed unit;

( TNC ) : Too numerous to count

Weather Report:

Sunny

Cloudy

Rain

Inspected by :

**Recommendation**

Boil water before drinking

Mario Soares Laboratory Manager

**District : Viqueque**

Sampling Date : 24/02/2002

Sample by : Marito da Costa DWSS Viqueque

**Town : Viqueque**

Testing Date : 26/02/2002

Tested by : Mario Soares WSS Laboratory

Received by : Miguel Quintao

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	T.Coli	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	CFU	CFU
East TimorGuidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	0	0
VQ-1	Loi Huno, intake		10:39	8.1	26.1	537	260	0.3	0.7	NT	NT	TNC	0
VQ-2	Break Pressure Tank		10:40	8.1	25.6	525	254	0.3	0.6	NT	NT	TNC	0
VQ-3	RSUD Viqueque		10:41	8.0	25.3	518	251	0.2	0.6	NT	NT	24	2
VQ-4	Beloi 1,PT		10:50	8.2	25.2	518	251	0.2	0.4	NT	NT	TNC	2
VQ-5	Boramatan 3		10:51	8.2	25.3	526	255	0.3	0.3	NT	NT	TNC	TNC
VQ-6	Bahafou PT		10:52	8.2	24.3	525	255	0.3	4.1	NT	NT	40	4
VQ-7	Beloi 3		11:10	8.1	24.9	526	255	0.3	0.8	NT	NT	70	2
VQ-8	Aulatar, PT		11:11	8.1	24.5	525	254	0.3	0.5	NT	NT	TNC	14
VQ-9	Carabaro H.No.261		11:12	8.2	25.0	527	255	0.3	0.5	NT	NT	TNC	12
VQ-10	Kabira, Boramatan 2		11:20	8.2	24.8	528	256	0.3	0.6	NT	NT	TNC	12
VQ-11	LoiHuno Spring		11:21	8.0	25.4	526	255	0.3	0.4	NT	NT	38	6

**Legend:**

( ND ) : not detectable

( NT ) : not tested

( NS ) : not set

( CFU ) : colony formed unit

( TNC ) : Too numerous to count

Weather Report :

Sunny

Cloudy

Rain

Inspected by :

**Recommendation**

Boil water before drinking

Mario Soares Laboratory Manager

District : Viqueque

Sampling Date : 24/04/2002

Sample by : Marito da Costa DWSS Viqueque

Town : Viqueque

Testing Date : 25 - 04 - 2002

Tested by : Miguel Quintao WSS Laboratory

Received by : Mario Soares

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	T.Coli	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	CFU	CFU
East TimorGuidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	0	0
VQ-1	Loi Huno, intake	16:15	09:45	8.5	28.5	164	78	0.1	0.7	255		18	0
VQ-2	Break Pressure Tank	16:35	09:46	7.7	28.1	352	170	0.2	0.8	NT	NT	4	4
VQ-3	RSUD Viqueque	06:15	09:50	7.6	28.4	441	213	0.2	0.7	NT	NT	40	2
VQ-4	Beloi 1,PT	06:10	09:51	7.5	28.1	420	203	0.2	1.1	NT	NT	4	0
VQ-5	Boramatan 3	06:25	10:00	7.5	28.0	459	222	0.2	0.8	NT	NT	0	0
VQ-6	Bahafou PT	06:20	10:01	7.3	27.7	443	214	0.2	0.6	NT	NT	14	0
VQ-7	Beloi 3	06:00	10:09	7.4	26.7	172	82	0.1	0.5	NT	NT	6	0
VQ-8	Aulatar, PT	06:30	10:16	7.3	26.5		120	0.1	0.8	NT	NT	32	0
VQ-9	Carabaro H.No.261	06:35	10:10	7.6	26.2	401	194	0.2	0.9	NT	NT	0	0
VQ-10	Kabira, Boramatan 2	06:40	10:17	7.3	26.3	128	61	0.1	0.5	NT	NT	6	0
VQ-11	LoiHuno Spring	16:17	10:25	6.9	26.2	62	29	0.0	0.5	350	245	30	2

**Legend:**

( ND ) : not detectable

( NT ) : not tested

( NS ) : not set

( CFU ) : colony formed unit

( TNC ) : Too numerous to count

Weather Report :

Sunny

Cloudy

Rain

Inspected by :

**Recommendation**

Boil water before drinking

Mario Soares Laboratory Manager

**District : Viqueque****Town : Viqueque**

Sampling Date :30 - 03 - 2003

Sample by : Marito da costa D wss Viqueque

Testing Date :31 - 03 - 2003

Tested by : Miguel Quintao Wss Laboratory

Received by : Miguel Quintao

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	T.Coli	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	CFU	CFU
East TimorGuidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	0	0
VQ-1	Loi Huno, intake	10:15	10:15	8.2	29.0	450	200	0.1	0.3	340	250	TNC	0
VQ-2	Break Pressure Tank	03:25	10:16	8.1	29.1	450	215	0.1	0.6	NT	NT	TNC	0
VQ-3	RSUD Viqueque	03:45	10:25	8.1	29.5	415	220	0.1	0.3	NT	NT	TNC	6
VQ-4	Beloi 1,PT	04:20	10:26	8.2	29.5	407	240	0.2	0.7	NT	NT	86	8
VQ-5	Boramatan 3	03:52	10:27	8.3	29.4	407	250	0.2	1.2	NT	NT	TNC	0
VQ-6	Bahafou PT	04:11	10:33	8.4	29.0	408	240	0.2	1.1	NT	NT	TNC	6
VQ-7	Beloi 3	04:25	10:34	8.1	29.1	450	240	0.2	0.7	NT	NT	70	2
VQ-8	Aulatar, PT	04:30	10:35	8.1	29.8	420	240	0.2	0.8	NT	NT	76	0
VQ-9	Carabaro H.No.261	04:19	10:38	8.1	28.5	415	210	0.2	0.6	NT	NT	TNC	12
VQ-10	Kabira, Boramatan 2	04:15	10:39	8.1	29.5	410	220	0.1	0.5	NT	NT	TNC	0
VQ-11	LoiHuno Spring	03:17	10:40	8.1	29.1	407	240	0.2	0.7	450	315	TNC	4

**Legend:**

( ND ) : not detectable

( NT ) : not tested

( NS ) : not set

( CFU ) : colony formed unit;

( TNC ) : Too numerous to count

Weather Report :

Sunny

Cloudy

Rain

Inspected by :

**Recommendation**

Boil water before drinking

Laboratory Officer DNAS

District : Viqueque

Sampling Date :19 - 12 - 2005

Sample by : Marito da costa D wss Viqueque

Town : Viqueque

Testing Date :20 - 12 - 2005

Tested by : Mario Soares &amp; Rui Manuel Pinto Belo Laboratory

Received by : Mario Soares

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	T.Coli	E.Coli
<b>East Timor Guidelines</b>		<b>Hours And Minutes</b>		<b>6.5-8.5</b>	<b>NS</b>	<b>NS</b>	<b>1000</b>	<b>NS</b>	<b>1.2</b>	<b>200</b>	<b>NS</b>	<b>0</b>	<b>0</b>
VQ-1	Loi Huno, intake	15.45	13.57	8.7	29.2	7.19	2,6	ND	0.6	NT	NT	12	26
VQ-2	Break Pressure Tank	15.30	13.58	8.4	29.1	0.22	ND	ND	1.0	NT	NT	TNC	TNC
VQ-3	RSUD Viqueque	13.40	13.59	7.6	29.0	0.17	ND	ND	0.6	NT	NT	TNC	TNC
VQ-4	Beloi 1,PT	14.21	14.10	8.5	29.0	0.17	ND	ND	0.5	NT	NT	TNC	TNC
VQ-5	Boramatan 3	13.48	14.11	8.6	29.0	0.18	ND	ND	0.5	NT	NT	TNC	TNC
VQ-6	Bahafu PT	13.55	14.12	8.7	29.1	138	69	0.1	0.5	NT	NT	TNC	94
VQ-7	Beloi 3	14.16	14.20	8.6	28.9	946	464	0.5	0.5	NT	NT	74	78
VQ-8	Aulatar, PT	14.39	14.21	7.5	29.1	111	52,3	ND	0.5	NT	NT	TNC	80
VQ-9	Carabaro H.No.261	14.10	14.22	7.6	29.3	609	296	0.3	0.5	NT	NT	TNC	8
VQ-10	Kabira, Boramatan 2	14.05	14.34	8.4	29.0	1060	490	0.5	0.5	NT	NT	78	58
VQ-11	LoiHuno Spring	15.50	14.35	8.5	29.7	1060	474	0.5	0.5	NT	NT	TNC	92

**Legend:**

( ND ) : not detectable

( NT ) : not tested

( NS ) : not set

( CFU ) : colony formed unit;

( TNC ) : Too numerous to count

Weather Report :

Sunny

Cloudy

Rain

Inspected by :

**District : Viqueque**  
**Town : Viqueque**

Sampling Date : 23/02/2006

Sample by : Marito da Costa SAS Viqueque

Testing Date : 24/02/2006

Tested by : Mario Soares

Received by : Mario Soares

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	T.Coli	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	CFU	CFU
East TimorGuidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	0	0
VQ-1	Loi Huno, intake	10.31	16.16	9.5	28.7	642	ND	0.5	0.5	NT	NT	5	0
VQ-2	Break Pressure Tank	10.38	16.17	9.3	27.6	643	ND	0.1	0.2	NT	NT	TNC	2
VQ-3	RSUD Viqueque	9.35	16.18	9.8	29.8	641	ND	0.1	0.3	NT	NT	TNC	0
VQ-4	Beloi 1,SAS	11.00	16.29	10.0	27.8	547	ND	0.5	0.3	NT	NT	18	0
VQ-5	Boramatan market	9.40	16.30	9.7	29.5	639	32	0.1	0.3	NT	NT	TNC	0
VQ-6	Bahafou PT	9.55	16.31	9.7	29.3	639	32	0.2	0.4	NT	NT	TNC	8
VQ-7	Beloi 3	9.00	16.40	8.6	28.0	550	275	0.5	0.2	NT	NT	4	0
VQ-8	Aulatar, PT	10.55	16.41	9.6	29.3	642	321	0.1	0.4	NT	NT	72	0
VQ-9	Carabaro H.No.261	9.50	16.42	9.6	29.6	646	323	0.2	0.5	NT	NT	20	0
VQ-10	Kabira, Boramatan 2	9.46	16.47	9.7	29.9	647	324	0.1	0.3	NT	NT	TNC	0
VQ-11	Loi-Huno Spring	10.21	16.48	9.5	28.6	644	322	0.1	0.2	NT	NT	TNC	3

**Legend:**

( ND ) : not detectable

( NT ) : not tested

( NS ) : not set

( CFU ) : colony formed unit

( TNC ) : Too numerous to count

Weather Report :

Sunny

Cloudy

Rain

Inspected by :

**Recommendation :**

Boil water before drinking

Mario Soares Laboratory Manager



District : Viqueque

Town : Viqueque

Sampling Date : 23/09/2008

Sample by : Alvaro Ximenes

Testing Date : 23/09/2008

Tested by : Alvaro Ximenes

Received by : Mario Soares

No	Sampling Point	Time		pH	Temp.	Cond.	TDS	Salinity	Turbid.	Hardness	Alkalinity	R.Chlorine	T.Coli	E.Coli
		sample	test		(°C)	(µS/cm)	(mg/L)	(‰)	(NTU)	(mg/l)	(mg/l)	( mg/L )	CFU	CFU
WHO/East TimorGuidelines		Hours And Minutes		6.5-8.5	NS	NS	1000	NS	5.0	200	NS	0.5	0	0
VQ-1	Loi Huno, intake	8.48	-	8.4	26.7	562	272	0.3	1.3	NT	NT	NT	0	0
VQ-2	Break Pressure Tank	8.53	-	8.5	26.4	565	274	0.3	2.4	NT	NT	NT	0	0
VQ-3	RSUD Viqueque	9.13	-	8.3	26.7	494	247	0.3	2.0	NT	NT	0.4	0	0
VQ-4	Beloi 1,SAS	9.24	-	8.2	27.0	540	270	0.3	7.0	NT	NT	0.4	0	0
VQ-5	Boramatan market	10.03	-	7.9	28.2	547	273	0.3	1.0	NT	NT	0.3	0	0
VQ-6	Bahafou PT	10.13	-	8.1	28.3	540	270	0.3	1.1	NT	NT		0	0
VQ-7	Beloi 3													
VQ-8	Aulatar, PT													
VQ-9	Caraubalo H.No.261													
VQ-10	Kabira, Boramatan 2													
VQ-11	Loi-Huno Spring													

**Legend:**

( ND ) : not detectable

( NT ) : not tested

( NS ) : not set

( CFU ) : colony formed unit

( TNC ) : Too numerous to count

Weather Report :

Sunny

Cloudy

Rain

Inspected by :

Recommendation :

Boil water before drinking

Mario Soares Laboratory Manager

Source - District Capitals Water Supply and Sanitation Master Plan - Baucau, Lospalos, Same and Viqueque

### Appendix C

#### Water quality test results

Cycle 1 tests May 2014

		Town	VIQUEQUE	VIQUEQUE	VIQUEQUE	VIQUEQUE	VIQUEQUE	VIQUEQUE	VIQUEQUE
		Date	11-May-14	11-May-14	11-May-14	11-May-14	11-May-14	11-May-14	11-May-14
		Location	LOIHUNO/BPT	BOROMATAN A WELL	BOROMATAN B WELL	DISTRIBUSI/SAS OFFICE	DISTRIBUSI/OLOBAI PT	DISTRIBUSI/KAVIRA OAN	BELOI DISTRIBUSI/TAP WATER
References and parameters	Units	WHO/TL Guideline	Sample Reference 4217	Sample Reference 4218	Sample Reference 4219	Sample Reference 4220	Sample Reference 4221	Sample Reference 4222	Sample Reference 4223
<b>Physical tests</b>									
pH	-	6.5 - 8.5	8.0	8.0	7.4	8.1	8.3	7.7	7.8
E. Conductivity	µs/cm	NS	615	615	1104	599	597	606	622
TSS	mg/L	NS	0.01	0.01	0.01	0.01	0.01	0.01	0.01
TDS	mg/L	1000	308	308	552	300	298	303	311
Salinity	%	NS	0.3	0.4	0.5	0.3	0.3	0.3	0.3
Temperature	oC	NS	28.2	28.2	30.1	29.5	26.6	30.6	29.6
Turbidity	NTU	5	0.2	0.2	0.4	0.5	0.5	0.2	1.7
<b>Chemical tests</b>									
NH3-N	mg/L	1.5	0.3	0.4	0.5	0.3	0.3	0.2	0.4
NO3-N	mg/L	10 (as NO3-N)	ND	0.1	0.2	ND	ND	ND	0.1
NO2-N	mg/L	1 (as NO2-N)	0.004	0.003	0.005	0.005	0.004	0.004	0.003
Iron (Fe)	mg/L	0.3	ND	ND	0.1	ND	ND	0.03	0.1
Manganese (Mn)	mg/L	0.5	ND	ND	ND	ND	ND	ND	ND
Fluoride	mg/L	1.5	0.9	0.2	0.1	0.9	0.9	0.8	0.70
Free chlorine	mg/L	0.5	ND	ND	ND	ND	ND	ND	ND
Ca hardness	mg/L	NS	225	235	240	215	180	180	210
Arsenic	mg/L	0.01	ND	ND	ND	ND	ND	ND	ND
T. Hardness (*)	mg/L	200	210	200	205	200	210	205	220
Total alkalinity	mg/L	NS	200	210	200	200	200	200	200
Sulphate (SO4 2-)	mg/L	250	25	24	48	26	26	2	24
<b>Bacteriological test</b>									
Total coliform	CFU/100 mL	0	0	0	0	0	2	2	0
E. Coli	CFU/100 mL	0	0	0	0	0	0	0	0

#### Legend:

ND: not detectable; NT: not tested; NS: not set; CFU: colony formed unit; TNC: Too numerous to count; FAC: free available chlorine

(\*) - The values for total hardness should be higher than Ca hardness

Non compliant

Serious non compliance/health risk



## **Appendix 5. Viqueque Public Consultation Meeting Notes (10<sup>th</sup> October 2020)**

### **Public Consultation Notes**

#### **“Water Supply and Sanitation Investment Project”**

- **1. Summary of Public Consultation Agenda**

##### **Meeting Details**

Detail : 10<sup>th</sup> October 2020

Time : 2.00 PM to 6.00PM

Location : Viqueque Municipality Meeting Centre, Municipio Lautem

- **Introduction**

The public consultation was led by the Administrator of Viqueque Municipality as the chairman, accompanied by the National Director for Basic Sanitation, and lastly attendees coming from local authorities, representatives from the PNDS, Ministry of Public Works and ADB, with a total of 45 participants (Attendance Sheet provided in the subsequent Appendix). This Public Consultation aimed on presenting the technical design of the referred project to the stakeholders in order for them to have the acknowledgement. The said program also created opportunities to the local community to express their voices, which the Consultants will then referenced as inputs for further adaptation on the design.

The public consultation was conducted at the Viqueque Municipality Administrative Assembly Room at 14:00 Timor-Leste Time zone and terminated at 17:00. The agenda comprised of several sessions, as described below:

- A. Registry and video presentation
- B. Introduction: opening remarks from Aguas de Portugal Project Manager, National Director for Basic Sanitation and Viqueque Municipality Administrator, and at the same time officially opened the meeting
- C. Technical presentation from the Consultant team, composed of:
  - General Vision of the Urban Water Cycle (Presented by Gaudencia, AdP Technical Engineer)
  - General Vision of the Work for the Project (Presented by Gaudencia, AdP Technical Engineer)
  - Water Component (Presented by Sandra Gusmao, AdP Technical Engineer)
  - Sanitation Component (Presented by Sandra Gusmao, AdP Technical Engineer)
  - Environmental Component (Presented by Maria Helena, OASIS National Environmental Technician)
  - Social Component (Presented by Mario, AdP Project Manager)
- D. Coffee Break
- E. Discussion session (Q&A)
- F. Conclusion and Closure

Questions and recommendations during the Discussion session raised by the participants are accumulated and are described below.

## 50. Questions, Recommendation, Reclamations, Responds and Discussion (Q&A session)

### a. Suco Chief Uma Uain Craic

#### ❑ Question 1:

If the project reaches the implementation phase, will all the features be utilised according to the design? I believe everyone has the same doubt in regards to this matter.

#### ❑ Question 2:

We can see that this project refers to urban area only. Is there any way that the water supply can also reach to the rural areas?

#### ❑ Consultant's Clarifications:

One of the solution for the reservatory system will be in the final version but in order to get into the implementation phase, we will not do the boreholes in that site, we will maintain all the features as before in terms of the measurements of the reservatory and all the documents that will deliver to the government entity will include tank measures in which will be the same as in the construction phase.

### • Suco Chief Uma Quico

#### ❑ Question 1:

After the construction works, how will the maintenance plan be implemented? Which agents are going to be responsible?

#### ❑ Consultant's clarification:

The period for maintenance is 3 years, in order to allow the personnel or other operators from SMASA to understand well in terms of operating the system under supervision of the Contractor. Thus, the SMASA operators will gain an indirect positive impact such as improving their capacity. The contracted Contractor will be responsible to also monitor whether or not the operators are following the O&M manuals. This also applies to treatment facilities in the proposed reservoirs.

### a. A) Estevao de Carvalho from PNDS

#### a. Representative from Ministry of Public Works

#### ❑ Recommendation:

According to him, it will be better if this project uses the existing source (Koha river) by making an abstraction and treatment and then distribute to the community. He concerns that if they continue do the borewell then they will spend a lot of money to do the work but they will not get any results at the end. He recommends that the important thing to do is to determine numbers of abstraction site to be implemented.

#### ❑ Consultant's Clarification:

Noted.

### 2.4 Estevao de Carvalho from PNDS

#### ❑ Recommendation 1:

Old pipelines should be decommissioned if this project is still maintaining the Loihuno spring, and pipe installation should be performed through trenching activity, buried under the ground to avoid the community from illegal connection. Water that supplies through the main and secondary pipelines cannot be illegally connected without SMASA authorization.

#### ❑ Recommendation 3:

He recommends to change the old pipes with the new one because according to him if continue maintain the old system than the community will continue to do the illegal connections. Therefore, if we changed the system with the newer pipes, underground

installations and prepare rules to the community to follow than we solved the issues regarding deficit of water.

❑ Recommendation 4:

Make a regulations with proper management of water to solve the issue related to the deficit of water.

❑ Consultant's Clarification:

Recommendation from Mr. Estevão – He informed that they will extract water from loihunu and the transmission and distribution line will follow the roads and to know about how it will be implemented, they have a close cooperation with the road consultant to allow and help them to identify the place and install the pipes. They also received a lot of information regarding the illegal connection from SMASA and also about the distribution schedule that implemented in Viqueque at the moment. Therefore, he stated that because of the mentioned problems, they have decided to change the old system to the new system so that can allow the community to access the water for 24 hour.

○ **Jaime Pereira Gonzaga – Ex Suco Chief**

❑ Question 1:

Questioned about the project term, regarding the implementation timing?

❑ Question 2:

Based on the explanation from Municipal Administrator regarding urbanization plan for Viqueque municipality and with the project from AdP, which program will be implemented first? Because if we implement the WATSAN project first and the urbanization plan come after it than will create another problem related to the water.

❑ Recommendation:

Recommends to the Municipal Administrator to determine the exact urbanization plan that covers all the aspect and needs of the Viqueque communities.

❑ Consultant's Clarification:

Regarding concerns from xefe suco about the budget for new office building for agriculture, the consultant has no right to answer that question.

○ **Alcino Pinto – Uma Uain Quic Local Community**

❑ Recommendation:

Recommends to AdP to create adequate toilet for peoples with disabilities iha 3 sucos that covers by the WATSAN project.

❑ Consultant's Clarification:

Noted.

○ **Mariano Soares – Aldeia Chief Osolin, Suco Uma Uain Craic**

❑ Recommendation:

Recommends to extend the distribution line to reach Ratau (Uma wain kiik) because based on the Viqueque municipal plan, administration office, municipal football stadium, agriculture office will move to Ratau.

❑ Administrator Clarification:

Viqueque Municipality Administrator clarifies that for the new office building that will open in Ratau was a decentralization plan that was made to prepare for the urbanization plan.

He also stated that they have done DED for the urbanization plan, and it will only need a fund to execute the plan according to the studies that already done.

The Underground Water test for Viqueque had done by some company few years ago and the results suggest that it is not reliable to do the borewell in Viqueque city, therefore he recommends to collaborate in order to get water from another place.

---

○ **Representative from Ministry of Public Works**

❑ Question 1:

He questioned about the master plan and suggest to create an integrated plan so that it can be easy to follow in the future.

❑ Consultant's Clarification:

Based on our design, it is well coordinated and it is integrated to the municipal plan and accommodate the population needs till 2040.

○ **Ceverina Marques da Silva – CVTL Coordinator Viqueque City**

❑ Recommendation 1:

Recommends to build public toilets near Police station because that place is considered as a bus stop for the local community.

❑ Recommendation 2:

Recommends to control the system related to the transmission and distribution line because at the moment some communities still use pump (Sanyo) that connect directly to the pipes in which minimize the water flow to another households. Suggest also to the project owners to increase the covers area so that another suco in viqueque city can have access to the project.

❑ Consultant's Clarification:

Noted

----- END OF NOTES -----

## Appendix 6. Selected Photographs of the Public Consultation for Viqueque (10<sup>th</sup> October 2020)

View of Participants in Public Consultation



Public Consultation led by Municipality Administrator (Centre), SMASA Director (left) and ADP-TL Director (right)





Oasis National Staff presenting Environmental Issues and Mitigation Measures



Chefe de Suco Uma Uain Craic requesting clarifications



MPW PMU technician clarifying questions to stakeholders.



Coordinator for CVTL-Viqueque requesting clarifications



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**Appendix 7. Attendance Sheet of the Stakeholders during Public Consultation**



**MINISTÉRIO DAS OBRAS PÚBLICAS**  
**DIREÇÃO GERAL ÁGUA E SANEAMENTO (DGAS)**

Rua: Avenida 20 de Maio - Caiçali, Caixa postal No 17, Tel. 3317157, 3317156 - Dili

**"Consulta Pública ba Desenvolvimento Projeto Abastecimento Be e Mos no Saneamento Iha Capital Municipio"**

**Dia: 10 de Outubro de 2020**

**LISTA PREZENZA**













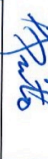



**MUNICIPIO VIQUEQUE**

NO	NARAN	SEXO		INSTITUISAUN/POZISAUN	SUCCO/ALDEIA	NO CONTACTO	ASSINATURA
		F	M				
1			✓				
2	Leopoldo H.		✓	Luaze	HS		
3	Marta da Costa		✓	Prata	Canabala	7700905	
4							
5	Fernanda Soares Pinto		✓	Agricultor	Canabala	75306273	
6	Celestino F. da Silva		✓	SMACA	Canabala	77333227	
7	Esperança de Carvalho		✓	MTE/PMDs	-	78385148	



8	Rhilio Ferreira	M	setope	Barauhalo	77343821	Alfred
9	Jamir Amaral da Costa	M	Jesaria Cui. 1da	Tramulae/Barau bata	75664469	Dimas
10	Mariane Lobato	M	Escola CATE	Mauulac	77775367	Carla
11	Celestino Alves	M	Komusladle	Bromasar	77777702	Chau
12	Augusto Soares	M	Xefe Aldeia	Messa	76049855	Alfonso
13	Salvador Soares	M	Xefe Aldeia	Fato-Madon	76225329	Simão
14	Gabino Miguel	M	Chefe Aldeia	Fahi Besele	77477609	Sebastião
15	Plaguel Soares	M	Verfomasa	Uuin caai	77334028	Alfonso
16	Manuel Hondo da Costa	M	Chapa Aldeia	Bua-Nuac	77378817	Alfonso
17	Julio Sarmento	M	Xefe Aldeia	Baha Bunoa	75638376	Alfonso
18	Alexandrisio do Carmo	M	Chefe Aldeia	Aldeia	78662461	Alfonso
19	Francisco Pinto	M	Chefe Aldeia	Baha Fou	76347486	Alfonso
20	Rui Sares Viana	M	Chefe Aldeia	NUE-BORUE	76865414	Alfonso
21	Rosendo dos Santos	M	ESG A DE SEGUNDA	Carau-Balo	77449063	Alfonso
22	Vitorino D. Purseino	M	Boa-Meio	Carau-Balo	77096343	Alfonso



23	Natalino Pinto	PM	R/T/TC	Caraculo	77456562	
24	Emerson D. Santos	m	chf Alden	Sin Lari	77822365	
25	Paulino Gomes	M	Rep: Almeida	Caraculo	77086886	
26	João da Costa	M	Xefe Almeida	Buda cai	77388208	
27	Carolina Gomes Soares	M	SNOP	Caraculo	77863576	
28	João Pinto	M	N/AE	Caraculo	78066139	
29	Rogério Augusto	M	Coord. Est. Manutenção	Caraculo	77622085	
30	Tamires F. Gonçalves	M	Artilheiro comb.	Uma - Kuit	—	
31	Leão Santos	M	chefe alheia	bata lin	77414282	
32	Hammoragildo Romel	M	Xefe SLCO	Uma Quic	78066138	
33	Francisco Pinto Amarel	M	Xefe Aldeia	Paixunuma	78652098	
34	Amílcaro Seixas Neto	M	Xefe Aldeia	cabina can	75708600	
35	Tullião Menezes	M	— " — M/AE	Uabulo	77284011	
36	João da Costa	M	Inspeção Unica	Caraculo	75734830	
37	Basilio Carvalho	M	RTTL-EP/Manutenção	— " —	77051040	
38	Matheus Ramos Pereira		Trabalho Propriedade	— " —	77305892	



39	Flavio Gons da Silva	✓	Candidato	Candidato	74855881	<i>[Signature]</i>
40	Comando Goreia Amual		Calista - Oan	Comandante	78244526	<i>[Signature]</i>
41	Sextina M. da Silva	✓	CVTL F-VI	Walterbonum	71294440	<i>[Signature]</i>
42	Flávia da Costa		Lama-kaduran	Comunidade	77065550	<i>[Signature]</i>
43	Guilherme G. S		SNADA - OSN	-	77582209	<i>[Signature]</i>
44	Domingos dos Reis Baptista	✓	Comunidade	Manoel	72293202	<i>[Signature]</i>
45	12ae Salsinha Soares	✓	Chefe Alceir	Manoel	77180162	<i>[Signature]</i>
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## Appendix 8. Spoil Management Plan

### SPOIL MANAGEMENT PLAN

#### A. Spoil Management Plan

The SMP is to describe how the contractor will manage the generated spoil and reuse related to design and construction activities. This is an integral part of EM.

##### 1. Objectives of SMP:

- i. To minimize spoil generation
- ii. To maximize beneficial reuse of spoil from construction activities in accordance with spoil management hierarchy
- iii. To minimize environmental impacts on resident and other receivers
- iv. Minimize and/or avoid any further site contamination of land, water and soil

##### 2. Structure of SMP:

Section 1: Introduction of SMP

Section 2: Legal and other requirements

Section 3: Roles and responsibilities

Section 4: Identification and assessment of spoil aspects and impacts

Section 5: Spoil volumes, characteristics and minimization

Section 6: Spoil reuses opportunities, identification and assessment

Section 7: On site spoil management approach

Section 8: Spoil transportation methodology

Section 9: Monitoring, Reporting, Review, and Improvements

##### 3. Aspects and Potential Impacts:

Aspects	Potential Impacts
Air Quality	Airborne dust generation due to wind
Sedimentation	Sediment laden site runoff from spoil stockpiles and spillage of spoil from truck on roads
Surface and Groundwater	Contamination of water quality
Noise	Temporary duration associated with spoil handling, haulage and storage
Traffic	Associated with spoil haulage
Land Use	Spoil being transported to a receivable site that doesn't have a permission for disposal

#### B. Spoil Volumes, Characteristics and Minimization

- a. **Spoil Volume Calculations.** Estimate the volumes of spoils produced from each of the construction sites.
- b. **Characterization of Spoil.** Based on the type of spoil (sand, stone, mix materials, reusable materials).
- c. **Adopt Spoil Reduce, Reuse Opportunities.** An overview of the assessment methodology to be used:
  - a. Consideration of likely spoil characteristics
  - b. Identification of possible reuse sites
  - c. Screening of possible reuse opportunities

- 4. Identification of Possible Safe Disposal Sites for Spoil.** Those spoils which can't be reuse shall be properly disposed in designated areas; such disposal areas should be identified in project locations. Such disposal areas should be safe from environmental aspects and there should be any legal and resettlement related issues. Such areas need to be identified and prior cliental approval should be obtained to use it as spoil disposal area. The local administration must be consulted and if required permission should be obtained from them.

### **C. Storage and Stock Piling**

- 1. Stockpiling.** Spoils shall be stockpiled at locations at least 300 m away from water courses and covered.
- 2. Transportation and Haulage Route.** Based on the above, the contractor will have to prepare a transport and route plan, and submit it to the consultant for review and approval.

**Appendix 9. Meeting Notes – National Department of Cultural Patrimony, Secretary of State for Art and Culture (SEAC) on the 7<sup>th</sup> & 22<sup>nd</sup> September 2020**

**Meeting Notes**

**“Water Supply and Sanitation Investment Project”**

Venue	Secretary of State for Arts and Culture Main Office, Pantai Kelapa
Date	September 7, 2020
Time	9.45 – 11.00
Interviewer	Maria Helena A. de Jesus
Sources/Participants	<ul style="list-style-type: none"> <li>• Irene dos Reis Goncalves (Chief Department of Archeology)</li> <li>• Ilisio do Carmo (Personnel staff)</li> <li>• Eustorgio da Silva (Personnel staff, Archeologist)</li> <li>• Joaquina Lopes (Personnel staff)</li> <li>• Leandro Aristides (Personnel staff, Archeologist)</li> <li>• Chris (Personnel staff, Engineer)</li> <li>• Carlos (Personnel staff, Engineer)</li> </ul>

Ms. Maria Helena (National Environmental Technician) on behalf of OASIS conveyed the objective of the meeting; to request cultural heritage sites data in all 4 Municipals in a form of shapefilez/kmz files in adherence to a request letter sent from the Ministry of Public Works (MPW) with a reference number 172/C50605/Gab.DGAS/MOP/VII/2020. This aiming to identify whether or not the sites are located adjacent to the project components and how they will impact on the related sites. Ms. Maria Helena also stated that the Environmental team from OASIS has identified several cultural, touristic and historical sites during the field visit in 4 Municipals. Hence, adjusting the data prepared from the National Directorate of Cultural Patrimony would be very beneficial in order to complete the information for subsequent mapping and analysis of environmental and social impacts.

Mrs. Irene Goncalves, Mr. Ilisio do Carmo and Mr. Leandro Aristides expressed gratitude and explained briefly on each of the personnel's roles who participated on the meeting. They are willing to share what the team requested, although some of the data are still confidential and cannot be publicized in order to avoid any interested parties in taking advantage of the assets. They highlighted the importance of their involvement in various projects and reminded us to invite the delegated person from the mentioned department to have a joint site visit whenever if necessary. The objective of the statement is to gain additional insights as inputs particularly for the Department of Archeology. Thus, the Chief Department and colleagues would like to know the location and total of the sites that the OASIS team had identified.

Ms. Maria Helena intervened that the site visits that the OASIS team had conducted was to characterize the environmental condition in the project area and had collaborated with local authority and Municipal Cultural center to gain the needed information. At the current moment, the OASIS team only needs the said description of the data, photographs, and kmz or shapefiles of the cultural heritage sites within the 15 km radius of the project area. The OASIS team for WATSAN project considers the existence of Secretary of State for Arts and Culture and will need the presence of their participation during the Public Consultation in all 4 Municipalities which will be conducted very soon within this September post submitting the IEE documents to ANLA. And the OASIS team is ready to do a presentation in regards to the related project's sensitive and cultural sites cumulated during the last site visit, if needed.

Mrs. Irene, Mr. Ilisio, Mr. Leandro and Ms. Maria Helena agreed and confirmed that OASIS team will do a presentation on Thursday, September 9 at 3 o'clock in the afternoon.

Venue	Secretary of State for Arts and Culture, Pantai Kelapa
Date	September 22, 2020
Time	9.00 – 10.00
Interviewer	Maria Helena A. de Jesus
Sources/Participants	<ol style="list-style-type: none"> <li>1. Irene Goncalves dos Reis (Chief of Department of Archeology)</li> <li>2. Maria Isabel Alves do Rego (Architecture)</li> <li>3. Eugenio de J. Sarmento (Chief of Department of Architectonic)</li> </ol>







	4. Octaviano Mota (Engineer) 5. Lisandro Manuel (Engineer) 6. Jose P. de S. Garcia (Staff) 7. Romeu Soares da Silva (Staff) 8. Elisio do Carmo (Staff/Technician)
<p>The objective of the meeting is to provide information of the cultural, touristic, sacred, and other heritage sites identified by the OASIS team in a form of power point presentation, which included photographic documentation, coordinate locations list, and mapping presentation. This meeting is to comply the National Department of Cultural Patrimony agreement with the OASIS team which was represented by the National Environmental Technician, Maria Helena, during a meeting conducted on the 7<sup>th</sup> of September 2020 and in relevance with MPW request letter No. 172/C50605/Gab.DGAS/MOP/VII/2020 aiming to receive data of location and description of the patrimony cultural in the associated 4 Municipalities.</p> <p>The meeting was attended by 8 participants coming from the Secretary of Arts and Culture and was commenced with a presentation from Maria Helena regarding to the Cultural Patrimony sites that was defined or identified by the OASIS team during a site visit for the Preliminary Design phase.</p> <p>Post the presentation is the discussion session composed of questions and recommendations from the Secretary of Arts and Culture party and answers were provided by Maria Helena. The discussion session is described below:</p> <ol style="list-style-type: none"> <li> <b>Q:</b> During the replacement of the pipe, what is the type of the pipe would your consultant recommend on implanting? (Octaviano Mota)  <b>A:</b> For transmission lines, the selected material would be HPDE and Ductile Iron. Meanwhile, the distribution network will be using HDPE </li> <li> <b>Q:</b> In this project that you are referring to, will it give a direct or indirect impact towards the cultural objects? And how do you plan to mitigate? (Elisio do Carmo)  <b>A:</b> The impact would mostly be direct coming from various construction activities, although the duration will be temporary. The mitigation would be in compliance with the Decree Law No. 33/2017 by not interfering the 50 m radius of each object located adjacent to the distribution alignments or any other project components. </li> <li>Request from Chief of Department, <b>Mrs. Irene:</b> Sharing the kmz files of distribution lines in order for them to inform us for additional information of the cultural patrimony object or other historical sites.</li> <li> Suggestion from <b>Mr. Jose Garcia:</b> If possible, the cultural sites that have been identified should also be described with their historical background  Respond: It is not part of our scope of work </li> <li> Comment from <b>Mr. Octaviano Mota:</b> The magnitude of the impacts towards the cultural objects won't be strong comparing to the Drainage (DDIUP) project for Dili </li> </ol>	

**Appendix 10. Attendance Sheet – SEAC**










ATTENDANCE SHEET  
MEETING AT THE STATE SECRETARY OF ARTS AND CULTURE, TIMOR-LESTE  
FOR  
"CONSULTING SERVICES FOR DETAILED ENGINEERING DESIGN OF TIMOR - LESTE FOUR MUNICIPAL CAPITALS  
WATER SUPPLY & SANITATION PROJECT"

Tuesday, 22<sup>nd</sup> of September 2020  
Dili, Timor-Leste

No.	Naran	Instituisaun	Pozisaun	No. Kontaktu	Asinatura
1	Jaue Gonçalves dos Reis	SEAC / DNRC	Ag. Depart. AE	993 999 35	
2	Maria Isabel Alves do Rego	SEAC / <del>SEAC</del>	Arquiteta	77132215	
3	Jaqueline de Jesus	SEAC	Coord. Administrativo	-	
4					
5	Octaviano Noh	SEAC / DNRC	Engineer	99624555	
6	Lisandro Manuel	SEAC / DNRC	Engineer	77382228	
7	Jaime P. de S. Pereira	SEAC / DNRC	Staff	99572213	
8	Romão Soares da Silva	SEAC / DNRC	Staff	95332268	R
9	Elisio do Carmo	SEAC / DNRC	Staff	99316922	

**ATTENDANCE SHEET**  
**MEETING AT THE STATE SECRETARY OF ARTS AND CULTURE, TIMOR-LESTE**  
**FOR**  
**"CONSULTING SERVICES FOR DETAILED ENGINEERING DESIGN OF TIMOR - LESTE FOUR MUNICIPAL CAPITALS**  
**WATER SUPPLY & SANITATION PROJECT"**

Monday, 7<sup>th</sup> of September 2020  
Dili, Timor-Leste

No.	Naran	Instituisaun	Pozisaun	No. Kontaktu	Assinatura
1	Shene Gonçalves das Reis	SEAC / DNPC	xyi Depart. AE	77399935	
2	Sandrae A. d. B. da	SEAC / DNPC	Staff	75665685	
3					
4	Joacquina Lopes	SEAC / DNPC	staff	77265730	
5	Octaviano Neta	SEAC / DNPC	Engineer	-	
6	Eustorgio da S.P. Lopes	SEAC / DNPC	Staff	-	
7	Castelano C.C. Carvalho	SEAC /		-	
8	Martaia de Jesus A. Ximenes	SEAC / DNPC	Staff	-	
9	Elisio do Carmo	SEAC / DNPC	Staff	-	

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**Appendix 11. Environmental Licenses from the District Capitals Water Supply Project in Pante Macassar and Manatuto cities**



**REPÚBLICA DEMOCRÁTICA DE TIMOR-LESTE**

National Directorate for Environment, State Secretariat for Environment,  
Ministry for Commerce, Industry and Environment

**ENVIRONMENTAL LICENSE**

Issued under Decree Law on Environmental Licensing No. 05/2011

In accordance with decision dated on 07<sup>th</sup> August 2014 by the *State Secretary for Environment* Mr. Numinando Soares Martins "Buras" Approved the Simplified Environmental Impact Statement. Hence, pursuant to the Chapter VI of Decree Law on *Environmental Licensing 05/2011* (Decree Law 05/2011), and Issued Environmental License for the activity referred to the Schedule below which subject to the conditions contained in the Annex.

*Schedule*

Proponent of Project:	National Directorate of Water Supply Services
Date Submitted Application:	20 <sup>th</sup> of March 2014
Application Number:	20/ AIA-DNMA /XI/ 2013
Environmental License Number:	06 / C:B-S / SSE-MCIE / VIII / 2014
Activity Scale:	Distance 15.09 km(Transmission pipe 15090m and distribution pipe 68741m; maximum depth 1m)
District and Sub-district:	Manatuto
Category of Project:	Category B
Project:	Upgrading and Rehabilitation of Existing Water supply
Date of Notification:	07 <sup>th</sup> of August 2014

*Notes*

1. This Environmental License is non-transferrable in accordance with Articles 22 (4) of Decree Law 05/2011.
2. Proposed changes to the project affecting environmental impacts or the project area/size, or relocation, are subject to technical review and approval in accordance with Chapter VIII of Decree Law 05/2011.
3. Appeal rights are governed by Decree Law 32/2008 on Administrative Procedure.
4. The Proponent is solely responsible for ensuring all other necessary renewal license, permit, authorisations or recommendations are obtained from relevant government authorities.

5. The Proponent is responsible for ensuring that all subcontractors or others carrying out works associated with this Environmental License comply with the SEIS, EMP and terms of this Environmental License.
6. All future communications, documents and reports prepared by or on behalf of the Proponent in relation to the Project and submitted to the National Directorate for Environment ('DNMA') shall be in both Tetum and English, and in both electronic and hard copy.

***Annex - Conditions of Environmental License***

*The conditions contained in this Annex are to protect the environment and to mitigate the environmental impacts of the Project.*

**General Conditions**

1. *Project in accordance with initial environmental examination documents, and future environmental licenses*
  - 1.1 The District Capital Water Supply Project must be conducted in accordance with the Final Report of Simplified Environmental Impact Statement (SEIS) prepared by Project Implementation Unit Consultant dated 20<sup>th</sup> of March 2014 and the incorporated Environmental Management Plan (EMP), except as modified or amended by this Environmental License.
  - 1.2 The Expansion, Rehabilitation and operation and maintenance of Manatuto Water Supply Systems must be conducted in accordance with Asia Development Bank Safety Environmental Principle.
  - 1.3 The Nature, Size, Location and Importance of the Project, described on page 12 – 15 (5.1-5.2) of the SEIS, strictly states the Project Site Boundary for all development and construction activities related to The District Capital Water Supply Project.
  - 1.4 To successfully implement the EMP the SEIS has given adequate instructions for the Project Implementation Unit (PIU) to monitor and report environmental compliance all through the project implementation period.
  - 1.5 As planned in the SEIS this Water Supply Project is given the Environmental License granted for two (2) years starting from the Date of the Notification mentioned in *Licensing*
  - 1.6 Any proposed changes, alterations or additions to the Project that the Proponent wishes to undertake that are not consistent with the SEIS and EMP and this Environmental License will require an additional Environmental License or amendment of this Environmental License, in accordance with relevant provisions of *Decree Law 05/2011*.
  - 1.7 DNMA may review and alter any conditions in this Environmental License, including by requiring alterations to the Environmental Management Plan, to respond to any proposed changes to any component of the Project through any application made by the Proponent to DNMA relating to the Project, if DNMA deems it necessary to do so to protect the environment.



### Additional requirements and modifications

#### *2. Construction phase*

- 2.1 When the activity starts, community near the area of the project must be included to offer them jobs in which could help minimize the social impacts.
- 2.2 The proponent must coordinate with other institution that related to this activity before implementing the project.
- 2.3 For air quality related to dust, inspection should be done to ensure that residents living along the construction route are not affected. Hence spreading water will help minimize dust emission close to the residential areas;
- 2.4 The proponent must assure that water bodies nearby are safe from siltation and contamination that includes fuel and lubricants used in the rehabilitation of the water supply project;
- 2.5 The proponent must enforce the disposal of surplus material at environmentally safe disposal/ fill sites and that spoil stockpiles are managed properly;
- 2.6 Soils from the excavation must not be disposed of near the water bodies, paddy field, Farmland and community's residential area along the road rehabilitation route;
- 2.7 Sites where rocks and sands are excavated should be 20 meters away from the river bank;
- 2.8 Avoiding excavation of soil and stone in the sensitive environmental areas (protected area/ Forest, potential landslides field, high elevation hills, etc);
- 2.9 When the project is complete, excavated areas must be rehabilitated, materials dumping, Facilities for staff and logistic installed must be demolished and managed it properly;
- 2.10 Actively monitor the water bodies that are close to the construction site during the Rehabilitation process;
- 2.11 The community from the residential areas, horticulture, paddy fields, And other types of farmlands and agricultural plantation whom are affected must be Given compensation in a fair and just manner;
- 2.12 Avoiding in necessary eviction. If any target household need to be remove, please Negotiate in fair manner and applying *prior consent principle*
- 2.13 During the rehabilitation activity, noise from the excavator must be controlled, need to Install appropriate warning signal for safety traffic, for the safety of worker and road Users;
- 2.14 Trucks carrying construction materials (sand, stones, cement etc) must be covered by Tarpaulin to prevent materials from falling off of the trucks;
- 2.15 Alternative roads must be built to ensure that public transportations are not delayed during the rehabilitation;




- 2.16 Rehabilitate eroded areas that caused by the construction activity;
- 2.17 During daytime construction site should be sprayed with water every three hours each day along the Rehabilitation project route;
- 2.18 Prepare disposal site for solid and liquid waste from the construction activity, excavator and trucks; except dangerous waste (oil, lubricant and so on)
- 2.19 Worker and staff compound close by community village must be develop in coordination with local leaders and the residence. Worker and staff need to respect local people, ritual, symbols of believe and cultures;
- 2.20 Need to apply local content principle for the involvement of local people in working Opportunity and possible local material procurement;
- 2.21 Identified appropriate location for material (sand, stone, wood, water and other material) collection;
- 2.22 Due to the instability of soil, high elevation of the areas and impact of climate change (more rain or less rain could cause erosion), there is need to have bio engineering expert in providing knowledge and techniques to community for re-vegetation and reforestation;
- 2.23 The Proponent must ensure that the waste is disposed of at disposal area;
- 2.24 After the project is finally done, the company is responsible to clean up all the waste and piles from the construction activity along the project route.

National Directorate of environment will be supervision and oriented company refer to the Environment License and Environment Management Plan.

Dili, 07<sup>th</sup> of August 2014

Approved by:

  
Numinando Soares Martins "BURAS"  
 Secretary of State for Environment



**REPÚBLICA DEMOCRÁTICA DE TIMOR-LESTE**  
**National Directorate for Environment, State Secretariat for Environment,**  
**Ministry for Commerce, Industry and Environment**

**ENVIRONMENTAL LICENSE**  
**Issued under Decree Law on Environmental Licensing No. 05/2011**

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**Schedule**

<b>Proponent of Project:</b>	National Directorate of Water Supply Services
<b>Date Submitted Application:</b>	20 <sup>th</sup> of March 2014
<b>Application Number:</b>	20/ AIA-DNMA /XI/ 2013
<b>Environmental License Number:</b>	06 / C:B-5 / SSE-MCIE / VIII / 2014
<b>Activity Scale:</b>	Distance 6.7 km(Transmission pipe 6768m and distribution pipe 39615m; maximum depth 1m)
<b>District and Sub-district:</b>	Pante Macasar, Oecusse
<b>Category of Project:</b>	Category B
<b>Project:</b>	Upgrading and Rehabilitation of Existing Water supply
<b>Date of Notification:</b>	07 <sup>th</sup> of August 2014

**Notes**

1. This Environmental License is non-transferrable in accordance with Articles 22 (4) of Decree Law 05/2011.
2. Proposed changes to the project affecting environmental impacts or the project area/size, or relocation, are subject to technical review and approval in accordance with Chapter VIII of Decree Law 05/2011.
3. Appeal rights are governed by *Decree Law 32/2008 on Administrative Procedure*.
4. The Proponent is solely responsible for ensuring all other necessary renewal license, permit, authorisations or recommendations are obtained from relevant government authorities.
5. The Proponent is responsible for ensuring that all subcontractors or others carrying out works associated with this Environmental License comply with the SEIS, EMP and terms of this Environmental License.

- 6 All future communications, documents and reports prepared by or on behalf of the Proponent in relation to the Project and submitted to the National Directorate for Environment ('DNMA') shall be in both Tetum and English, and in both electronic and hard copy.

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**General Conditions**

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  - 1.2. The Expansion, Rehabilitation and operation and maintenance of Manatuto Water Supply Systems must be conducted in accordance with Asia Development Bank Safety Environmental Principle.
  - 1.3. The Nature, Size, Location and Importance of the Project, described on page 13 – 19 (5.1-5.2) of the SEIS, strictly states the Project Site Boundary for all development and construction activities related to The District Capital Water Supply Project.
  - 1.4. To successfully implement the EMP the SEIS has given adequate instructions for the Project Implementation Unit (PIU) to monitor and report environmental compliance all through the project implementation period.
  - 1.5. As planned in the SEIS this Water Supply Project is given the Environmental License granted for two (2) years starting from the Date of the Notification mentioned in *Licensing*.
  - 1.6. Any proposed changes, alterations or additions to the Project that the Proponent wishes to undertake that are not consistent with the SEIS and EMP and this Environmental License will require an additional Environmental License or amendment of this Environmental License, in accordance with relevant provisions of *Decree Law 05/2011*.
  - 1.7. DNMA may review and alter any conditions in this Environmental License, including by requiring alterations to the Environmental Management Plan, to respond to any proposed changes to any component of the Project through any application made by the Proponent to DNMA relating to the Project, if DNMA deems it necessary to do so to protect the environment.

### Additional requirements and modifications

#### **2. Construction phase**

- 2.1 When the activity starts, community near the area of the project must be included to offer them jobs in which could help minimize the social impacts;
- 2.2 For air quality related to dust, inspection should be done to ensure that residents living along the construction route are not affected. Hence spreading water will help minimize dust emission close to the residential areas;
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- 2.4 The proponent must assure that water bodies nearby are safe from siltation and contamination that includes fuel and lubricants used in the rehabilitation of the water supply project;
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- 2.13 During the rehabilitation activity, noise from the excavator must be controlled, need to Install appropriate warning signal for safety traffic, for the safety of worker and road Users;
- 2.14 Trucks carrying construction materials (sand, stones, cement etc) must be covered by Tarpaulin to prevent materials from falling off of the trucks;
- 2.15 Alternative roads must be built to ensure that public transportations are not delayed during the rehabilitation;

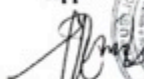


- 2.16 Rehabilitate eroded areas that caused by the construction activity;
- 2.17 During daytime construction site should be sprayed with water every three hours each day along the Rehabilitation project route;
- 2.18 Prepare disposal site for solid and liquid waste from the construction activity, excavator and trucks; except dangerous waste (oil ,lubricant and so on)
- 2.19 Worker and staff compound close by community village must be develop in coordination with local leaders and the residence. Worker and staff need to respect local people, ritual, symbols of believe and cultures;
- 2.20 Need to apply local content principle for the involvement of local people in working Opportunity and possible local material procurement;
- 2.21 Identified appropriate location for material (sand, stone, wood, water and other material) collection;
- 2.22 The Proponent must ensure that the waste is disposed of at disposal area;
- 2.23 Due to the instability of soil, high elevation of the areas and impact of climate change (more rain or less rain could cause erosion), there is need to have bio engineering expert in providing knowledge and techniques to community for re-vegetation and reforestation;
- 2.24 After the project is finally done, the company is responsible to clean up all the waste and piles from the construction activity along the project route.

National Directorate of environment will be supervision and oriented company refer to the Environment License and Environment Management Plan.

Dili, 07<sup>th</sup> of August 2014

Approved by:



**Numinando Soares Martins "BURAS"**  
Secretary of State for Environment

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## Appendix 12. Applicable Environmental Quality Standards

### (1) Ambient Air Quality Standards

Source: WHO Air Quality Guidelines (2000) and Global Update (2005)

Parameter	Averaging Period <sup>a</sup>	WHO Air Quality Guidelines ( $\mu\text{g}/\text{m}^3$ )		Standards to be followed by Project ( $\mu\text{g}/\text{m}^3$ )
		Global Update 2005 <sup>b</sup>	Second Edition 2000 <sup>c</sup>	
PM <sub>10</sub>	Annual	20		20
	24-Hour	50		50
PM <sub>2.5</sub>	Annual	10		10
	24-Hour	25		25
SO <sub>2</sub>	24-Hour	20		20
	10-minute	500		500
NO <sub>2</sub>	1-year	40		40
	1-Hour	200		200
CO	8-hour		10,000	10,000
	15-minute		100,000	100,000
Pb	1-year		0.5	0.5

<sup>a</sup> Due to short term duration of civil works, the shortest period will be more practical to use.

<sup>b</sup> Source: World Bank Group. IFC. 2007. Environmental, Health and Safety General Guidelines.

<sup>c</sup> Source: Air Quality Guidelines for Europe, Second Edition, 2000; WHO Regional Office for Europe, Copenhagen

### (2) Ambient Noise Standards

Source: World Bank Group. IFC. 2007. Environmental, Health and Safety General Guidelines.

Receptor / Source	Standards to be Used for Project WHO Guideline Values for Noise Measured Out of Doors <sup>a</sup> (one hour LA <sub>eq</sub> in dBA)	
	07:00 – 22:00	22:00 – 07:00
Industrial Area <sup>a</sup>	70	70
Commercial Area <sup>a</sup>	70	70
Educational Area <sup>a</sup>	55	45
Rural Residential Area	55	45
Urban Residential Area	55	45
Mixed Residential Area	55	45
Quiet Area	55	45

### (3) Water Quality Standards

Source: Decree-Law no. 31/2020 – Control of Water Quality for Human Consumption.

Timor-Leste has developed new legislation in drinking water quality and The Guidelines for Drinking Water Quality in Timor-Leste have been drafted based on Guidelines for Drinking Water Quality (WHO, 1993), other guidelines in nearby countries, and various factors of natural, social and economic aspects in Timor-Leste. The document provides guideline values and testing methods on a certain range of microbiological indicators, chemical substances and physical properties of water quality, to ensure the drinking water does not pose any significant health risk to consumers and is aesthetically acceptable.

Parameters	Units	Timor-Leste (DL 31/2020 – Control of Water Quality for Human Consumption)	WHO Guidelines <sup>(1) (2)</sup>
<b>Bacteriological tests</b>			
Total Coliform	CFU/100 ml	0	0
Escherichia coli (E.coli)	CFU/100 ml	0	0
<b>Physical and chemical tests</b>			
Aluminum	mg/l Al	0.2	0.2
Arsenic	mg/l As	0.01	0.01
Ammonia	mg/l <sup>(3)</sup>	0.5	1.5



Parameters	Units	Timor-Leste (DL 31/2020 – Control of Water Quality for Human Consumption)	WHO Guidelines <sup>(1) (2)</sup>
Calcium	mg/l Ca	100	100-300
Chlorides	mg/l CL	250	250
Chlorine	mg/l Cl	0.2-0.6	5
Conductivity	µS/cm	2500	
Colour	mg/l Platinum-Cobalt Scale	20	15
Fluoride	mg/l F	1.5	1.5
Hardness	mg/L CaCO <sub>3</sub>	110-500	200-500
Iron	mg/l Fe	0.3	0.3
Langelier Index		-0.5 – 0.5	-
Magnesium	mg/l Mg	50	-
Manganese	mg/l Mn	0.05	0.1
Nitrate	mg/l <sup>(4)</sup>	11	50
Nitrite	mg/l <sup>(5)</sup>	0.15	3
pH	Sorensen	6.5-8.5	6.5-8.5
Sulphate	mg/l SO <sub>4</sub> <sup>2-</sup>	250	250
Taste and odour	dilution rate	Free of taste and odour	Free of taste and odour
Total dissolved solids	mg/L	1000	1000
Turbidity	NTU	5	4

<sup>(1)</sup> The values indicated are guideline values for microbiological indicators or chemicals that are of health significance in drinking water or recommended values based on other reasons, like the acceptability of water and corrosion control.

<sup>(2)</sup> Guidelines for drinking-water quality: fourth edition incorporating the first addendum, World Health Organization, 2017

<sup>(3)</sup> Ammoniacal nitrogen (mg NH<sub>4</sub>/l) for WHO and Decreto-lei n° 152/2017 and mg/l NH<sub>4</sub>-N for Timor-Leste legislation

<sup>(4)</sup> Nitrate (mg NO<sub>3</sub>/l) for WHO and Decreto-lei n° 152/2017 and mg/l NO<sub>3</sub>-N for Timor-Leste legislation

<sup>(5)</sup> Nitrite (mg NO<sub>2</sub>/l) for WHO and Decreto-lei n° 152/2017 and mg/l NO<sub>2</sub>-N for Timor-Leste legislation

#### (4) Wastewater Standards

Source: WHO Guidelines for Wastewater Irrigation (1989).

Wastewater, excreta and grey water use in agriculture is more and more considered a method that combines water and nutrient recycling, supporting increased household food security and nutrition in poor households. For the past few decades WHO guidelines have been influential regarding technical standard and policy level setting for this issue, and have been adopted by several countries for their wastewater and excreta use practices. They are also designed to protect the health of farmers (and their families), local communities and product consumers but adaptable to specific circumstances, to maximize overall public health benefits and the beneficial use of scarce resources.

The project intends to follow suit with this principle and use its resources efficiently and sustainably and attempt to have a positive influence on the local economy, by applying the dried treated FSTP sludge to the agricultural sector in the area, following the WHO 1989 Guidelines for Wastewater Irrigation and its thresholds for the effluent discharge and treated dried sludge use in agriculture:

ITEM	BOD (mg/L)		NH <sub>4</sub> -N (mg/L)	Helminth eggs (No. /filter)	FC (No. /100 ml)
	Total	Filtered			
A. Liquid effluent - Discharge into receiving waters:					
Seasonal stream estuary	100-200	30-60	10-30	≤2-5	≤10 <sup>4</sup>
Perennial river or sea	200-300	60-90	20-50	≤10	≤10 <sup>5</sup>
B. Reuse					
Restricted irrigation	n.c.		1)	≤1	≤10 <sup>5</sup>
Unrestricted irrigation	n.c.		1)	≤1	≤10 <sup>3</sup>
C. Treated Plant Sludge					
Use in agriculture	n.c.		n.c.	≤3-8 g TS <sup>2)</sup>	3)

ITEM	BOD (mg/L)	NH <sub>4</sub> -N	Helminth eggs	FC
NOTES: 1) ≤ Crop's nitrogen requirement (100-200 kg N/ ha-year) 2) Based on the nematode egg load per unit surface area derived from WHO guidelines for wastewater irrigation (WHO 1989) and on maturing rate of 2-3 tons of dry matter /ha-year 3) Safe level if egg standard is met. n. c.----not critical				

However, the FSTP effluent will be discharged into an Irrigation Cropping Area and will require frequent testing before discharge for the purpose of groundwater and soil pollution prevention. The standards for such will be in accordance with the 1.3. Wastewater and Ambiente Water Quality of the World Bank Group. IFC. 2007. Environmental, Health and Safety General Guidelines.

Table 1.3.1 Indicative Values for Treated Sanitary Sewage Discharges <sup>a</sup>		
Pollutants	Units	Guideline Value
pH	pH	6 – 9
BOD	mg/l	30
COD	mg/l	125
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Oil and grease	mg/l	10
Total suspended solids	mg/l	50
Total coliform bacteria	MPN <sup>b</sup> / 100 ml	400 <sup>a</sup>
Notes: <sup>a</sup> Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation. <sup>b</sup> MPN = Most Probable Number		

## (5) COVID-19 Requirements

Source: Government-Decree no. 21/2020, of the 30<sup>th</sup> December, on the execution measures for the State of Emergency Declaration by Presidential Decree no. 70/2020, of 30<sup>th</sup> December

The COVID-19 world pandemic has challenged Governments and private sector to adapt their operations to difficult health situations and obligated more organization from these entities in order to do their part in this unusual world situation.

The project must follow the requirements of the Government of Timor-Leste, as they evolve, which currently are in the form of Government-Decree no. 21/2020, of the 30<sup>th</sup> December, on the execution measures for the State of Emergency Declaration by Presidential Decree no. 70/2020, of 30<sup>th</sup> December, which are summarised below:

<b>Execution measures of the state of emergency, renewed by the President of the Republic's Decree 73/2020, of December 30<sup>th</sup>,</b> to respond to the COVID-19 pandemic, which covers the entire national territory and is in force between January 3 <sup>rd</sup> , 2021, 00.00 a.m. and February 1 <sup>st</sup> , 2021, 11.59 p.m.
This Government Decree recommends that all individuals, who are not subject to compulsory isolation and who do not exercise any professional activity or are exempt from the duty to be present at workplace, should remain in their homes, limiting their exits to the minimum necessary.  With regard to the distancing rules on public roads, this Government Decree requires that all individuals, who are not subject to a mandatory isolation regime, when walking on public roads must do so

unaccompanied, wearing masks, observing the distance of, at least, one meter from other passers-by and avoid the formation of crowds. All individuals shall also maintain a distance of, at least, one meter when they are waiting for the opportunity to enter commercial, provision of services or public administration services facilities, as well as at the places of entry and exit of passengers on public transport.

It is forbidden to hold meetings and demonstrations, as well as any social, cultural or sporting events involving the agglomeration of more than ten people. This prohibition does not apply to individual sporting activities, which do not involve the agglomeration of people.

It is also prohibited to hold any religious events, including worship celebrations involving the agglomeration of more than ten people. Funerals are conditional on the adoption of organizational measures that prevent the transmission of the SARS-Cov-2 virus and should not imply the simultaneous presence of more than ten people.

Public passenger transport is allowed, however vehicles must be sanitized daily, before starting the activity, and drivers, crews and passengers are required to wear mouth and nose protection masks. Passengers shall avoid, among themselves and to the extent possible, any form of physical contact.

Markets and all commercial, industrial, crafts or service provision establishments are permitted. All individuals wishing to enter these establishments or premises must wear a mask, wash their hands before entering the premises and respect the distance of, at least, one meter from other individuals. Those responsible for market and establishments shall provide the necessary conditions for compliance with those rules and shall refuse entry to those who do not comply with the previous provisions. The above rules also apply to premises where public services operate.

Street vendors must keep a distance of, at least, one meter from their customers and other street vendors, and shall permanently wear a mouth and nose protection mask, as well as ensure hand hygiene.

This diploma does not impose any prohibition on the teaching and non-teaching activities of educational establishments, the latter not including those which have a playful, recreational or ceremonial nature. The necessary and appropriate prophylaxis standards for the prevention and control of the COVID-19 epidemic are approved by a joint ministerial diploma from the members of the Government responsible for the health, education and higher education areas.

Security forces officers should sensitize all individuals to the need to comply with the provisions of this Government Decree. The security forces officers will identify the individuals who disrespect the issued orders and will report the incident to the Public Prosecutor's Office, and the offenders may incur in criminal liability, under the Penal Code.

The obligation that all individuals wishing to enter or leave the national territory must be subject to sanitary control is maintained. It also remains mandatory for prophylactic isolation (quarantine), with a minimum duration of fourteen days, and COVID-19 testing, to citizens wishing to enter the country, who have symptoms of COVID-19, or who have had contact with individuals infected with SARS-CoV-2. Expenses related to prophylactic isolation are borne by each individual when it is carried out in a private health facility, residence or isolation centre.

Land border crossing for traditional or customary purposes and for access to regulated markets is still prohibited, and the respective sanctions are also maintained. The entry of foreigners into national territory, across land borders, remains subject to prior authorization. The Minister of the Interior, through a ministerial diploma, may order the temporary closure of border posts or the reduction of their public service hours.

**Appendix 13. Viqueque – Proposed Water Supply System – General Plan**



## Appendix 14. COVID-19 Protection and Mitigation Measures

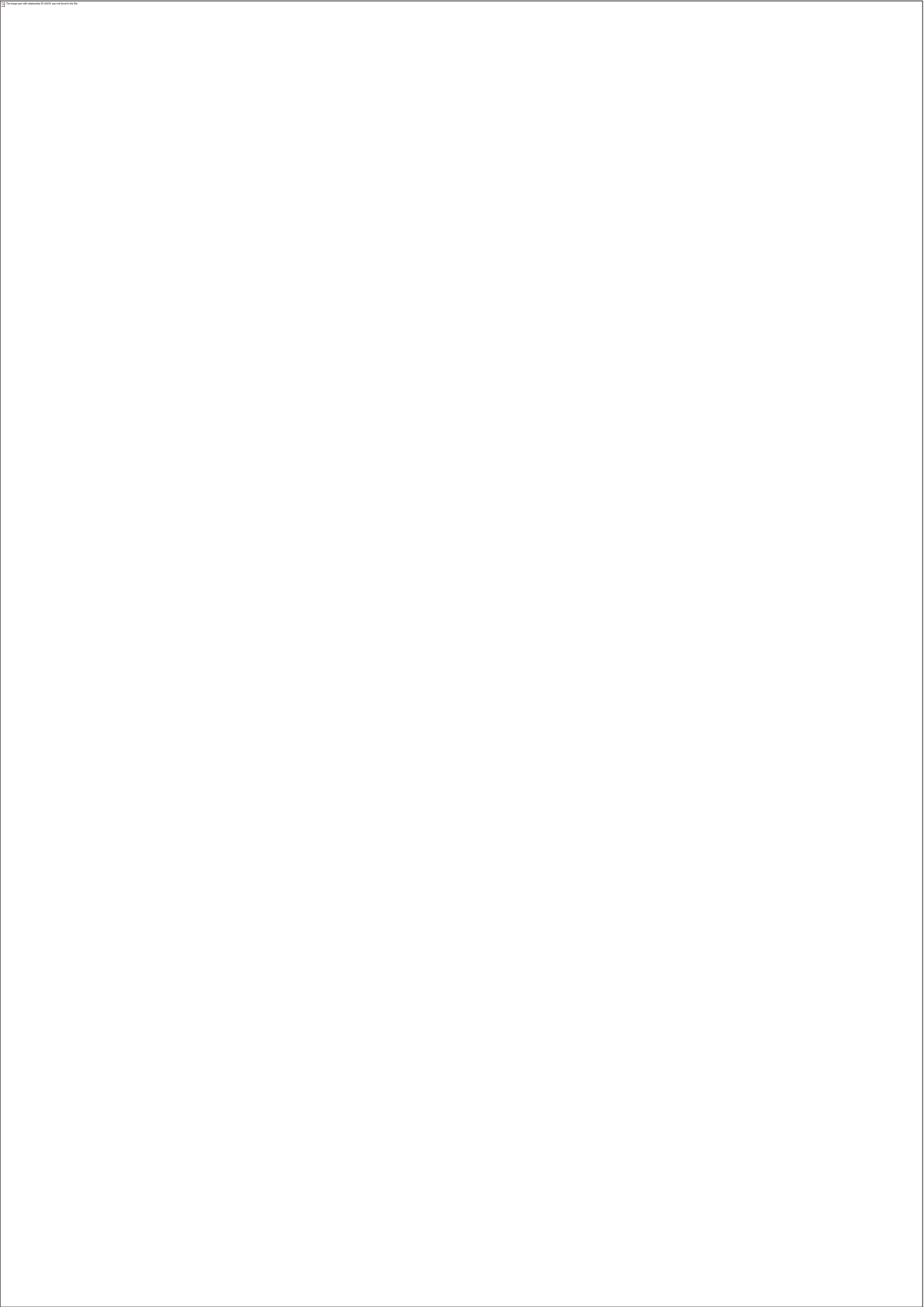
1 Construction Site Working Conditions Mitigation Measures for COVID-19	
1. Form a joint team to plan and organize return to work	<ul style="list-style-type: none"> <li>Develop or convene a joint occupational safety and health committee with members representing the employer and workers.</li> <li>Train team members on the basic principles for the formulation and implementation of occupational safety and health preventive and control measures.</li> <li>Develop and communicate a work plan on safe working for COVID-19. Such plan should be fully aligned with any government regulations and guidelines on COVID-19 prevention and control, or in the absence thereof, with international good practice guidelines as may be updated from time to time.</li> </ul>
2. Risk assessment to decide when to work, who works	<ul style="list-style-type: none"> <li>Undertake a risk assessment to determine the preventive and control measures.</li> <li>Ensure preventative measures are in place before resuming or beginning construction work.</li> </ul>
3. Adopt engineering, organizational and administrative measures	<ul style="list-style-type: none"> <li>Avoid physical interaction and maintain physical distancing requirements as prescribed by national policy, or in the absence thereof, international good practice.</li> <li>Ventilate enclosed workplaces including work camps and communal spaces.</li> <li>Avoid concentration of workers - limit the capacity of common areas such as work camp dining rooms and changing rooms to allow the minimum separation of 2 m and organize one-way systems. This includes sleeping areas which must be a minimum of 2 m between beds.</li> <li>Put in place training and information on COVID-19 and measures required for its management.</li> <li>The construction site is to be segregated to the extent possible in zones or other</li> </ul>
4. Regularly clean and disinfect	<ul style="list-style-type: none"> <li>Increase the frequency of cleaning and disinfection, in particular heavily trafficked areas and common areas, including work camps.</li> <li>All door handles, railings, ladders, switches, controls, eating surfaces, shared tools and equipment, taps, toilets, and personal areas are wiped down at least twice a day with a disinfectant.</li> <li>Discourage the sharing of items such as cups, glasses, plates, tools</li> </ul>
5. Promote personal hygiene	<ul style="list-style-type: none"> <li>Provide workers with the conditions and means necessary for frequent hand washing (soap, water or alcohol gel) with a posted hand washing protocol at site entries, exits, bathrooms, communal areas, offices, and any other areas with commonly touched surfaces.</li> <li>Inform workers of the need to avoid physical contact when greeting, and avoid touching eyes, nose and mouth.</li> <li>Inform workers of the need to cover the mouth and nose with a disposable handkerchief when coughing or sneezing or the crook of their arm</li> </ul>
6. Provide PPE and inform workers of its correct use	<ul style="list-style-type: none"> <li>Identify appropriate PPE related to the tasks and health and safety risks faced by workers according to the results of risk assessment and the level of risk, and provide it to workers free of charge and in sufficient number, along with instructions, procedures, training and supervision.</li> <li>Non-medical face-coverings (such as homemade cloth masks) should be worn as mitigation for catching and transmitting the virus, but are not to be treated as</li> </ul>
7. Health surveillance and insurance	<ul style="list-style-type: none"> <li>Before entering the site, staff and visitors must confirm that they are not currently exhibiting flu-like symptoms.</li> <li>Monitor the health status of workers, develop protocols for cases of suspected and confirmed COVID-19. The protocol will state that:             <ul style="list-style-type: none"> <li>Workers with symptoms or confirmed cases must be isolated within the construction camp or stay at home for 7 days after symptoms started.</li> <li>If symptoms persist after 7 days the person must isolate until the symptoms stop</li> </ul> </li> </ul>
8. Consider other hazards, including psychosocial	<ul style="list-style-type: none"> <li>Promote a safe and healthy working environment free from violence and harassment.</li> <li>Encourage health promotion and wellbeing in the workplace through enough rest, balance of physical and mental activity and adequate work- life balance.</li> <li>Implement prevention and control measures for the use and storage of chemicals.</li> </ul>
9. Review emergency	<ul style="list-style-type: none"> <li>Develop an emergency plan adapted to COVID-19 and regularly review it.</li> </ul>

1 Construction Site Working Conditions Mitigation Measures for COVID-19	
10. Review and update preventive and control measures as the	<ul style="list-style-type: none"> <li>Periodically monitor prevention and control measures to determine whether they have been adequate to avoid or minimize risk, and identify and implement corrective actions for continuous improvement.</li> <li>Establish and maintain records related to work-related injuries, illnesses and incidents, worker exposures, monitoring of the work environment and workers'</li> </ul>
<b>Source:</b> Adapted from: ILO, WHO, Canada Construction Association, and UK Government.	

2. Worker Camp Siting and Management Mitigation Measures for H&S and COVID-19	
5. 1. Siting	<ul style="list-style-type: none"> <li>Not in area liable to flooding, landslide or other natural disaster</li> <li>Not in area affected by construction dust, noise, sewage or other pollution</li> <li>Not in a residential area.</li> </ul>
5. 2. Minimum housing standards	<ul style="list-style-type: none"> <li>A separate bed for each worker</li> <li>Beds should not be arranged in tiers of more than two;</li> <li>Separate accommodation of the sexes or to accommodate couples</li> <li>Adequate natural light during the daytime and adequate artificial light</li> <li>Adequate ventilation to ensure sufficient movement of air</li> <li>Adequate supply of safe potable water</li> <li>Adequate sanitary facilities (see below);</li> <li>Adequate drainage</li> <li>Adequate furniture for each worker to secure his or her belongings, such as a locker.</li> <li>Common dining rooms, canteens or mess rooms, located away from the sleeping areas</li> <li>Appropriately situated and furnished laundry facilities</li> </ul>
5. 3. Minimum accommodation sizes	<ul style="list-style-type: none"> <li>Sleeping space</li> <li>Inside dimensions over 198 cm by 80 cm; sleeping room:</li> <li>headroom of over 203 cm allowing full free movement</li> <li>Beds minimum 2 m apart for COVID-19 risk management</li> </ul>
5. 4. Sanitation Facilities	<ul style="list-style-type: none"> <li>One toilet, one tap / basin, one toilet for every 6 people</li> <li>Convenient location to accommodation</li> <li>Provision of soap</li> <li>Separate facilities for men and women</li> <li>Ventilation to open air</li> <li>Fresh cold running water</li> <li>Clean and hygienic</li> <li>Septic tank / sewage treatment facility, or pit latrines located at least 200 m from surface waters, and in areas of suitable soil profiles and above the groundwater levels</li> </ul>
5. 5. H&S within worker accommodation	<ul style="list-style-type: none"> <li>Separate area for sick workers to prevent transmission of disease</li> <li>Smoke detector in sleeping area</li> <li>Fire safety throughout accommodation such as fire extinguishers, fire alarms, fire blankets</li> <li>Worker training in fire prevention and procedures</li> <li>Fire exit sign, adequate means of escape and clearly maintained exit</li> <li>Security lighting within camp and for sanitation block and lighting for route from sleeping area to sanitation block</li> </ul>
5. 6. Inspection	<ul style="list-style-type: none"> <li>2 weekly inspect to inspect for cleanliness, state of repair of building, accommodation and fire equipment.</li> <li>Record inspection results and retain for review</li> </ul>



**Appendix 15. Viqueque Social Public Consultations List of Participants  
(Suco Loihunu, Caraubalo, Uma Quic and Uma Uain Craic)**





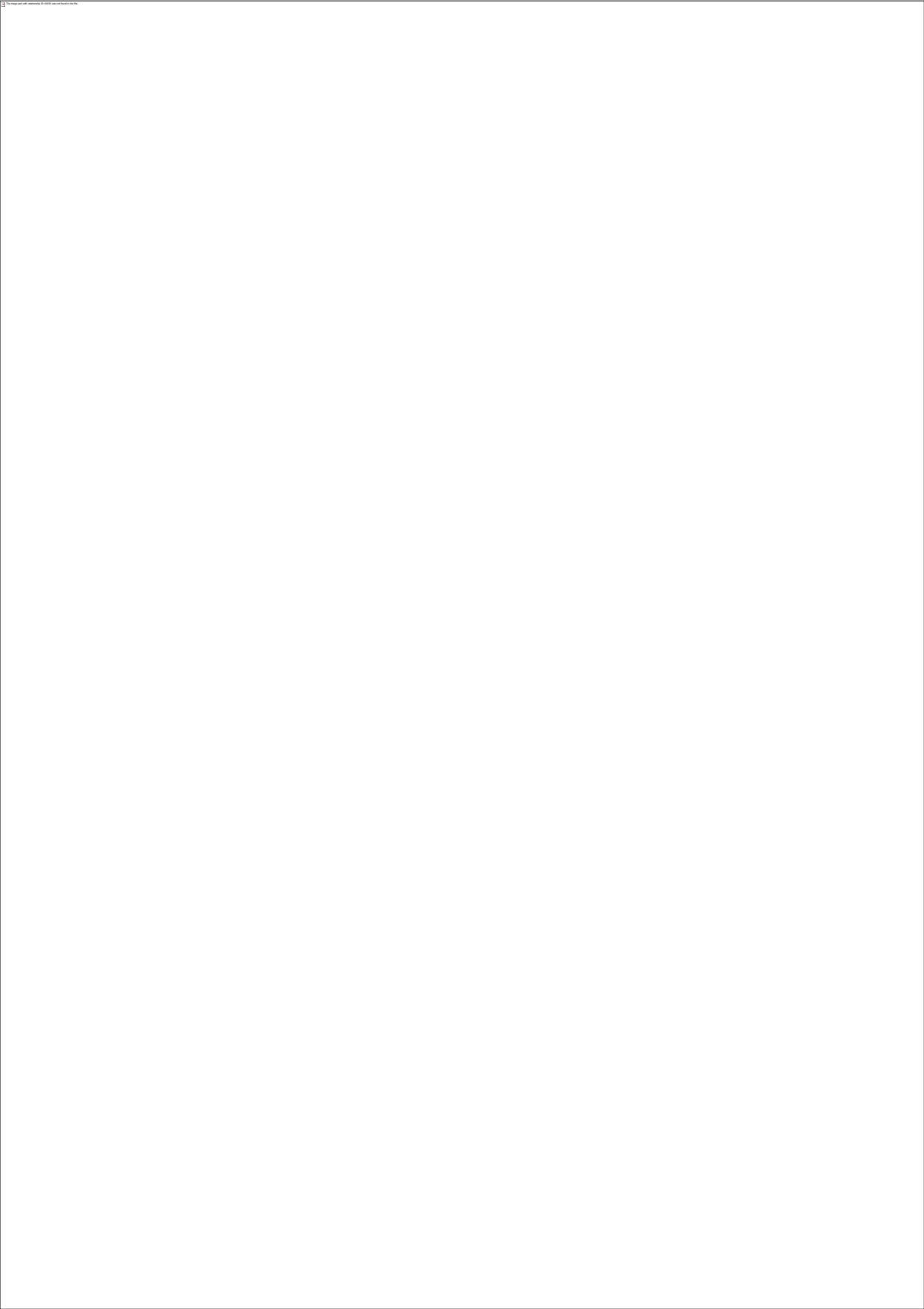




Figure 10.10: A plot of the function  $f(x) = x^2$  on the interval  $[0, 1]$ .

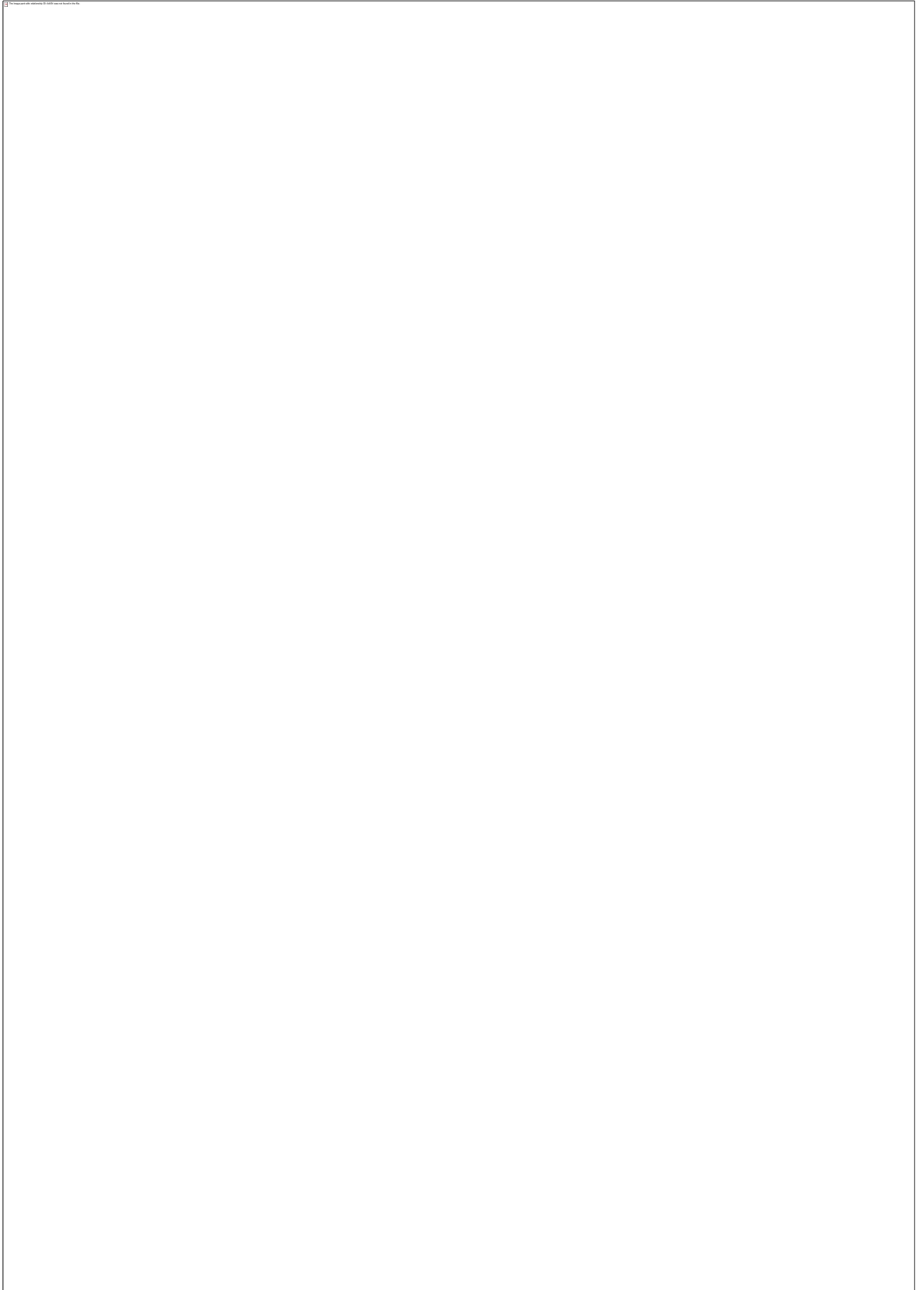


Figure 1. The effect of the concentration of the solution on the rate of the reaction.





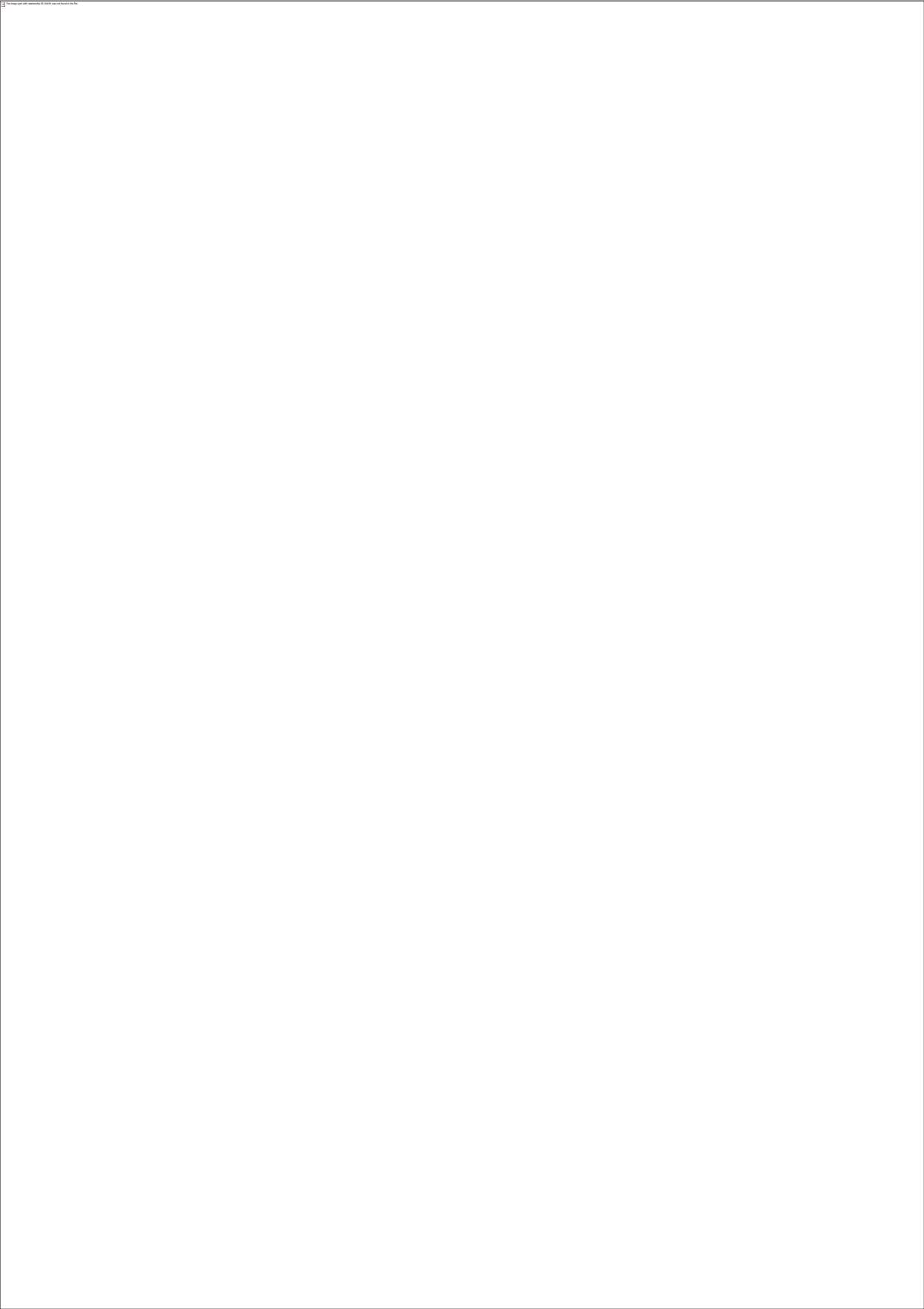
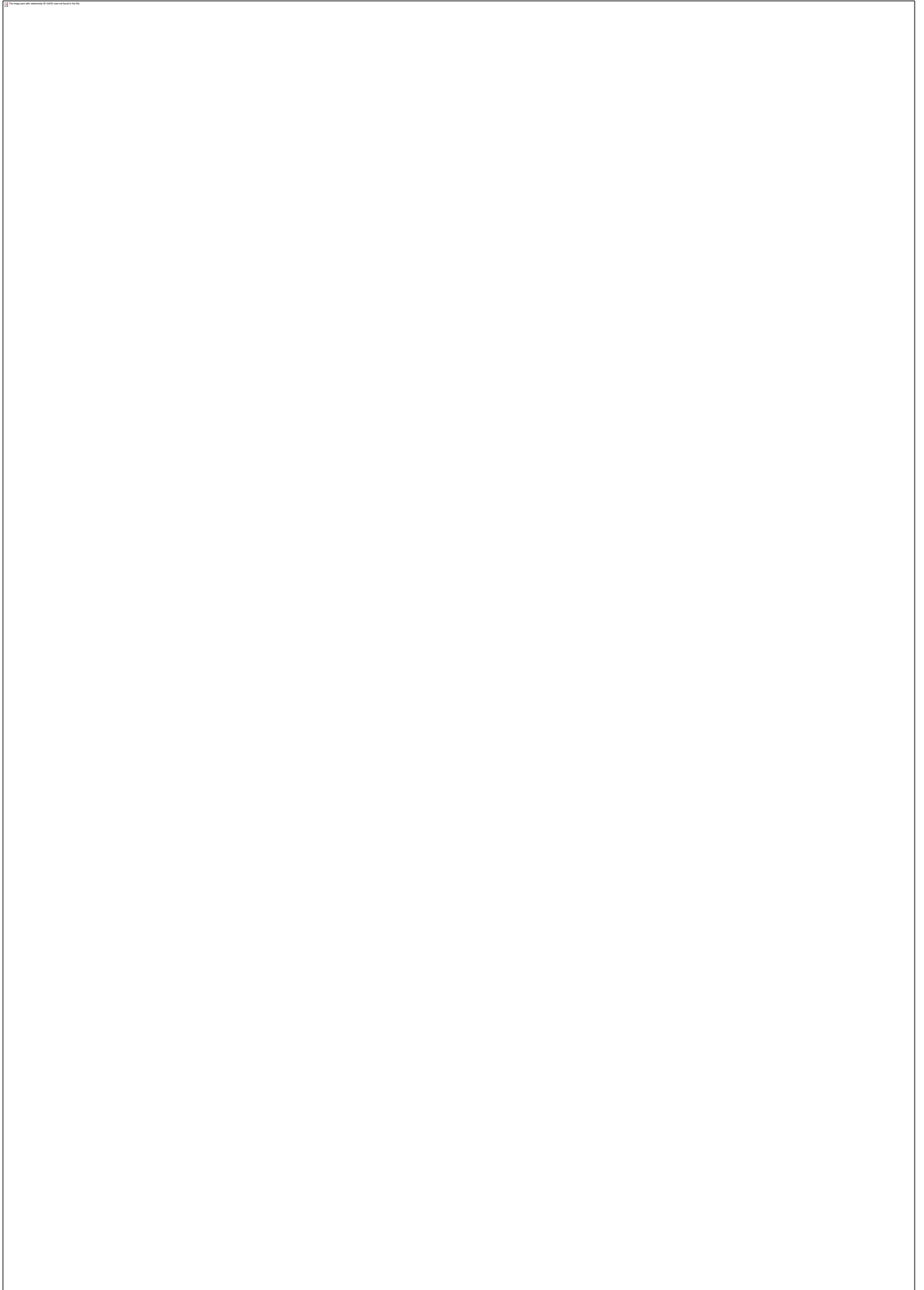


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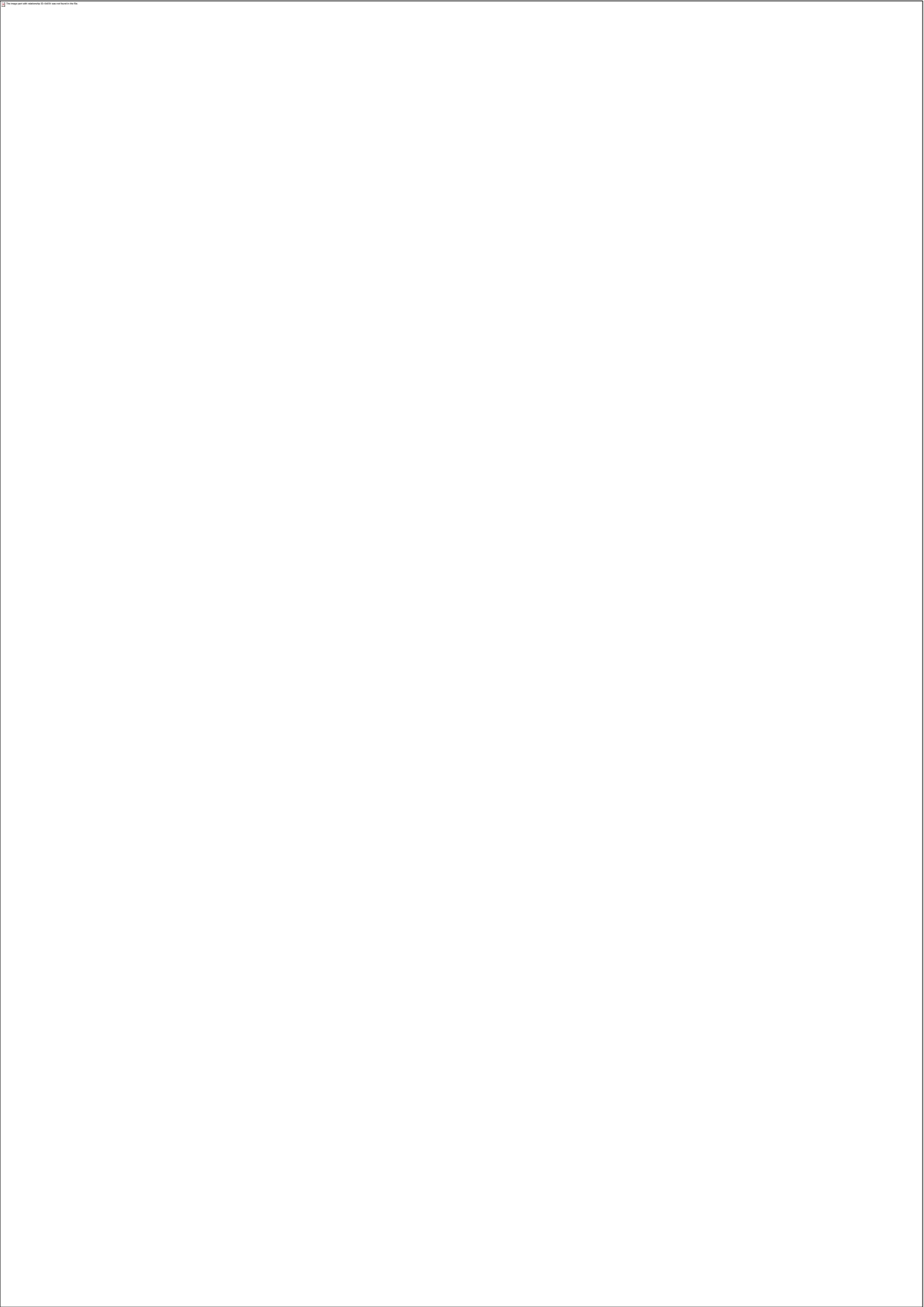
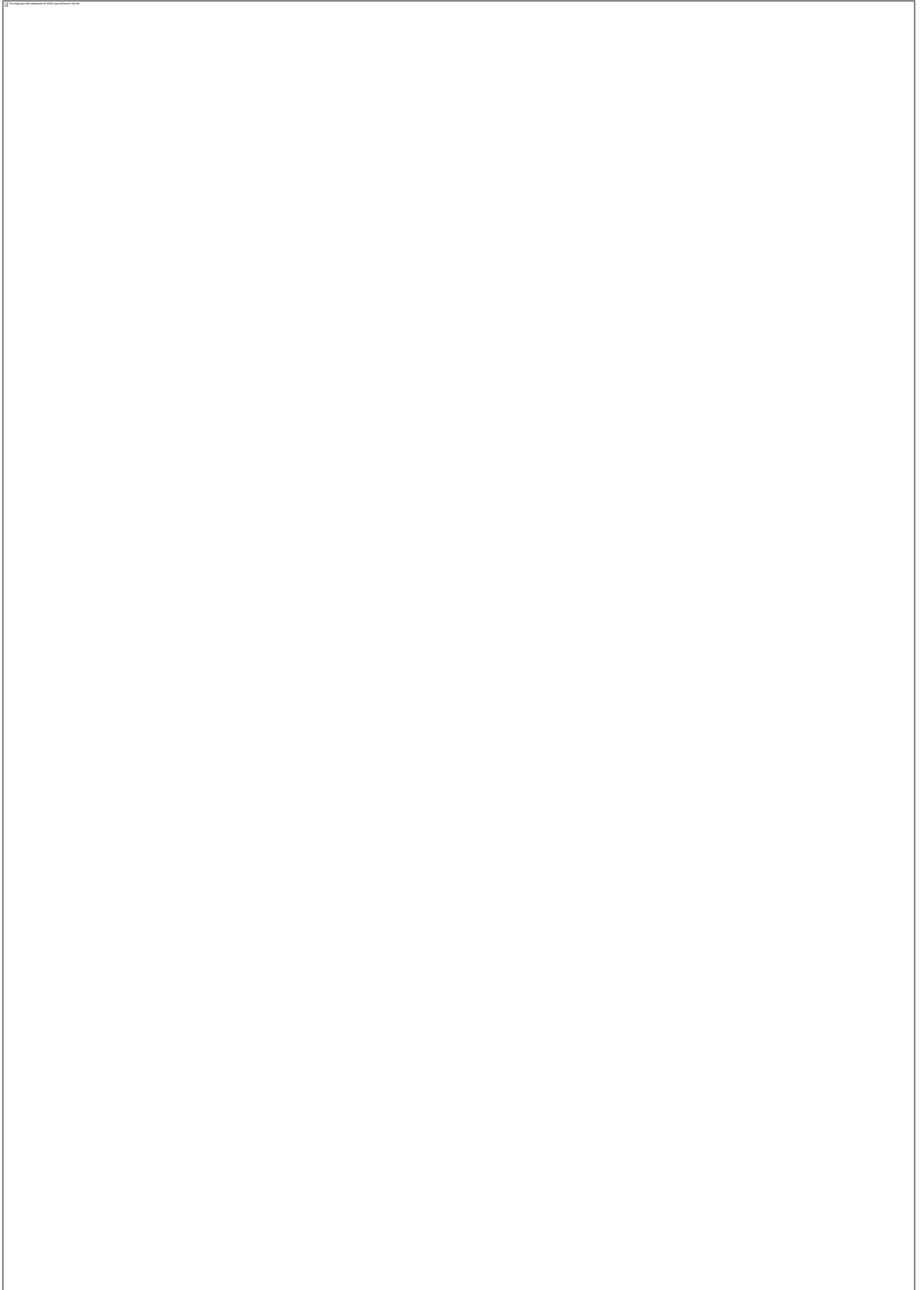


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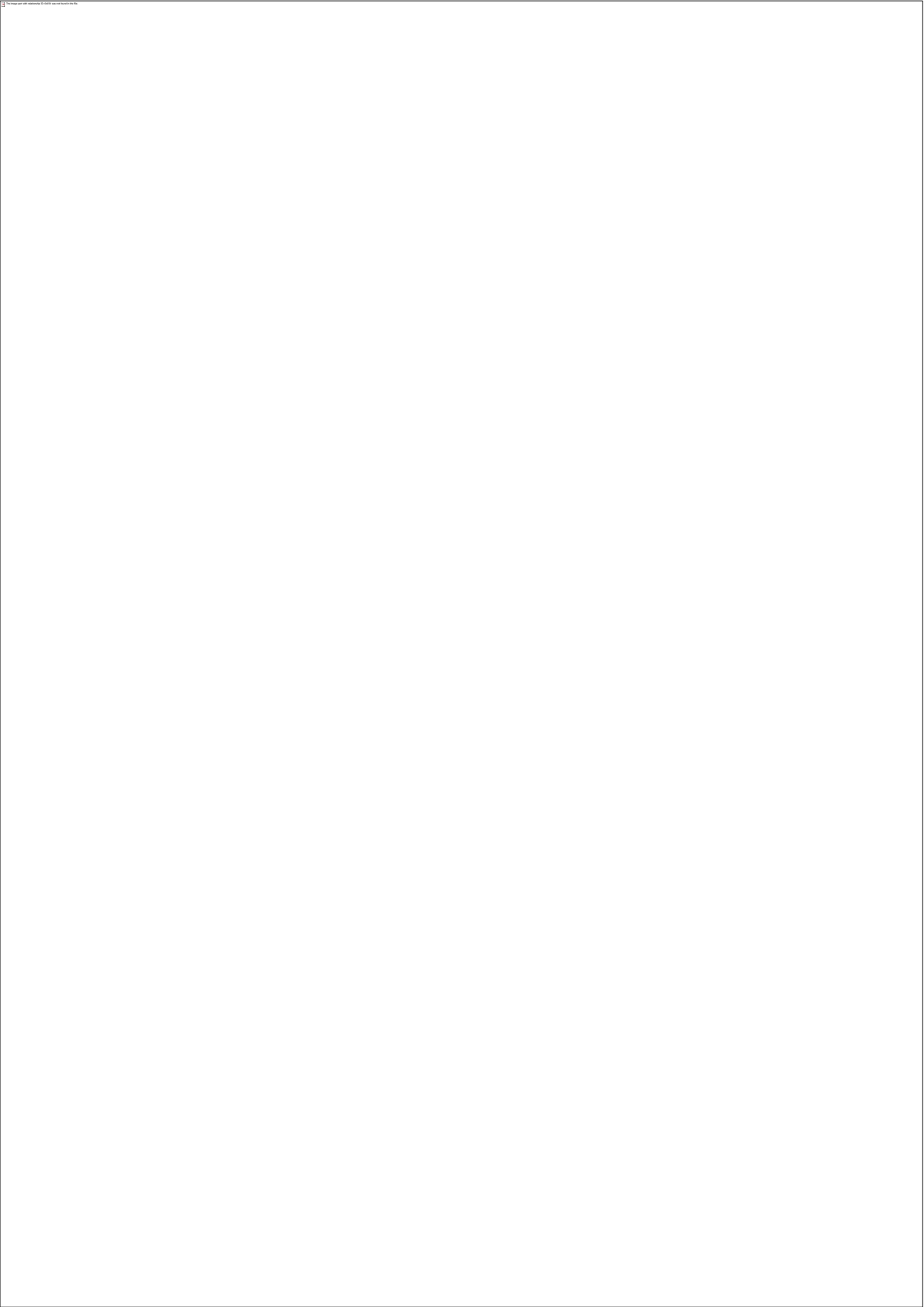


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