DILI SANITATION AND DRAINAGE MASTER PLAN
(PHASE II)

DILI DRAINAGE INFRASTRUCTURE UPGRADING PROJECT (DDIUP)

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

TERMS OF REFERENCE

May 2018

Revision 1 – Regulator First Review

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DOCUMENT TECHNICAL INFORMATION

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Name of Project:	Dili Drainage Infrastructure Upgrading (DDIU) – Phase II Project
Owner:	*Ministry for Development and Institutional Reform (MDRI)*
Proponent:	*National Directorate for Basic Sanitation (DNSB)*
Main Contractor:	AdP-TL (Águas de Portugal – Timor-Leste)
Lead Environmental Consultant:	Vasco Lobato Leitão, representing: *OASIS – Sustainable Projects & JGP NVIST - Consulting*

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Acronyms and Abbreviations

	English	Portuguese
ADB	Asia Development Bank	Banco de Desenvolvimento Asiático
ADI	Area of Direct Impact	
AdP - TL		Águas de Portugal – Timor-Leste
AII	Area of Indirect Impact	
AOI	Area of Influence	
ARI	Average Return internal	
CNC	National Centre CHEGA!	Centro Nacional CHEGA!
DDIUP	Dili Drainage Infrastructure Upgrading Project	
DED	Detail Engineering Design	
DGA	General Directorate for Environment	Direção Geral do Ambiente
DNCPIA	National Directorate for Pollution Control and Impact Assessment	Direção Nacional de Controlo de Poluição e Impacto Ambiental
DNGRA	National Directorate for Water Resources Management	Direção Nacional de Gestão e Recursos de Água
DNSB	National Directorate for Basic Sanitation	Direção Nacional de Saneamento Básico
DNSA	National Directorate of Water Services	Direção Nacional dos Serviços de Água
DSDMP	Dili Sanitation and Drainage Masterplan	
DUMP	Dili Urban Masterplan	Plano Urbano de Dili
EA	Environmental Assessment	
EIA	Environmental Impact Assessment	
EIS	Environmental Impact Statement	
EMP	Environmental Management Plan	
G-RDTL	Government of the Republic of Timor-Leste	Governo da República Democrática de Timor-Leste
IBA	Important Bird Area	
IEE	Initial Environmental Examination	
IFC	International Finance Corporation	
IMWG	Inter-Ministerial Working Group	
JGP NVIST		JGP NVIST, Consultoria Ambiental, S.A. (JGP NVIST)
MAPMAG	Deputy Minister of the Prime-Minister for Governance Issues	Ministro do Adjunto do Primeiro Ministro para Assuntos Governamentais
MDG	Millennium Development Goals	
MDRI	Ministry of Development and Institutional Reform	Ministério do Desenvolvimento e Reforma Institucional
MOPTC	Ministry of Public Works, Transport and Communications	Ministério das Obras Publicas, Transportes e Comunicações

	English	Portuguese
MPIE	Ministry of Planning and Strategic Investment	Ministério de Planeamento e Investimento Estratégico
OASIS	OASIS – Sustainable Projects	
PED	Strategic Development Plan	Plano Estratégico de Desenvolvimento
PM_{10}	Particulate Matter with a diameter ≤ 10 micron	
PAR/PR	Resettlement Action Plan/Resettlement Plan	Plano de Ação para Reassentamento / Plano de Reassentamento
RB	Retardation Basin	
SD	Scope Definition	
SDGs	Sustainable Development Goals	
SGP	Major Project Secretariat	Secretariado dos Grandes Projetos
PC	Public Consultation	Consulta Pública
SIA	Social Impact Assessment	
TOR	Terms of Reference	
WHO	World Health Organization	
WP	Worley Parson	

Note: Only Public and selected Private (Development Partners) Institutions acronyms have been translated into English, at the request of DNSB, given their familiarity and common use in Timor-Leste.

1 Introduction

The Scoping, or Scope Definition (SD), constitutes a preliminary phase in the Environmental Impact Assessment (EIA) procedure, which is of great importance to the early identification of issues and thematic areas that are expected to be of greater relevance, because of the potentially negative and positive environmental and social impacts generated by projects, contributing to the effectiveness of the EIA process.

Under the terms of article 5 of Decree-Law no 5/2011, which establishes the legal framework for the environmental licensing system for public and private projects that are likely to produce social and environmental impacts, the proponent, for the purposes of guidance on the preparation of the environmental assessment procedure, may submit a Terms of Reference (TOR) to the Environmental Authority for assessment.

The present document, denominated “Terms of Reference (TOR) for the Environmental Impact Assessment (EIA) for the Dili Drainage Infrastructure Upgrading Project (DDIUP)” intends to explain and establish the framework, methodologies and commitments of the project proponent to carry out the investigation of activities and impacts that will focus the Environmental Impact Assessment (EIA) on the environmental issues and possible effects which need the most thorough attention, identify those issues which are unlikely to need detailed study, and provide a means to discuss methods of assessing effects and reach agreement on those most appropriate. It aids site selection and avoids delays due to having to assess previously unidentified possible impacts.

This document complements the previous TOR delivered by the proponent, in July 2015 (see 2.3), for this project and adapts and updates the contained project information based on the current characteristics, scale and extent of the project, as declared by the proponent, based on field surveys and on the study of the previous TOR, literature and relevant legislation and the Environmental Authority’s comments and corrections of 31st July 2015 (see Appendix A).

At the request of DNCPIA, during the technical meeting held on the 8th May 2018, the proponent has also included a Comparison Table between the requests made in 2015 and the changes made in the TOR version 0, delivered to DNCPIA on the 17th April 2018 (see Appendix A).

The structure and contents of this SD are in compliance with the provisions set out in Ministerial Diploma no.46/2017 – Regulation on the detailed requirements for Scoping, Terms of Reference, Environmental Impact Statements (EIS) and Environmental Management Plans (EMP) for Environmental Evaluation, which establishes the framework and the information that must be included in the TOR proposal for the Environmental Impact Statement, in compliance with the provisions of item 4 of article 5 and article 42 of Decree-Law no. 05/2011 - Environmental Licensing.

2 General Information

2.1 Background on Drainage in Dili

Timor-Leste has been the subject to a development process, in which the authorities have been concerned with intervention in key sectors, such as the consolidation of urban infrastructures.

Dili, as the country's capital and largest urban area, has rapidly grown into a tropical city where the provision and management of storm water drainage and sanitation has lagged behind the needs of its ever-changing population.

Situated along the northern coastline, on relatively flat land that grades from 0m at the coast to 40m above sea level at its foothills, it is surrounded by very steep catchment areas just outside the urban area that rise to 1100 m above sea level, about 9 kilometres inland. These geographical and topographical natural characteristics result in frequent flash flooding episodes throughout the city, during the rainy season, which has pressured several Governments to a political compromise and attempt to revert unsatisfactory health and environmental related conditions in several parts of the city.

The government has made an effort to develop drainage improvement plans since 2011. These plans were set to support the objectives within the Government's Strategic Development Plan 2011 – 2030 (in Portuguese "*Plano Estratégico de Desenvolvimento (PED)"*), specifically the following: *"Appropriate drainage channels and flood plan management can help alleviate flooding and erosion…A…Drainage Masterplan is…being prepared to provide solutions for Dili's significant drainage problems…The improvement of operation and maintenance of the Dili drainage system will result in a cleaner city and reduced flooding."* (G-RDTL, 2011)

As a result, the "Dili Sanitation and Drainage Master Plan" (G-RDTL, 2012) was drafted between 2010 and 2012, resulting from the work of a Joint Venture between the Governments of Timor-Leste (G-RDTL) and the State of Victoria, Australia. It's Drainage component was drafted to answer specific problems associated with the Dili drainage system, such as: a) flash-flooding within specific areas in the city; b) under-capacity and lack of regular maintenance of existing surface and underground drainage infrastructure to match the city's urban development and growth.

Both the Sanitation and the Drainage components of the Dili Sanitation and Drainage Masterplan (DSDMP) were approved by the Council of Ministers in 2012, where the Drainage component had the following objectives:

1. To upgrade or increase the capacity of the existing drainage infrastructures in Dili which will eventually reduce the occurrence of flooding in the City;
2. Construct two flood retarding basins at strategic places in order to regulate the flow of floodwater during heavy downpour. The drainage facility will serve as recreation area during dry season;

3. Construct appropriate road drainage structures that can prolong the life of pavements and other public facilities.

After the approval of "Phase I – Design" in late 2012, the National Directorate for Basic Sanitation (*in Portuguese "Direção Nacional de Saneamento Básico* (*DNSB*)") was intent in implementing the Drainage component and reduce the frequent flooding events and improve public health and safety conditions, which ultimately contributes to the economic growth of the city. Thus, the DDIUP was initiated and undergone implementation of its Phase II since the beginning of 2014, where the G-RDTL contracted Águas de Portugal – Timor-Leste to study and update the 2012 Drainage Masterplan, through development work such as topographic surveys, the update of rainfall data used in Phase I of the Masterplan and the update of the existing network records, mapping and design, by considering data from the new sections built between the end of Phase I and 2014 Fiscal Year (AdP-TL, 2014).

As mentioned in the 2015 TOR, implementation of the DDIUP will help address various problems still exacerbating the flood occurrence in Dili today but the provision of long-term and sustainable solutions to these issues will result in various positive outcomes. A non-extensive list of the problems to be solved and positive outcomes from the project's implementation are listed in Table 1.

Table 1 Drainage Problems vs Positive Outcomes of Project Implementation

Problems Increasing Flood Risk in Dili	Outcomes from Project Implementation
• Under-designed channels • Insufficient drainage capacity due to blockages and sedimentation • High rate of urban developments, increasing the impervious area in the city • Limited or no drainage infrastructure for roads and general residential areas • Obstruction to flow caused by bridges, roads and buildings • *Kangkung* (in English "***Watercress***") plantation in some drainage channels and river-beds • Difficult maintenance of litter traps systems causing the blockage of drainage channels • Blockages caused by infrastructure occupying channels and culvert cross-sections • Blockages caused by pedestrian passages and roads over the channels, reducing the channel's cross-section	• Reduction of frequent flooding and the impact will be minimized substantially • General public health will be improved in the long-term • Direct and indirect medium-to-long-term employment and job-opportunity generation due to the construction and operation activities of the drainage system • Reduction of Flood Risk (caused by higher frequency of rain) due to the River System Improvement Works and construction of flood retardation basins • Green buffer zones (parks and recreation facilities) created as part of the retardation basin improvement that will provide extra urban living space for the Dili population and improve the liveability in the city

2.2 Summary information of DDIUP Major Project Components

This chapter is a summary of the Major components of the DDIUP described in Chapter 7.1 - Description of the proposed Project, where the maps and plans of appropriate scale are located and described fully. Please refer to Table 4 in Chapter 7.1 for the full list of the DDIUP components.

2.2.1 General Description

The DDIUP main objective is to review and update the DSDMP Phase 1 contents and the development of engineering projects for Drainage priority works, defining interventions in the Dili drainage system, whether they are upgrading the existing network, rehabilitation or construction of new drainage infrastructure, representing the entire Drainage system characterization in Díli.

Dili's main drainage system includes six (6) major rivers that flow through the city and discharge into the coastline (Comoro, Maloa, Kuluhun, Santana, Becóra/Benamauk and Bemori rivers) and a series of networks of major drainage lines within the catchments, typically consisting of large channels that define the structure of the drainage network.

The proposed components for drainage improvement are: a) New Channel diversion; b) River Improvement, c) Flood Retardation Basins; and d) Rehabilitation, cleaning of existing and/or construction of New Drainage structures.

Major drainage canals will be upgraded to retain or accommodate a higher volume of storm water runoff. At the same time, drainage channel diversion at the hill of Caicoli and Vila Verde will be constructed to prevent the uphill storm water from entering the central city area. As the channel diversions will contribute substantial volume of runoff into the Kuluhun and Maloa Rivers, their carrying capacity will increase significantly and so they are priority components for improvement, while two retardation basins will also be crucial for the mitigation of flooding in Díli, as recommended in the Dili Drainage Master Plan 2012 (G-RDTL, 2012).

A brief description of these components are presented below.

2.2.1.1 Drainage Channel Diversion

There are two proposed diversion channels in this project (see Figure 2 to Figure 8).

The first is Mascarenhas Diversion Channel, a new 2.1 Km long drainage infrastructure located in the hillside above Suco Mascarenhas to divert the 0,45 km2 catchment flow of the mountain above Caicoli, into the Kuluhun River.

The second is Vila Verde Diversion Channel, a new 975m long drainage infrastructure located in the hillside above Suco Vila Verde, one of the new drainage works foreseen for Phase III of the DDIUP to divert the 0,134 km2 catchment flow of the mountain above Vila Verde and convey it into the Maloa river bed.

Both Channels are designed with a carrying capacity of 100-year storm and predicted to reduce up to 50% of the storm water in these catchments.

2.2.1.2 River Improvements

River improvement consists of approximately 12,5 km of a total three rivers (Maloa, Kuluhun and Santana Rivers) that flow through the urban area of Dili (see Figure 1), rivers that are found to be one of main causes of the periodical flooding of the Dili downtown urban area.

The river design improvements will generally consist of widening and deepening of the river bed by excavation, adjustment of river alignment, construction of new retaining walls along the river banks (bank stabilization), replacement of the existing bridges or bridge/weir or construction of side seawalls at the river mouth to maintain the velocity of the river flow. These improvements will increase the rivers' drainage capacity and storm water runoff from the diversion channels and the urban area can be diverted into these systems.

2.2.1.3 Flood Retention Basins

Two flood retention basins (Caicoli and Aimutin) [see 7.1.3] are proposed for construction mainly to provide temporary storage for storm water runoff and delay the outflow and reduce the outlet flow rate for storms of higher average recurrence interval.

The areas are also proposed for use in the dry season to maximize the benefits from the structure and enhance aesthetics and urban function of the location and the city of Dili as a whole.

2.2.1.4 Construction of New and Rehabilitation of Existing Drainage Channels

The drainage channel system is divided in major and minor drains (main, secondary and tertiary types) based on the size of the channel and whether they define the structure of drainage network or not. The main drainage network is composed of rectangular or trapezoidal open channels, some collectors and some buried channels, most of them discharging directly into the ocean.

The purpose of rehabilitation of the existing channels and/or construction of new channels is to improve the carrying capacity of the existing drainage system that will enhance flooding mitigation in adjacent areas. Works to be performed consist of cleaning, excavation of sediment, re-shaping, and re-sloping of channels.

2.3 The EIA process for the DDIUP

Under the auspices of the preparation of a concession loan arrangement between the G-RDTL and the EXIM Bank of China for the implementation of the DDIUP, the Government of Timor-Leste was required to conduct an Environmental Impact Assessment of the project. In 2015, the Major Projects Secretariat (in Portuguese "*Secretariado dos Grandes Projetos (SGP)*"), under the Ministry for Planning and Strategic Investment (in Portuguese "*Ministério do Planeamento e Investimento Estratégico (MPIE)*"), took lead of the EIA process and contracted an "in-house" team of experts and Worley Parsons Consultancy to initiate the EIA and fulfil the possible loan requirements, as well as Timor-Leste's Environmental Licensing Law in effect.

SGP "in-house" experts prepared a Terms of Reference (TOR) for the EIA process, which was delivered to National Directorate for Pollution Control and Impact Assessment (*in Portuguese "Direção Nacional de Controlo de Poluição e Impacto Ambiental (DNCPIA*)") in 2015, pertaining an approximate 32 Km of drainage rehabilitation throughout Dili, based on preliminary but thorough Environmental Baseline Impact Studies carried out in late 2014 by the technical consultant (Worley Parsons, 2014), describing the conditions of the following components:

a. Air quality aspect: provide an analysis on the baseline conditions of the project's priority areas in Dili in order to identify air quality in terms of particulate matter (PM_{10})
b. Traffic aspect: provide an analysis on the impact of traffic and associated traffic management plan during project implementation;
c. Social aspect: provide a social impact analysis, as well as management and resettlement plan of the affected communities around the priority areas.

Unfortunately, the loan and consequently the EIA process suffered a major "freeze" in 2015 due to procurement requirements review requested by the Audit Chamber of the Court of Appeal of Timor-Leste, which lasted through to 2017 and ultimately, saw the cancelling of the loan process.

Set on not losing its investment, the Government of Timor-Leste, through the DNSB, has committed itself to follow through with the DDIUP and develop the Drainage system for the city. Therefore, DNSB has lead the preparation of this updated TOR/SD so that the EIA process continues for the current project, complementing it in scale, relevant targeted infrastructure (see 7.1) and evaluation of all the relevant environmental components.

2.4 Agreements celebrated with the Environmental Regulator (DNCPIA)

In order to follow item 2 of Annex III – Format for Terms of Reference of Category A Projects in Ministerial Diploma no.46/2017, specifically regarding "…, agreements celebrated with the Environmental Authority", the proponent had several technical meetings with the DNCPIA to. review the 1st TOR delivered on the 17th April 2018, one of which was carried on the 8th of May and where the DNCPIA comments were review and clarified with the proponent and these have been reflected in the current TOR version. Subsequently, the proponent reviewed and requested and received approval for the following requests (see below), which have been reflected in the various sub-chapters of this TOR.

a) **Public Consultation Exemption in TOR Phase:** as justified 7.7, the proponent requested a waiver for this public consultation, based on the justification that since 2015 to present, the proponent has been carrying out several consultation activities (internal, with Government entities and affected communities) in priority drainage locations, to prepare for the project execution phase, confirm and assess realistic compensation scope and scale to prepare for project budgeting update, and assess environmental and social impact perceptiveness of the interested parties and population directly affected.

The Environmental Authority accepted this request and approved a waiver for Public Consultation in the TOR phase, approval registered in the DNCPIA letter no. 178/DNCPIA-DGA-GVMDHOA-MDRI/VI/2018.

b) **Request for use of Remote Sensing as Air Quality Baseline Collection Methodology:** the proponent requested the use of Remote Sensing Tools by Satellite Spectrophotometry Detection to collect PM_{10} primary data in the project site. Based on the satellite data collected, a model will be developed (and calibrated using available results from previous in situ air quality measurements) to produce air quality baseline maps and contour data (in GIS) to predict the baseline environmental air quality in the study area (sensitive receptors) [see subchapter 7.5.1.3];

The Environmental Authority accepted this request and approved the methodology proposed for the air quality and remaining components in the TOR, approval registered in the DNCPIA letter no. 178/DNCPIA-DGA-GVMDHOA-MDRI/VI/2018.

3 Details of the Proponent

The Project Proponent of the EIA for the Dili Drainage Infrastructure Upgrading Project (DDIUP) – Phase II is the Ministry for Development and Institutional Reform (MDRI), under the guidance of the Deputy Minister to Prime-Minister for Governance Issues (*in Portuguese Ministro Adjunto do Primeiro-Ministro para Assuntos Governamentais (*MAPMAG)) of G-RDTL, as defined in the responsibilities defined in Article 11 of the Seventh Constitutional Government Organic Law (G-RDTL, 2017).

These responsibilities are further strengthened by Article 12 of Ministerial Diploma no. 70/GMOPTC/XI/2016 – DGAS Organic Law, where DNSB is to "*c) Draft, in collaboration with other relevant public services, studies on the obligatory nature of the public sewerage system, including the management of public and residential networks and drainage systems for waste water, industrial and other water types;*" and "*d) collaborate with other relevant public services and entities in drafting plan for flood prevention*". This places DNSB as the Government Agency at the heart of managing and implementing the Drainage components in urban areas and therefore the responsible entity for the design, implementation and management of the DDIUP in all its Phases.

This Entity represents the project owner and, consequently, is identified as the proponent in the EIA process, with the following contact details of the respective responsible person:

Name:	João Nazareth de Piedade Brás
Position:	National Director for Basic Sanitation (DNSB)
Address:	General Directorate for Water and Sanitation (DGAS) Compound, Caicoli. Dili, Timor-Leste
Contact:	+670 77327463
Email Address:	joao.piedade@mop.gov.tl

The present TOR is a pre-requisite for conducting the EIA for the project, as well as the preparation of the EIS and EMP in accordance with the Environmental Licensing Law. Therefore, the EIA preparation and approval process accompaniment are carried out by the project proponent, assisted by the Consultant and the Environmental Specialists mentioned in Chapter 4.

4 Details of the Consultant

In order to implement Phase II of the DDIUP, DNSB contracted the consultant AdP - Timor Leste, Unipessoal, Lda (AdP-TL), to develop the required institutional and regulatory frameworks and institutional capacity building through planning, consultations, preparation of detailed drainage designs (DEDs), procurement guidelines and construction standards for the execution of the drainage system upgrade in Dili.

Regarding the project's EIA process, AdP-TL has sub-contracted OASIS - Sustainable Projects (shortly known as OASIS), a local environmental consultancy, to give continuation to the EIA study and achieve the MDRI goals for DDIUP implementation.

OASIS - Sustainable Projects was established in 2011 for the Environmental, Planning and Development areas, providing strategic consulting and project delivery to its Timor-Leste Private and Public Sectors clients' needs in environmental, planning and development services.

To prepare the EIS and Environmental Management Plan (EMP) of the DDIUP, the OASIS technical team is composed of the following consultants and support staff:

Table 2 List of Technical Staff to carry out the EIA for the DDIUP - Phase II Project

Components	Name	Academic / Professional
General and Local Coordination	Vasco Leitão	Environmental Engineer and Master in International Urban and Environmental Management
Co-Coordination	Paulo Pereira	Environmental Engineer (OE 48890)
Local Coordination Assistant	Ricardo Florindo	Environmental Technician
Geology and Geomorphology	Sérgio Rosa	Geological Engineer
Air Quality	Paulo Pereira	Environmental Engineer and Master in International Urban and Environmental Management
Noise	Inês Paulino	Environmental Engineer (OE 50221; DFA in Acoustic Engineering)
Biodiversity (Terrestrial)	Nuno Vilela	Biologist, Master in Ecological Economy (APAI Professional member no. 94)
Hydrology and Water Resources	Paulo Pereira	Environmental Engineer (OE 48890)
Soils, Land use, Planning and Zoning	Elisabete Rodrigues	Geographer
Water, Waste and Wastewater Management	Monica Patel	Environmental Technology Expert
Socioeconomic Plan	João José Martins	Sociologist and Graduate Specialization Course in City, Territory and Rehabilitation
Heritage (Architecture and Archaeology)	João Albergaria	Archaeologist
Technical Design and GIS	João Valado	Design, Map and GIS technician

5 Legal Requirements

This section provides a brief non-exhaustive list of policies and legislation currently in effect in Timor-Leste that may be of relevance to the project, particularly those related to the Environmental Sector, that may govern the process of the environmental and social impact studies and preparation of the EIS and EMP documentation. It also identifies other applicable laws, regulations, guidelines, and standards governing environmental quality, health and safety, that, in the absence of Timorese regulations, become adapted benchmarks for environmental and social legal compliance.

5.1 Overarching Legislation

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

  One of the most important pieces of legislation in Timor-Leste, it provides the guiding principle for environmental protection in the country and recognises the need to develop Timor-Leste's resources sustainably, providing a better quality of life for its citizens and highlighting the importance of environmental protection as a right of its citizens and a responsibility of the Government.

  Its Article 61 stipulates the following:

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

- **Decree-Law no. 19/2009 - Penal Code**

  Defines the legal and judicial instruments and procedures to deal with crimes in Timor-Leste, including those against the environment.

5.2 Environmental Policy and Legislation

- **Government Resolution no. 05/2012 – Environmental Policy**

  Sets the objectives and defines guidance of responsibility amongst Government Entities to define, regulate and supervise the various environmental aspects.

- **Decree-Law no. 26/2012 - Base Law for Environment**

  Sets the framework for Environmental Protection in Timor-Leste, making 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 Constitution of RDTL. It defines important procedures and requirements such as e.g. the Environmental Assessment and Licensing process and environmental standards.

- **Decree-Law no. 05/2011 - Environmental Licensing**

This Decree-Law is the regulatory implementation of article 15 of the Base Law for Environment, defining the methods of environmental classification, evaluation, decision, licensing and monitoring of development projects, throughout their construction, operation and decommissioning phases. Also relevant are the recently approved diplomas that regulate 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, Scoping and the Terms of Reference, Environmental Impact Statements and Environmental Management Plan 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.

- **Government Resolution no. 33/2011 - National Adaptation Plan of Action (NAPA) for Climate Change**

  As Climate Change is one of the compulsory components of the Environmental Impact Statement and the DDIUP Drainage Project deals directly with its variations and adaptation requirements, especially regarding infrastructure durability.

- **Draft Decree Law on Biodiversity, dated March 2012**

  This Decree-Law is relevant and related to the project because it belongs to the Ecological components, such as coral and wetlands.

- **Decree-Law no. 5/2016, of 16th March – National System of Protected Areas**

  This Decree-Law establishes the necessary legal instruments for the protection of sensitive ecological areas in Timor-Leste and their categorization. It is not directly related to the project, as explained in 7.2.1.

- **Ministerial Diploma no. 18/MAP/MCIA/II/2017 - List of the Protected Aquatic Species**

  This Diploma is not related directly to the project, but is relevant to the environment adjacent to the project, because the protection of aquatic species is essential to preserve sensitive and protected biodiversity on national maritime waters.

5.3 Environment and Social related Legislation

5.3.1 Planning

- **Law no. 6/2017 – Base Law for Planning**

  Sets the targets and objectives for Municipalities to present their respective urban mobility plans in order to facilitate and coordinate city growth in a sustained and planned manner.

- **Government Resolution no. 16/2016 – National Policy on Urban Mobility**

Defines the principles for regional and municipal planning, defining these scopes a setting up the responsibilities to draft a National Plan and Municipal Plans, to set the rules within these plans so as to guarantee the promotion of prosperity, progress and the just partition of the national product and liveability.

5.3.2 Land and Property

- **Law no. 13/2017 - Special Regime for the definition of ownership of immovable assets**

  Rules on land ownership, legal clarification of ownership and promotion of distribution and access to land, as well as the figure of community property/land.

- **Law no. 7/2017 – Public Expropriation**

  Rules on land expropriation for public interest reasons, responsibilities, procedures, fair compensation and public hearing have to include environmental, social or economic impact assessment studies.

5.3.3 Labour

- **Decree-Law no. 4/2012 – Labour Code**

  This law 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, with the aim of creating good working conditions and a fair, safe and healthy working environment.

5.3.4 Water and Sanitation

- **Decree-Law no. 04/2004 – Approving the Water Distribution Regime for Public Consumption**

  Establishes the conditions for domestic water distribution and the restrictions to other activities and/or projects, persons, etc, that may impact on the system itself.

- **Decree-Law no. 33/2008 – Hygiene and Public Order**

  Establishes the local administrative measures in terms of public hygiene and order, setting the conditions and regulations to avoid interference with public land or infrastructure, namely drainage channels.

- **Government Resolution no. 08/2012 – Sanitation Policy**

  Sets the objectives and defines guidance amongst Government Entities to define, regulate and supervise the various sanitation responsibilities and aspects.

- **Parliament Resolution no. 9/2016 – Recommends the Government to adopt urgent measures to inform and make the public aware towards the preservation of the environment.**

Recommends to the Government to promote awareness campaigns and foster economic activities that focus on plastic and waste recycling or incentivise national production of reusable bags, in order to stop plastic bag import altogether and promote solid waste separation and treatment.

- **Government Resolution no. 15/2016 – National Strategy for Sea Waste Management**

  Sets up an Inter-Ministerial Technical Committee to integrate sea waste into broader policy in Timor-Leste. Related to the project, since one of the sources of this problem is the solid waste that flows through the drainage system in Dili, towards the sea.

- **Government Resolution no.32/2016 – Investment Strategy for the management of Urban Solid Waste in Dili**

  Relevant as it defines responsibilities and financial commitments for the Urban Solid Waste management system in Dili, especially to prevent impacts on e.g. drainage blockage, which indirectly impacts the long-term functioning of the Drainage network.

- **Ministerial Diploma no.32/2016 – Sewerage Cleaning Program**

  Defines objectives and budget allocation for types of activities to finance regarding drainage/sewerage channel cleaning program, for the Municipality Administrations in Dili and remaining 12 Municipalities.

- **Decree-Law no.2/2017 – Urban Solid Waste Management System**

  Relevant as it defines the “do’s” and “don'ts” regarding solid waste management and directs the project in the mitigation and operational procedures regarding generated waste during the construction and operation phases of the Project.

5.3.5 Culture and Heritage

- **Government Resolution no. 24/2009 – National Policy for Culture**

  Defines the concept of culture, heritage and types of and how these should be identified, classified and communicated to the public, registered so as to make it a dynamic sector for the development of the identity and citizenship of Timor-Leste.

- **Decree-Law no. 33/2017 on Legal Framework for Cultural Heritage**

  Defines the concept of cultural heritage and the measures for its support, protection, preservation and conservation and the typology of cultural heritage in Timor-Lest.

5.3.6 Tourism

- **Decree-Law no. 14/2014 on Legal Framework for the Tourism Policy**

  Establishes the basis for public policy for Tourism and the instruments to execute the policy, as a strategic sector in the national economy.

- **Government Resolution no. 16/2017 – National Policy for Culture**

Contains the general principles defined to develop the Tourism sector in Timor-Leste, up to the year 2030.

5.4 Environment and Social related International Guidelines

Pursuant to article 67º of the DL 26/2012 - Environment for Bases Law, regarding WHO guidelines and other guiding international benchmarks i.e. the IFC, the following may be relevant to the project:

- **WHO Guidelines 1999 - Community Noise**
- **WHO Guidelines 2003 - Water Quality –Guidelines for safe recreational water environments: Volume 1 - Coastal and Fresh Waters**
- **WHO Guidelines 2005 - Air Quality guidelines for particulate matter, ozone, nitrogen dioxide, and Sulphur dioxide**
- **WHO Guidelines 2006 – Safe Use of Wastewater, Excreta and Grey water**
- **IFC 2007 – Environmental, Health and Safety Guidelines. General EHS Guidelines: ENVIRONMENTAL**
- **IFC 2012 - Performance Standard on Environment and Social Sustainability 2012**

  This Framework comprises IFC's Policy and Performance Standards on Environmental and Social Sustainability. There are eight performance standards for the following objectives:

  PS 1. Assessment and Management of Environmental and Social Risks and Impacts
  PS 2. Labour and Working conditions,
  PS 3. Resource Efficiency and Pollution Prevention,
  PS 4. Community Health, Safety, and Security,
  PS 5. Land Acquisition and Involuntary Resettlement,
  PS 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources,
  PS 7. Indigenous Peoples,
  PS 8. Cultural Heritage

6 Study Area

6.1 Location

The Project is located in Dili Municipality, covering a large portion of the Dili Urban area, close to 30 km^2 that includes the Dom Aleixo, Vera Cruz, Nain Feto and Cristo Rei Administrative Posts.

The project area is bordered by the Wetar Straight Sea to the north, the Dili surrounding mountain range from the Northeast [Bidau Santana] to the Southeast [Becora Hill] and follows Westwards along the mountain range foothill towards the Comoro Riverbed, following on North-westwards to the foothill of the range that separates Comoro (airport area) from Tasitolu (in the Dili-Liquiça Road) and finally turning North bound to the West end of the Dili Nicolau Lobato Airport runway (see Figure 1).

6.2 Area of Influence (AOI)

The Area of Influence (AOI) is the area likely to be affected by the project, including all its ancillary aspects, such as channels, watercourses, access roads, and construction sites and borrow and disposal areas, as well as unplanned developments induced by the project (e.g.: resettlement areas).

The AOI includes two important concepts: 1) the area of direct impacts (ADI); and 2) the area of indirect impacts (AII):

1. Area of Direct Impacts: usually considered the physical footprint of the project such as right–of way, construction sites, work staging areas, and areas affected during the operational phase (e.g. new traffic patterns);
2. Area of Indirect Impacts: more difficult to define precisely but includes areas which may experience induced or cumulative changes in combination with activities not under the direct control of the project.

In the project under study, the following ADI and AII boundaries were considered:

1. Channels:
    a. ADI: 0 - 2 meters band for each side of the channel;
    b. AII: > 2 - 50 meters.
2. Rivers:
    a. ADI: 0 - 10 meters band for each river bank;
    b. AII: > 10 - 50 meters.

In Sheets Nº 2 and 3 of Appendix G it is possible to see, in detail, the different AOIs of the various project components.

To date, there is still no Law in Timor-Leste that has defines the Public Water Domain, and therefore, the ADI for rivers has been considered as 0 to 10 meters, using the Portuguese reference in Decree-Law no. 58/2005 – Law of Water, regarding Public Water Domain in rivers. However, this reference does not include an ADI distance for secondary channels and

therefore the values for ADI (0 to 2 meters) for these channels and the AII for channels (2 to 50 meters) and for rivers (10 to 50 meters) have been defined according to best practise and experience in other EIA projects.

6.3 Study Timeline

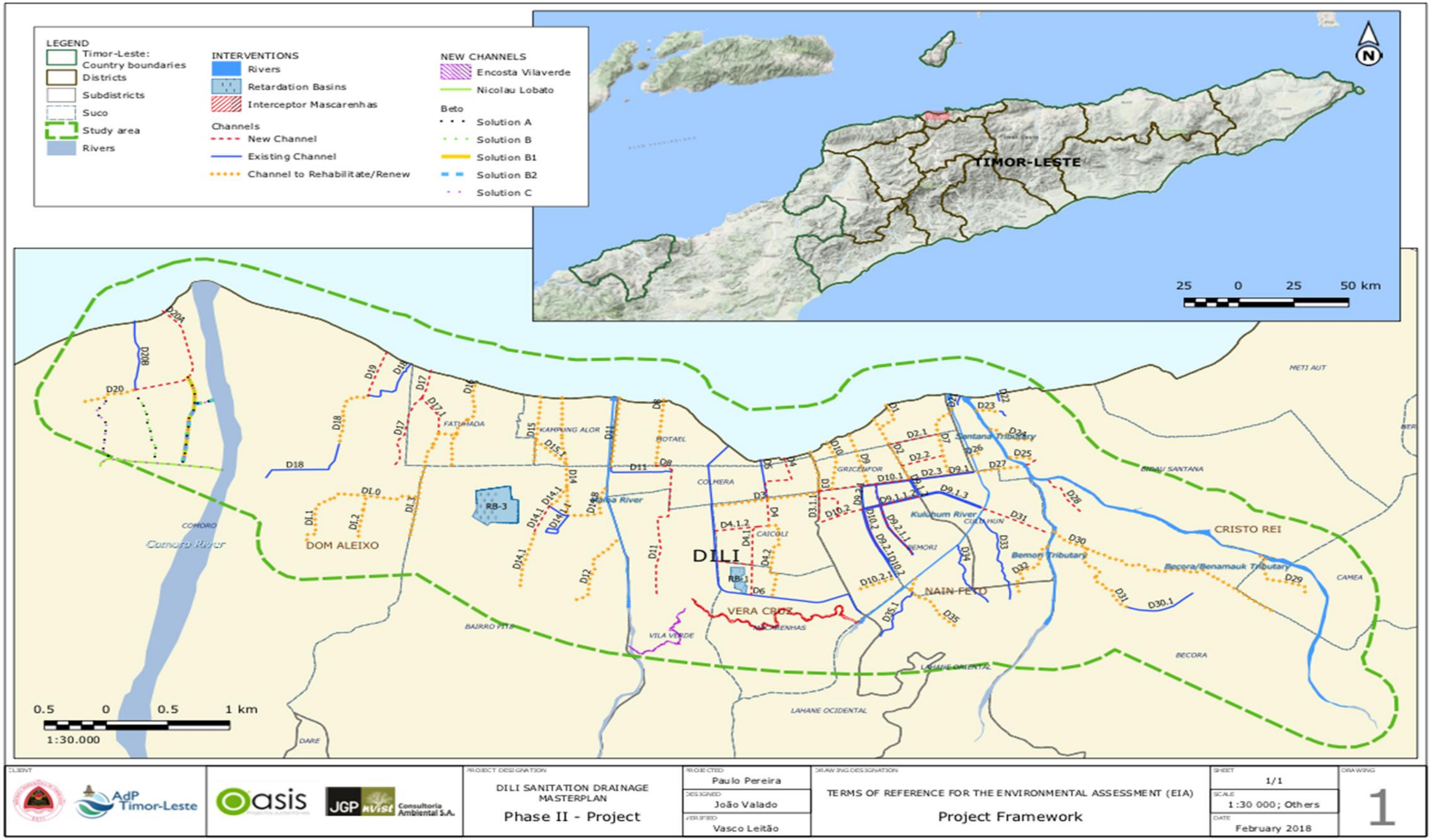
In terms of time, the project's environmental evaluation and request for proper environmental licensing has been drafted to comply with the requirements of the Timorese Legislation in effect.

It has started in January 2018 and is expected to end in October 2018, with the attribution of the environmental license and the consequent inclusion of all necessary environmental clauses derived from the Environmental procedure, into the future construction contracts TORs and procedures (see Table 3).

Table 3 EIA Timeline / Schedule

		Month 1		Month 2		Month 3		Month 4		Month 5	
1	**EIA Scoping and TOR Document**										
1.1	Scoping Document Delivery										
1.2	Analysis and approval by NDPCEI										
2	**EIA Process**										
2.1	Background Research / Literature Review										
2.2	Baseline Survey										
2.3	Impact Assessment and Draft EIA/EMP preparation										
2.4	EIA/EMP Delivery and analysis by NDPCEI										
2.5	Public Consultation Process										
2.6	Review and Submit Final EIS/EMP for Approval										

Figure 1 Project Framework - Drainage Infrastructure for the DDIUP Phase II



7 Scope of works to be carried out during the study phase

In order to support the achievement of the general objectives of the DDIUP, mentioned in Chapter 2, the preparation of the EIS and the EMP will adhere with the document structuring and technical requirements of Decree-Law 05/2011 – Environmental Licensing and respective regulations, in effect in Timor-Leste.

The work will also be based on the review of previous environmental, social and planning studies related to the baseline conditions of the project area, to identify and understand the probable environmental and social risks and impacts associated with the development of the Drainage network. The following is a non-extensive list of documents that are relevant inputs to the project:

- DSDMP Phase I (G-RDTL, 2012);
- DSDMP Phase II – Detailed Engineering Designs (DEDs) (G-RDTL, 2016);
- Final Report - Urban Services Improvement Sector Project Dili Metropolitan Area Water Supply Master Plan 2016-2030 (G-RDTL, 2018);
- Final Report (Volumes I, II&III) – Dili Urban Masterplan (G-RDTL, 2016)
- Final Report - Solid Waste Management Investment Strategy for Dili (ADB, 2015)
- Initial Environmental Examination (IEE) for Subzone 1 and 10 – Final Report (G-RDTL, 2013)
- Public Consultation Information (see 7.7)
- Various infrastructure related projects and activities and/or other information relevant to the drainage sector within or adjacent to the project AOI;

This chapter describes briefly the major project components, baseline studies to be carried out and methodologies to be used by the Consultant team, on behalf of the proponent, during the EIA phase and how the EIS and EMP will be compiled and presented for analysis and approval.

7.1 Description of the proposed Project

The DDIUP main objective is to review and update the DSDMP Phase 1 contents and the development of engineering projects for priority works of Sanitation. These engineering projects define interventions in the Dili drainage system, whether they are upgrading the existing network, rehabilitation or construction of new drainage infrastructure.

In addition to the information available from the DSDMP Phase 1, Phase II also relied on most recent and available data on topography, network surveys and rainfall data from previous years, with better reliability and to the most current situation.

With the gathered information the project updated several data settings for drainage sizing and flow, network cadastre and existing characteristics.

The present TOR has gained considerable reliability with this upgrade as the designs represent the entire Drainage system characterization in Dili, enveloping the previous EXIM

Bank-led drainage components and including them in this TOR's scope. The characteristics of the drainage works are very much alike throughout the project components, with an increase in number of drainage works for this TOR, requested by the Proponent, that has not increased the project area itself (still at 30 Km^2) but increased the Drainage Work length to an approximate 60 Km, extending the previous EXIM BANK-led drainage project by 29 Km in length.

It also draws on the fact that most of Dili's drainage system is located mainly in the lower parts of Comoro, Maloa, Kuluhun, Santana, Bemori and Becusi rivers catchments, within the urban areas and in flat areas and that localized flooding in Dili is mostly due to under design of the drainage system, particularly the design of the sections themselves, in addition to being clogged with garbage and sediments in the channel bottom.

In a general way, Dili's main drainage system includes six (6) major rivers that flow through the city and discharge into the coastline (Comoro, Maloa, Kuluhun, Santana, Becóra/Benamauk and Bemori rivers) and a series of networks of major drainage lines within the catchments, typically consisting of large channels that define the structure of the drainage network.

The DDIUP list of drainage infrastructure planned for construction is listed in Table 4, and illustrated in Figure 1. The maps and plans of appropriate scale are shown in Appendix B of this report. They answer Dili's need for flash flood alleviation and control, where different construction components are applied to different scales, needs and scenarios.

The proposed components for drainage improvement are categorized into four drainage systems, namely: a) New Channel diversion; b) River Improvement, c) Flood Retardation Basins; and d) Rehabilitation, cleaning of existing and/or Construction of New Drainage structures. The order of components is presented here for explanation purposes only and not as order of construction. The ***estimated*** time for construction for each drainage infrastructure is indicated in Table 4.

Drainage channel diversion (i.e.: at the hill of Caicoli) is planned to alleviate the pressure of the current storm water volumes from the mountain area and prevent them from entering i.e. the Caicoli central area, which has often suffered from major flooding in the past, directing these volumes to watersheds with a higher carrying capacity, such as the River Systems.

The channel diversion project will contribute with substantial volumes of runoff into the main river system, which will see their carrying capacity increase significantly. Therefore, River Systems are a priority component for improvement such as i.e. Santana, Kuluhun or Maloa River. The latter, which traverses the central area of Dili and, as currently designed, will alleviate the city centre of significant volumes of storm water runoff to the sea.

Equally, the city drainage system itself, as is, does not have enough carrying capacity for the current flash flooding episodes and will also suffer an additional increased pressure from the diversion channel projects.

Table 4 Main Project Components, Characteristics, Location and Estimated Construction Schedule (Source: AdP-TL 2018)

TOTAL LENGTH OF PROJECT CHANELS	64100.51		Estimated Construction Period				
Main Project Components	**Length (m)**	**Location of the proposed project infrastructure**	**2019**	**2020**	**2021**	**2022**	**2023**
D1	**307**	Channel D1 extends along Lecidere Street and Travessa de Lecidere Street and discharges into the sea.	X				
D2	**2607.38**	Channel D2 extends along Belarmino Lobo Street to the shoreline where it discharges.	X				
D3	**4405.79**	Lower parts of Comoro, Maloa, Kuluhun and Santana rivers catchments, within the urban areas and flat areas (e.g. Av. Bpo de Medeiros, Avenue to the Governor Alves Aldeia, Av Cidade de Lisboa; R. Jose Maria Marques; Rua jacinto candido, Correia central, R. Caicoli	X				
D4	**218.86**	Channel D4 is a small underground channel that extends from city of Lisboa Avenue to the Governor Alves Aldeia Avenue and discharges into the sea; R. jacintocandido (including Av. Bispo de Medeiros, Avenue to the Governor Alves Aldeia, Av. cidade de Lisboa; R. Jose Maria Marques, correia central, R. Caicoli; R. Nicolau dos Reis Lobato)	X				
D5	**396.62**	Central Dili, between Maloa and Kuluhun rivers (e.g. Av. Bpo de Medeiros, Avenue to the Governor Alves Aldeia, Av cidade de Lisboa; R. Jose Maria Marques; R. jacinto candido, correia central, R. Caicoli; R. Nicolau dos Reis Lobato	X				
D6	**2111.87**	Channel D6 extends from Desa Mascarinas to Desa Colmera and ends under the structure of Port of Dili.					X
D7	**730**	Channel 07 is an main channel, located on the border of central Dili with East Dili, near Kuluhun river. Channel D7 extends from Desa Akadiruhun to Kuluhun river, where it discharges. Other impact areas are: Estr. de Bidau, R.Barros Gomes, R. Humberto da Cruz, R. Srg. Lobato; Belarmino Lobo	X				
D8	**667.31**	Border of Central Dili with West Dili, near Maloa river- Channel D8 is an underground channel that extedns along the street, in Desa Motael, to the shoreline, where it discharges into the sea.	X				
D9	**5553.62**	Channel D9 extends from Bairo Gricenfor to Dili Hotel/Lecidere Park and discharges into the sea. Rua Jacinto Candido. Other impact areas are R. de Nu Laran; R. de Santa Cruz; R. Quinze de Outubro.	X	X			
D10	**2087.62**	Desa Santa Cruz, Audian Road, Kintal Kiik, BAirro economico, Stadium Municipal Dili, Bairro Formosa, President Nicolau Lobato Avenue, Martires da Patria Avenue where it discharge to the sea	X	X			
D11	**2213.13**	Channel D11 extends along Abílio Monteiro street, D. Aleixo Corte Real street and Marinha Street to the shoreline, where it discharges into the sea.	X				
D12	**795**	Channel D12 is a major channel, located in Central Dili, next to Maloa River. Channel D12 discharges into Maloa River.					X
D14	**2491.96**	Channel D14 is a major channel, located in West Dili, discharging into the sea. Channel D14 develops in Desa Bairo Pite. Channel D14 is mainly an open channel, though some sections are developed underground, mainly in intersections. Channel D14 has several tributaries which correspond to old streams flowing down from the mountains.					X
D15	**996**	Channel D15 is a major channel, located in West Dili, discharging into the sea. Channel D15 develops in Desa Bairo Pite. Channel D15 is mainly an open channel, though some sections are developed underground, mainly in intersections. Channel D15 has several tributaries which correspond to old streams flowing down from the mountains.					X
D16	**929**	Channels D16, D17 and branches include a concrete channel that drains to the sea.				X	
I0	**433**	Drainage system of the various channels such as Aimutin Channel, “Banana Road”, RB3, in a way that can distribute to the D16 and D17				X	
I1	**838**					X	
I2	**412**					X	
I3	**1188**					X	

TOTAL LENGTH OF PROJECT CHANELS	64100.51		Estimated Construction Period				
Main Project Components	**Length (m)**	**Location of the proposed project infrastructure**	**2019**	**2020**	**2021**	**2022**	**2023**
D17	**1043**	Channels D16, D17 and branches include a concrete channel that drains to the sea.The channel D17 was designed from the need to establish a new channel over an existing flowline that develops along lows points, that was being uncharacteristic over the time, due to the urbanization and building edification. Therefore, as a consequence, in the high precipitation events is frequent the occurrence of floods.				X	
D18	**2083.39**	Colmera, Av. de Portugal adjacent; R. be Horris; Av. Pres. NicolauLobato.	X	X			
D19	**462**	Channel D19 is a major channel, located in West Dili, between Comoro and Maloa Rivers. Channel D19 extends from PASAR COMORO/PERUMAHAN VILA PANTAL KELAPA to Portugal Avenue, where it discharges into the sea. Channel D19 starts as an opened channel, passing afterwards to a closed section, till it reaches the sea.				X	
D20A	**1129**	Currently, channel D20 is a small channel, extending laterally to the airport platform in the west-east direction, ending in a ponding area upstream of the existing tunnel beneath the airport platform.	X				
D20B	**1653**		X				
D21	**NO VALUE**	Channels D21, D22, D23 and D24 are major channels, located in East Dili, near Santana Rivers. Channels D23 and D24 discharges into Santana river and channels D21 and D22 into the sea					X
D22	**79.71**						X
D23	**217.61**						X
D24	**415**						X
D25	**294.11**	Channels D25, D26 and D27 are major channels, located in East Dili, near Kuluhun and Santana Rivers. All the channels discharge into the rivers. Channel D25 discharges into Santana river and channels D26 and D27 into Kuluhun river.					X
D26	**69.34**						X
D27	**999.69**		X				X
D28	**427.51**	Channels D28 and D29 are major channels, located in East Dili, near S. Becora River. Channels D28 e D29 discharges into S. Becora river.		X			
D29	**640.34**			X			
D30	**2902.68**	Rua Kuluhun; Av. Liberdade de Imprensa.		X			
D31	**559.66**	Channels D31 and D32 are main channels, located in East Dili, between Kuluhum and S. Bemori Rivers. Channels D31 and D32 develop in Desa Kuluhum.				X	
D32	**671.35**					X	
D33	**918.23**	Channels D33 and D34 are main channels, located in Central Dili, between Kuhulun and S. Bemori Rivers. Channels D33 and D34 develop in Desa Bemori				X	
D34	**676.49**					X	
D35	**1236.92**	Channel D35 is a major channel, located in East Dili, between Kuluhun and S. Bemori rivers. Other potential impact areas are: Area adjacent to Rua Ponte Meira; Estrada Semore		X			
RB-1	**22000m2**	Caicoli area, Estr. De Balide, R. de Mascarenhas Vera Cruz			X		
RB-3	**100000m2**	Aimutin area, Bairro Pite			X		
Kuluhun River	**3000**	Along Kuluhun river channel traversing parts of LahaneOcidental, Kuluhun, Acadiru-Hun, Bidau Santana, Lahane Oriental.		X	X		
Maloa River	**2450**	Along river channel tranversing parts of Kampung Alor area.		X	X		
Santana River System		Santana River is a three (3) river fluvial system, where the Santana results from the confluence of the Bemori with the Becora/Benamauk tributaries					X
SRS - Santana	**1062**	Bemori and Becora/Benamuak rivers come from maximal elevations of 863 m.a.s.l. and 890 m.a.s.l. down to the point where both rivers are joined together, at elevation 8,0 m.a.s.l. From this latter point the Santana river flows down to the ocean.					X
SRS - Becora / Benamauk	**4134.44**						X
SRS - Bemori	**1594.93**						X
Mascarenhas Interceptor Channel	**2047.95**	The channel is located in the hillside overlooking the Mascarenhas Suco, its purpose being to collect the runoff produced by a set of small mountain streams that, presently, drain directly into Dili urban area, causing frequent flooding of densely inhabited areas.		X			
Vila Verde Interceptor Channel	**925**	The channel is located in the hillside overlooking the Vila Verde Suco. Its purpose being to collect the runoff produced by a set of small mountain streams that, presently, drain directly into Dili urban area, causing frequent flooding of densely inhabited areas.					
Av. Nicolau Lobato Channel - Solution C	**2425**	Construction of two new channels: one across Beto area, defined as alternative B, and another along Av. Do Aeroporto					
Beto Channel – Solution A	**600**	The channel is the same channel that is proposed the preliminary design “Hydraulic Assessment of the Drainage Channel along Av. Nicolau Lobato”, starting downstream of the Ministry of Public Function’s box culvert.					

Two retardation basins are planned for Construction, as recommended in the DSDMP 2012, which will be crucial to retain and delay the entrance of important flood volumes into the drainage channel system. Throughout the system, some problems of sediment deposition along the network (rivers, channels and manifolds), resulting from soil erosion in the areas upstream of the hydrographic basins and the growth of vegetables along the river/channels bed, where embankments are executed to create a bed for plantations, result in the diminished drainage channels' transport capacity of the flood flows.

Therefore, the remaining small, medium and large-scale drainage channels upstream and downstream of the retardation basins, as well as those throughout the rest of the city that connect to the River Systems or flow directly to the sea, will be rehabilitated and new drainage channels constructed, to increase retention or accommodate a higher volume of storm water runoff from the top to the bottom of the several watersheds in Dili, guaranteeing the timely flow of the storm water out of the system and into the sea, mitigating flood occurrence in Dili.

An important aspect of this project phase is that, contrary to DSDMP-Phase 1, where the existing drainage network was dimensioned considering a return period of 5 years, and so the rainfalls excess with a higher return period will certainly result into a flooding situation in the city of Dili, the DDIUP – Phase II has designed the urban drainage system for a return period of 25 years and the diversion channel and river regularization for a return period of 100 years. In fact, according to international literature, urban drainage networks should be designed for return periods of 10-20 years.

Dili has an urban space with specific limitations (narrow streets and private land) which forced the adoption of more expensive underground solutions in some areas in the city. The existence of severe constraints, such as the increasing impermeable areas that result from the growth of urban areas located further upstream in the watershed and which prevent water infiltration into the soil and increase the superficial outflow of drainage basins or the already built infrastructure that cannot be intervened, forced the design team to divert flows to other channels, overburdening these systems, such as the diversion from channels D5 and D6 to channels D3 and D4.

Given the characteristics of the Dili urban area, with very flat areas and lack of regular maintenance, it was considered prudent to adopt a general return period of 25 years for the overall drainage system.

7.1.1 Component 1: Drainage Channel Diversion

There are two proposed diversion channels in this project

7.1.1.1 Mascarenhas Diversion Channel:

A new 2.1 Km long drainage infrastructure located in the hillside above Suco Mascarenhas (see Figure 2, Figure 3 and Figure 4). It is designed with a carrying capacity of 100-year storm to divert the 0,45 km2 catchment flow of the mountain above Caicoli, into the Kuluhun River, whose regularization design was performed already taking into account this flow diversion.

Figure 2 Mascarenhas Hillside Interceptor Channel - Longitudinal Profile and Plan over Aerial Photograph - Section 1 – 0+000.00 Km (Source: AdP-TL, 2014)

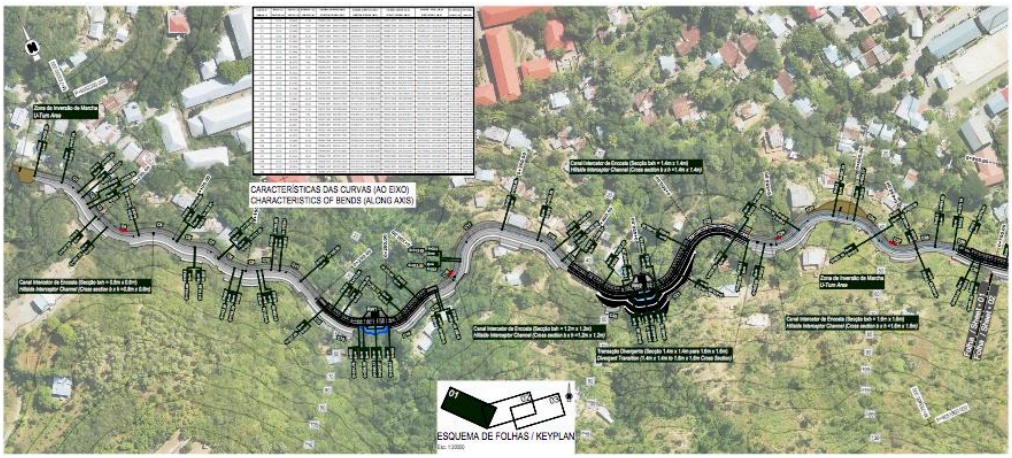
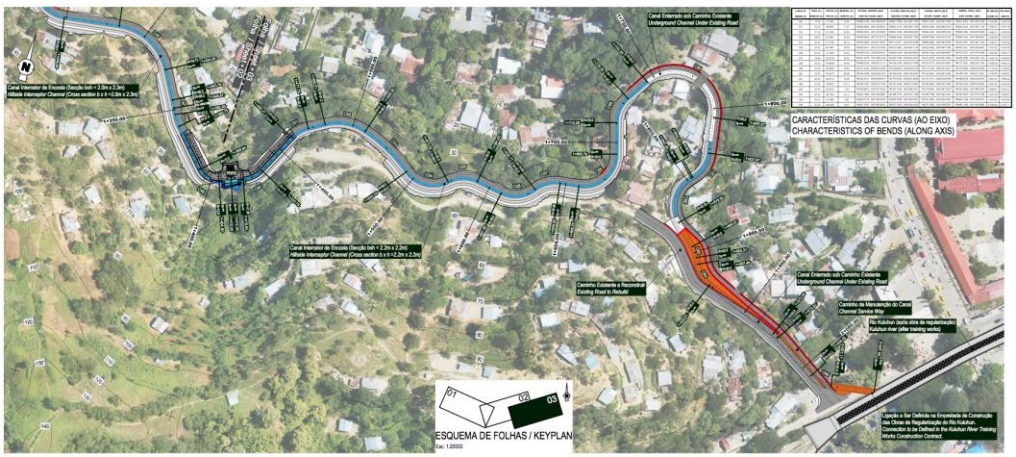


Figure 3 Mascarenhas Hillside Interceptor Channel Longitudinal Profile and Plan over Aerial Photograph - Section 2 (Source: AdP-TL, 2014)

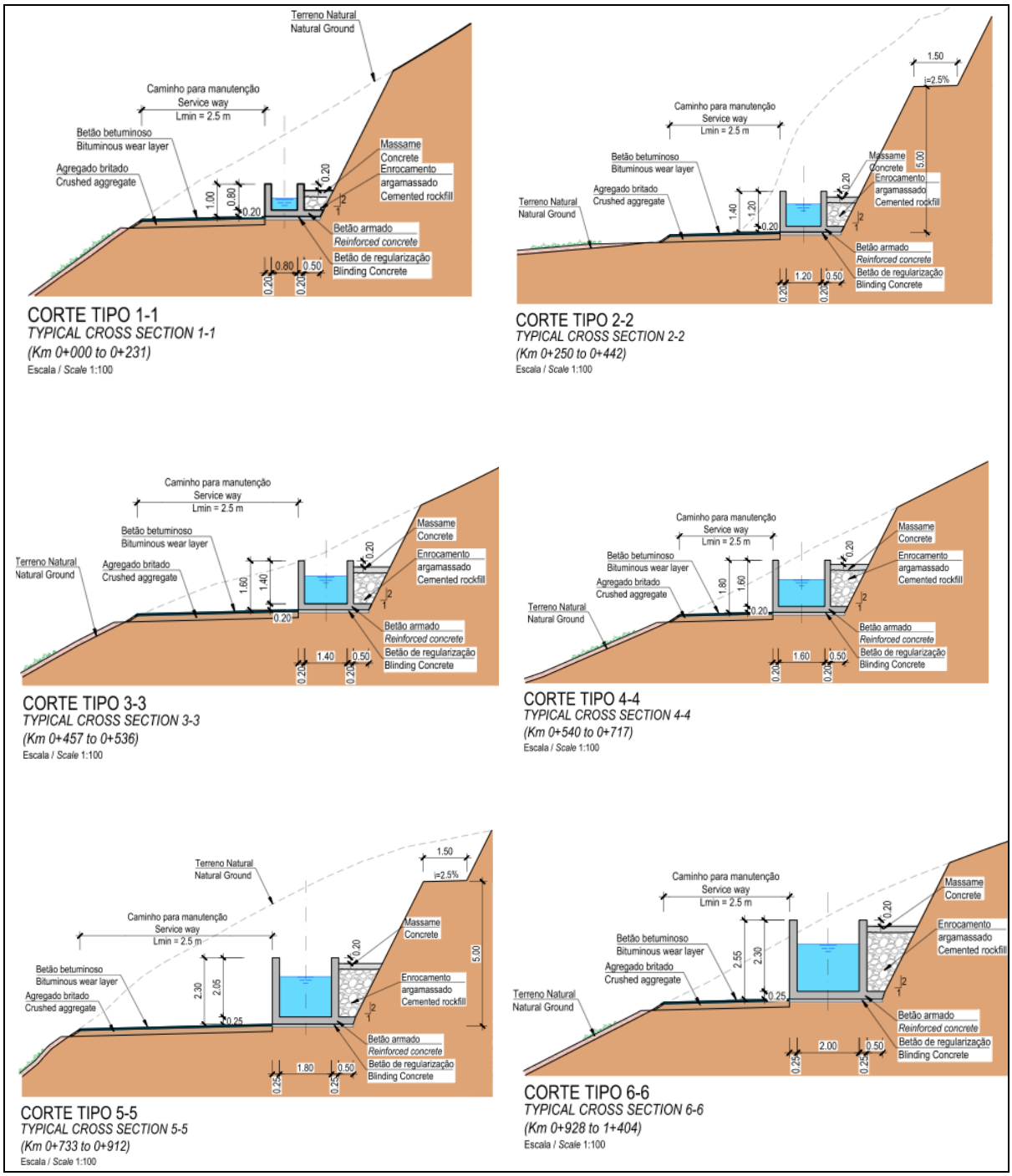
Figure 4 Mascarenhas Hillside Interceptor Channel Longitudinal Profile and Plan over Aerial Photograph - Section 3 (Source: AdP-TL, 2014)

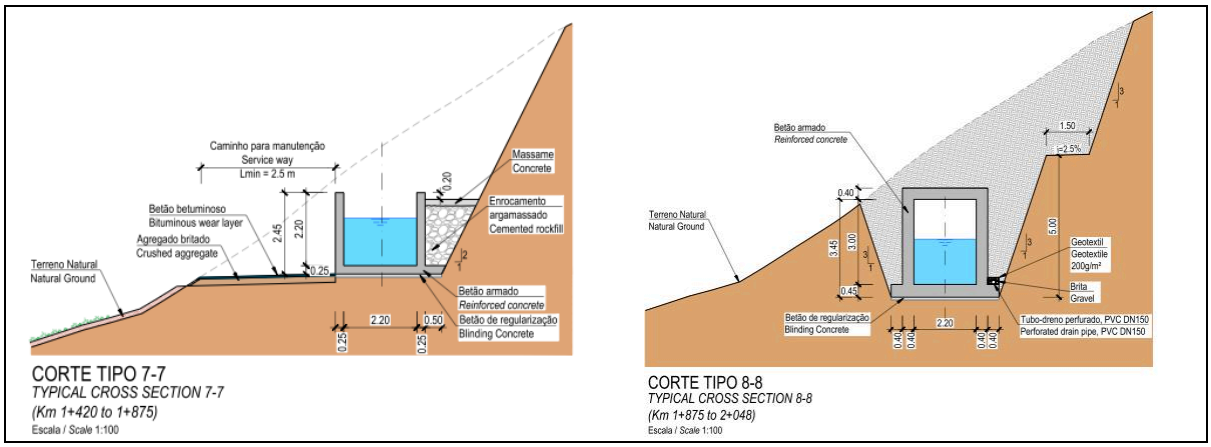


The typical cross section of the proposed drainage system can be seen in Figure 5 and to retain part of the flow's sediments, small sediment retention weirs are to be built in the largest five water stream tributaries that flow into the channel.

It will reduce 50% of the storm runoff that is currently discharging to the central part of Dili and thus, reduce frequent flooding in this area.

Figure 5 Mascarenhas Hillside Interceptor Channel - Typical Cross sections (AdP-TL, 2015)





7.1.1.2 Vila Verde Diversion Channel:

A new 975m long drainage infrastructure located in the hillside above Suco Vila Verde (see Figure 6, Figure 7 and Figure 8), one of the new drainage works foreseen for Phase III of the DDIUP. It is designed with a carrying capacity of 100-year storm to divert the 0,134 km2 catchment flow of the mountain above Vila Verde and convey it into the Maloa river bed, whose training works, DDIUP - Phase 2, have already been designed taking into account this diversion. The typical cross section of the proposed drainage system can be seen in Figure 8 and to retain part of the flow‘s sediments, small sediment retention weirs are to be built in the largest three water stream tributaries that flow into the channel.

It will reduce the storm runoff that is currently discharging to the central part of Dili and thus, reduce frequent flooding in this area.

Figure 6 Vila Verde Hillside Interceptor Channel - Longitudinal Profile and Plan over Aerial Photograph - Section 1 (Source: Adp-TL 2018)

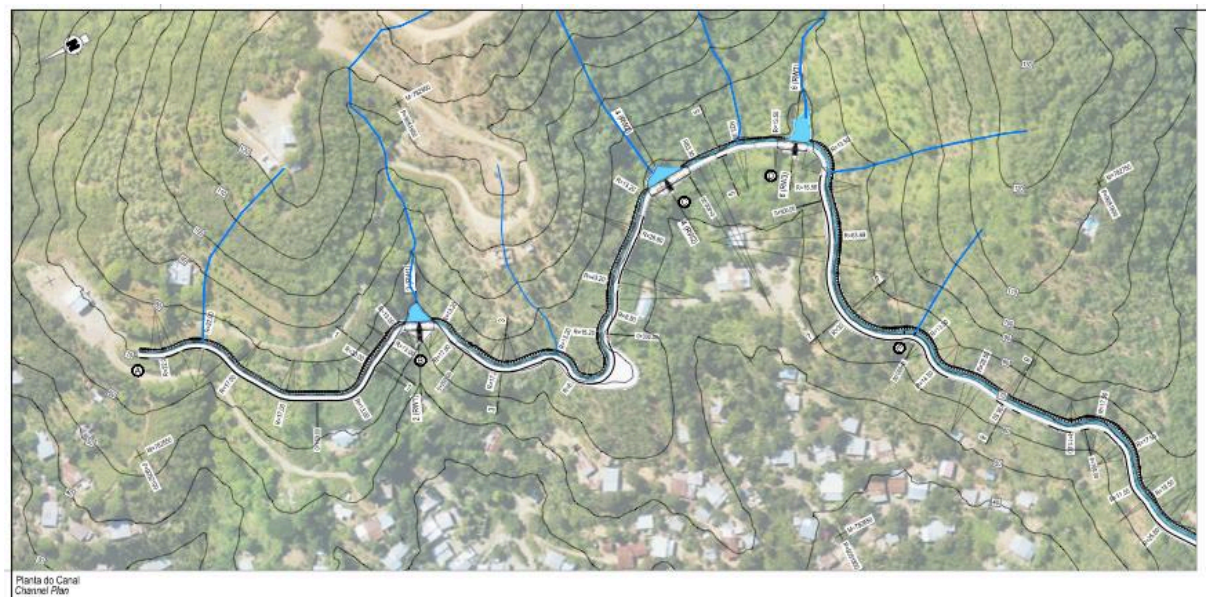
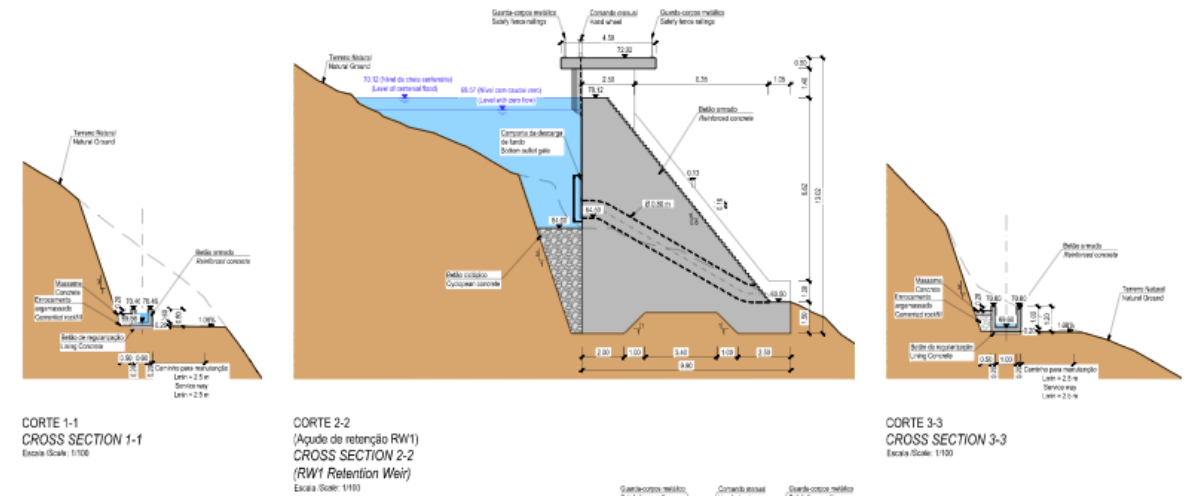


Figure 7 Vila Verde Hillside Interceptor Channel - Longitudinal Profile and Plan over Aerial Photograph - Section 2 (Source: AdP-TL 2018)

Figure 8 Vila Verde Hillside Interceptor Channel - Typical Cross sections (Source: AdP-TL, 2018)



7.1.2 Component 2: River improvements

River improvement consists of approximately 12,5 km of a total three rivers (Maloa, Kuluhun and Santana Rivers) that flow through the urban area of Dili (see Figure 1).

Within the scope of the Dili Sanitation & Drainage Masterplan, the current conditions of these rivers are found to be one of main causes of the periodical flooding of the Dili downtown urban area. Therefore, it was considered urgent to draft the design, at a detailed level, of the training works necessary to make the identified river beds capable of conveying 100-year return period floods without overtopping their banks (see Table 5).

Table 5 Rivers planned for Improvement (Source: AdP-TL 2018)

River System	Length (m)	Design ARI, Year

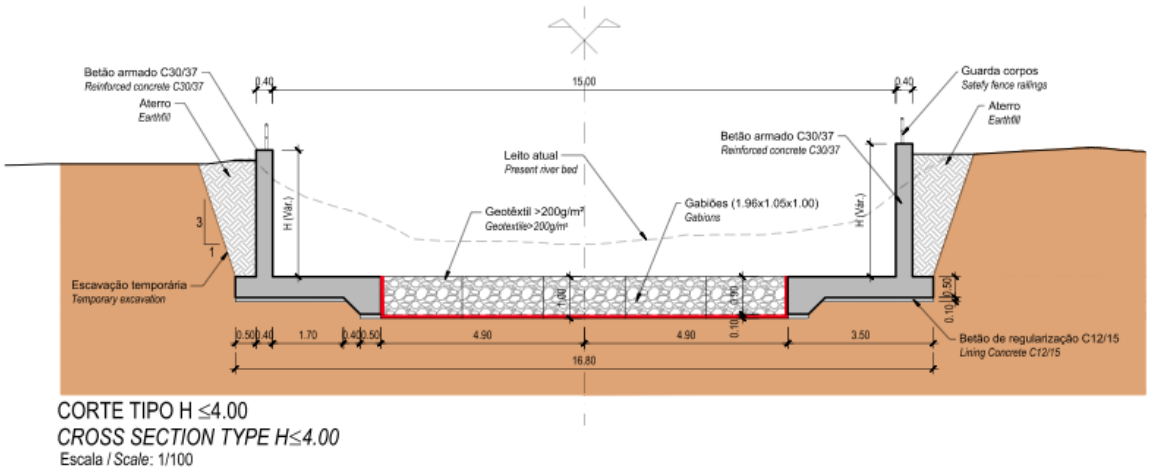
Kuluhun	3000	100
Maloa River	2450	100
Santana River		
Santana River	1062	100
Becora/Benamauk Tributary	4135	100
Bemori Tributary	1595	100

The river design improvements will consist of:

- Widening and deepening of the river bed by means of bottom excavation;
- Adjustment of river alignment, smoothing all the bends and bottom re-lining;
- Construction of new and higher concrete side retaining walls along the river banks (bank stabilization);
- Replacement of the existing bridges or bridge/weir;
- Levee construction;
- Fencing the river with the wall.

The civil works for this component will include bank protection, where Berlin wall retention type structures will be applied in some sections in order to prevent the structural collapse of the surrounding area (see Figure 10 and Figure 9). These improvements will increase the rivers' drainage capacity and storm water runoff in the urban area can be diverted into these systems.

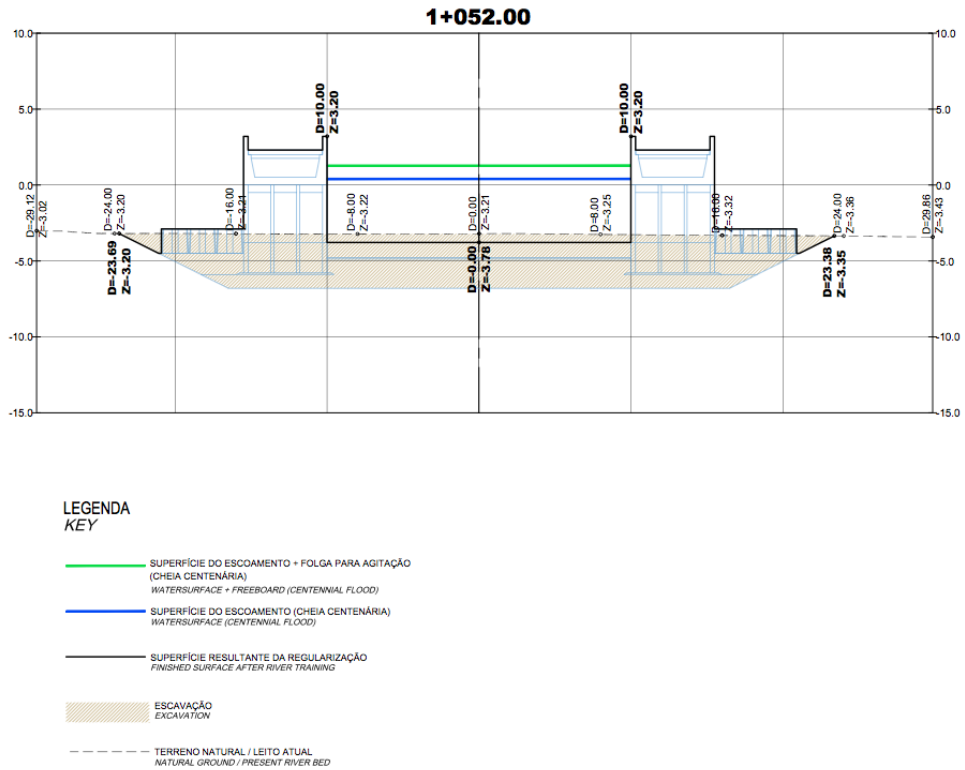
Figure 9 River Becora/Benamauk - Cross-section - Side walls between km 1+220 and km 1+340



CORTE TIPO H ≤4.00
CROSS SECTION TYPE H≤4.00
Escala / *Scale*: 1/100

In some river systems more profound design approaches will be required to guarantee storm water flow and flood alleviation. For example, at the Santana river mouth, due to the delta shaped silting, the river outlet is, actually, higher than the sea level, causing overtopping of the river banks right within the city downtown area during high floods. To solve this, the river mouth will be excavated right into the sea and accompanying side seawalls, resistant to sea waves, will be built which will contain the river flow laterally, keeping its velocity high and, thus, avoiding sediment settling and river silting.

Figure 10 Example of Cross-section of Future Construction Work in Rivers - Example: Santana River at 1+052.00 (Source: AdP-TL, 2015)



7.1.3 Component 3: Flood Retention Basins

A Retention Basin is a depression for temporary storing of storm water in order to reduce the rate of runoff from a drainage area.

The initial purposes for the construction of these basins, according to the DSDMP– Phase 1, were to: a) provide temporary storage for storm water runoff, delaying the outflow; b) reduce the outlet flow rate for storms of higher average recurrence interval; and c) introduce social urban areas such as playing fields and park use during the dry season.

Two flood retention basins are proposed for construction to help reduce long-term flooding issues in Dili (Figure 11 and Figure 12). The flooding retention basins are designed to take the excess flow from the adjacent urban drainage system, including road drainages and help control the runoff pressure downstream.

Table 6 Proposed Retention Basins (RB) in the DDIUP - Phase II

Retention Basin	Area, Ha	Design ARI, Year
RB-1 (Caicoli)	2.2	25
RB-3 (Aimutin)	4	50

The introduction of the use of the area in the dry season maximizes the benefits from the structure, where the extra space and green area components can enhance aesthetics and urban function of the location and the city of Dili as a whole.

Figure 11 Retention Basin Caicoli (RB-1) (Source: AdP-TL)

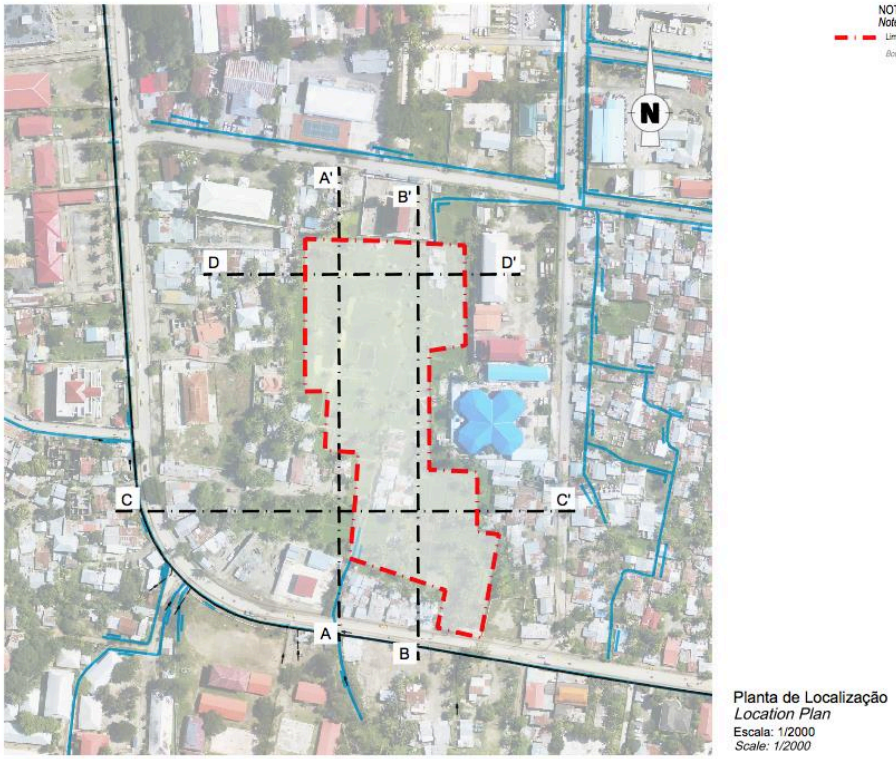
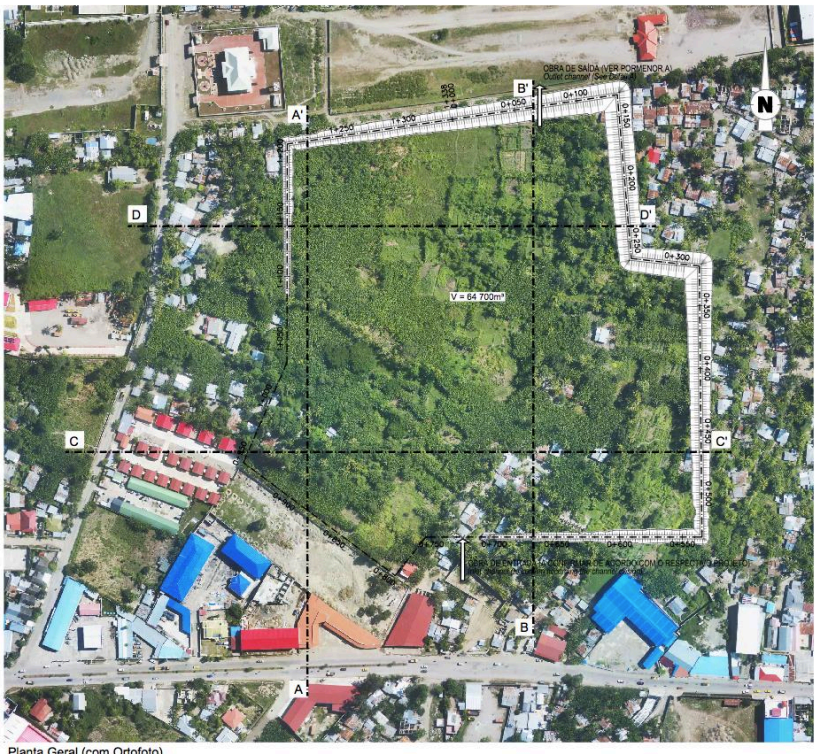


Figure 12 Retention Basin Aimutin (RB-3) (Source: AdP-TL)



7.1.4 Component 4: Construction of New and Rehabilitation of Existing Drainage Channels

This drainage channel system can be divided into major and minor drains (main, secondary and tertiary types) based on the size of the channel and whether they define the structure of drainage network or not. A minor drain is usually i.e. a roadside drain or channel from a residential or government facilities while a main drain can be i.e. an underground channel in the centre of a city avenue. This means the main drainage networks are composed of rectangular or trapezoidal open channels, some collectors and some buried channels. Most of these networks discharged directly into the ocean, thus are under the influence of the tide.

As mentioned before, the existing drainage faces several problems, particularly in the denser urban agglomerates in the city that have the highest concentration of social, commercial and government development and more space limitations, giving it the highest flooding risk.

In general, drainage channel capacity is limited by:

a) Existing channel under design/dimensioning;
b) Insufficient capacity due to blockages and sedimentation (be it a bottom layer of sediments/solid waste) due to the absence of regular or no maintenance;
c) Change in the original section shape/size due to obstructions to flow caused by bridges, road crossings or temporary housing below the top of the channel section, usually occurring when the open channel switches to underground channel, which corresponds to a reduction of about 35% of the cross section area;
d) The confluence of tributary channels causes flow disturbance in the main flow channel, by increasing the flow rate without changing the section or the channel.

The purpose of rehabilitation of the existing channels and/or construction of new channels is to improve the carrying capacity of the existing drainage system that will enhance flooding mitigation in adjacent areas. Works to be performed consist of cleaning, excavation of sediment, re-shaping, and re-sloping of channels.

7.2 Description of the project environment

7.2.1 The Physical Aspects

Geographically, the project study area is located in the Dili Urban Area at the northwest coast of Timor-Leste, facing the Ombai Strait. It encompasses the Administrative Posts of Dom Aleixo, Vera Cruz, Nain Feto and Cristo Rei.

The *topography* of the Dili Urban Area catchment system is mainly mountainous with steep slopes at the upper side of the catchment, gently sloping areas in the mid-section and narrow stretch of limited flatland next to the coastline, as the longest distance from the coast to the foot of mountains does not go beyond four kilometres. It is shaped as a half cauldron open to the sea in the North and surrounded by mountains to the East, South and West, except for a small gap in the Southwest which is filled by the Comoro Catchment, penetrating South into the Aileu, Ermera and Liquiça Municipalities.

The urban area is approximately 10 km long and 2.5 km wide, grading from the coast to a level of about 40 m above sea level on the south side of urban development. The elevation of some parts of the urbanized areas, such as some parts of Caicoli area, are lower than sea level, which makes it difficult for an effective drainage system to the sea whilst the catchment areas outside the urban area are very steep, rising to around 1,100 m above sea level about 9 kilometres inland. This mix of high and low increases the Dili catchment system's susceptibility to higher rate of runoff and sediment load due to lack of vegetation cover at the upper mountain, particularly at the higher slope.

Additionally, Dili is located in the *geological* highly sheared and deformed Permian Aileu Formation, a metamorphic formation that occurs widely in the northern part of central Timor, consisting of a series of shales, phyllites, slates and occasional low-grade metamorphosed eruptive rocks (Thompson, 2011). This formation has been repeatedly exposed to deformation especially in the north coast, which, coupled with the steep terrain and the occurrence of intense rainfall, makes it susceptible to landslides, erosion and sedimentation and thus one of the most active geologic processes in Timor-Leste.

This situation may be exacerbated because Dili has a tropical *climate* with two seasons, one wet season with intense and sporadic rain events lasting from November to April and a dry season in the remaining months of the year, from May to October. This weather variation of heavier rainfall in short bursts of time is the main factor that is considered in the design of water-related infrastructure and facilities, to reduce disaster risks and maintenance and rehabilitation costs and ensure the public with climate-prone public infrastructure.

Four major *surface water* courses traverse the Dili Urban Area. These rivers are the Comoro [the largest], Maloa, Kuluhn and Santana rivers, the latter with an inflow from two tributaries: the Becora/Benamauk and Bemori rivers. Together with the urban drainage channels, these rivers help transport almost 90% of the storm runoff and the city wastewater and discharge both into the adjacent coastline ((G-RDTL, 2012). This, combined with steep slopes in the upper catchment, short duration intense rainfalls and currently inadequate drainage infrastructure, as well as roads becoming temporary drainage conveyors due to overflow from the rivers, flooding occurs in several parts of the urban area of Dili.

Underneath this drainage system lies the Dili *Groundwater* Aquifer, an alluvial aquifer located under the City of Dili, comprised of merged delta sediments of the Comoro River and the lesser Maloa and Becora/Benamauk Rivers. The thickness of the aquifer varies from a few metres at sea level in the south to over 100 metres in the north, possibly up to 200 metres in Comoro and provides for a significant percentage of the drinking water for the city. The sandy soil types in the Dili catchment area provide for a high infiltration capacity and so groundwater recharge close to the mountainside is high, where Furness (2011) estimated that 60% of the water flows in the upper region of Comoro River seep into an underground river system or Dili Aquifer, which eventually contributes to ground water recharge in Caicoli. This also allows for contamination of the groundwater, due to the infiltration of wastewater into the ground and thus extremely pertinent to the improvement of the sanitation network parallel to the drainage work.

To the north, receiving the city's runoff, the *marine water* environment is composed of a coastal seabed profile that is steep and very narrow throughout its littoral zone and drops off sharply

3,000 metres into the deep marine trench, approximately 20 km from shore, influenced by the Indonesian trough flow current (Advisian, 2017). The majority of the marine area adjacent to the project area, from the Coast north of the Dili Airport and moving Eastwards towards and along Dili bay has a predominantly shallow characteristic, with several sections of reef becoming exposed during low tide, interrupted by a deeper area from Motael to the Government Palace, that serves the Dili Port. The constant discharge of storm and wastewater with solid waste into this general area, in the past few years, has begun to show qualitative signs of deterioration, demonstrating the urgency of initializing the design and implementation of the Dili Sanitation master plan (G-RDTL, 2012), to protect the Government's investment in the Drainage sector and avoid further deterioration of this coastline.

Overall, *Air Quality* is affected mainly by human activity, by the circulation of vehicles, construction areas, mining areas (quarries) and firewood burning in housing. Although there is a gradual increase of people and vehicles in Dili area, the Air Quality Study of Dili Drainage Project - Final Report carried out in 2015 under the first TOR (Worley Parsons, 2015), states that the air in the city of Dili is still in good condition and there are no situations in which concentrations of pollutants reach the limits stated for 24-hour average by the WHO, and in most of the year, and particularly in the rainy season, the air quality in the AOI is considered fairly good for human.

The study selected the concentration of Particulate Matter with a diameter ≤ 10 micron (PM10) as the most overall indicative and likely common air quality parameter to be affected by the proposed drainage improvements but indicated that activities around Dili could increase PM10 levels above the standards in areas of the city influenced by particulate sources, especially during windy conditions, such as roads and adjacent areas (soil/dust re-suspension due to vehicle mobility), solid waste burning (still practiced in the city), fuel wood usage in cooking activities or land disturbance in areas where construction and/or demolitions take place i.e. the construction phase of the proposed drainage works.

Given its urban characteristic and density, the *Ecology* of lowland Dili city area has little vegetative coverage, distributed mainly in parks, roadside shading, urban landscapes and household gardens. The trees in Dili are typical of the Northern coast, with the lowland slopes having, amongst others, tropical chestnut, candlenut, several fruit trees (banana, mango, coconut and/or papaya) and broad-leaf trees like *Alstonia scholaris*, *Albizia julibrissin* and/or *Ficus microcarpa*, whilst the higher and rocky slopes accommodate mostly palm, acacia and/or eucalyptus trees, the latter used for firewood as cooking fuel ((MPIE, 2016)). Despite this wide selection of tree species, their dispersion, quantity and the city's urban setting and exposure to human activities make it unsuitable for terrestrial wildlife habitat. In addition, the current project intervention area does not lie within, border or is even close to any declared protected areas or any areas of particular ecological significance. This includes the only two (2) ecological and currently protected areas (according to Decree-Law no. 05/2016 – Protected Areas Network in Timor-Leste) in the Dili area, the Cristo Rei and Hinterland Protected Area and Tasitolu Protected Area, both designated as Important Bird Areas (IBAs).

Above the project's Northern boundary, the *marine ecology* is composed mostly of fringing reefs that form an almost continuous strip along the coast adjacent to the project, where the most biodiverse areas are located in the Tasi tolu marine area (to the West) or the Areia

Branca and Cristo-Rei beaches (to the East of the project area). These areas have historically been important for small-scale fishing activities that are evident in the sea bordering Dili, which serve as an additional source of food for the communities, as well as for recreational purposes. Despite the Government, in 2016, removing the proposed Behau Marine Area from its protected list, approximately 3Km inwards to the sea lies a most important migratory corridor for several species of marine macrofauna such as whales, dolphins, turtles, dugongs, manta rays and whale sharks that represent a potential tourism and economic potential to the country. Both areas may be indirectly impacted by the deterioration of the water quality due to wastewater and solid waste discharges in the wet season.

7.2.2 The Socioeconomic Aspects

As the capital city of Timor-Leste, Dili accommodates 23.4% of a population of 277,279, according to the National Census carried out in 2015 with an annual *population* growth rate at 4.1%, far above the national average growth rate (2.1%). The urban population is expected to share 30% of the national population in 2020 (G-RDTL, 2015).

Land use in the catchment is mainly urban and rural land. Urban land consists of offices, shops, housing or residential areas, schools, bridges and roads, while agricultural developments and secondary forests resources are located mostly in the non-urban lands in the upper catchment.

However, *land cover* in the project area is dominated by urban land use. Therefore, it is important to control the influx of urban growth in Dili using appropriate land zoning and limit the rate of increasing imperviousness to minimize potential negative impacts.

To date there have been limited measures undertaken to counter such rapid growth of the urban population in the city, with the consequent impacts of uncontrolled construction and urbanization, traffic congestion and higher risks of natural disasters (i.e.: landslides or flooding) and worsened sanitary conditions (i.e.: underdeveloped sewerage and solid waste management facilities). As we have mentioned before, these issues have impacted the environment surrounding in and around Dili. The drainage system itself is frequently found to be obstructed with recent constructions, provoking localised flooding and, accumulated with other illegal structures, create larger-scale flooding situations elsewhere in the system, in houses, businesses and thus obstructing economic activities in general.

The increasing *working population* (age 15-64), high rate of economically inactive population (especially students) and a diminishing rate of unemployment suggests Dili is evermore becoming a hub for the country's population to seek a better educational and economic future. With the Government and Services sector absorbing 65% of the current labour distribution, the sense is that the overall population in Dili will continue to increase substantially in the next 15 years (G-RDTL, 2016).

The concern then turns to *living conditions*. Although the most urbanised city, the majority of Dili residents can only afford firewood as cooking fuel or do not have access to appropriate water, sanitation and solid waste disposal infrastructure and services. Many households source their water from private boreholes connected to a higher groundwater table susceptible of contamination due to its closeness to underground, frequently neglected permeable septic

tanks, or equally problematic “Pour-flush to permeable pit” to dispose human waste, thereby heightening implications to public health.

This increases the pressure on overall pollution and *public health*, proliferation of water-borne and vector-diffused diseases and deforestation within and around the city. As an example, current estimates of daily unaccounted [non-collected] waste lies at 14%, which means that there are 15 Tons of daily waste that most likely find its way into the drainage system during the rainy season (G-RDTL, 2016).

These densely populated areas are spread across Dili, particularly the central region. Rehabilitation and construction works, throughout the project area, may affect public properties and assets such as housing, husbandry, agriculture, facilities etc. Minor social impacts can include temporary disturbance to daily living and business activities associated with construction, traffic and noise. Major issues would include degradation of public and private assets, acquisition of land owned or used by individuals and communities, displacement of people and activities that introduce significant changes in patterns of use of natural resources which correlates to their economic, social, cultural and religious conditions. General acceptance is usually stronger in infrastructure development projects such as disaster reduction (i.e.: drainage) or water sector projects, aimed to enhance the delivery of social services, as long as the appropriate mitigation measures are set and agreed upon.

The AOI preliminary analysis identified several *culture and heritage* related elements (e.g. historic places or buildings), which are also recognized in the Dili Urban Master Plan (DUMP) (G-RDTL, 2016). Although the DUMP states historic urban districts are not identified in the city, it mentions architectural heritage sites from the Portuguese colonial period and the Indonesian invasion. More recently, a list of Resistance-related historic locations in the city has been announced by the National Centre CHEGA! *(in Portuguese “Centro Nacional CHEGA! (CNC)”*), which adds on to the List of Cultural *Tara Bandu* (Sacred) sites in Dili and Timor-Leste, produced by the General Directorate for Environment (*in Portuguese “Direção Geral do Ambiente (DGA)”*), reflecting the local beliefs represented in old trees, rocks and traditional houses.

The cultural aspect services Dili *Tourism* sector, enabling it as the central tourist zone in the country, where a range of services such as accommodations, restaurants, transportation, and telecommunications are easily accessible and where the Dili National Airport and the Dili Maritime Port reside, serving as gateways to other tourist attractions in other municipalities across Timor-Leste. Cristo Rei and Atauro Island remain as a significant focus of tourism landmarks in Dili Municipality.

7.3 Analysis of Alternatives

7.3.1 “Do-nothing or “Zero (0)” alternative” for the DDIUP

The alternative analysis of the project regarding a “Do-nothing scenario” was largely carried out during the Phase 1 of the project, the “Dili Sanitation and Drainage Master Plan (Phase 1)” (G-RDTL, 2012), justifiably because Dili is a rapidly growing tropical city where the provision and management of stormwater drainage has lagged behind the needs of the population, leading to unsatisfactory health and environmental conditions.

The DSDMP was based on the Timor-Leste Strategic Development Plan (SDP) (G-RDTL, 2011), which includes a vision for a healthy Timor-Leste and an upper middle class country where extreme poverty has been eradicated. It has a vision that by 2030 all citizens will have access to clean water and improved sanitation. For Dili, the SDP has targets of improved operation and maintenance of the drainage system, resulting in a cleaner city and reduced flooding and in parallel, the establishment of appropriate, well-operated and maintained sustainable infrastructure for the collection, treatment and disposal of sewage by 2020.

The DSDMP (G-RDTL, 2012) concluded that flooding is one of major problems associated with the rainy season in Díli and that localized flooding in Díli is mainly because of insufficient capacity of the current, existing system due to under design, sediment build up, blockage from debris and utilization of the drainage lines as kangkung (water spinach) beds, as well as flow obstruction from the design of bridges with decks lower than the channel bank, thus reducing conveyance.

According to the DSDMP - Phase1, the existing drainage network was dimensioned considering a return period of 5 years (AdP-TL, 2014) thus excess runoff during higher return period events inevitably leads to flooding situations in the city of Díli. The hydraulic calculation at the time indicated that the river system as a whole was able to hold the runoff caused by a 25-year return period storm before the banks overflow and the adjacent urban area is flooded but needed to be upgraded as higher flows such as those with a 50-100 year recurrence interval caused frequent flood occurrences in the city.

Most of the flooding problems in Dili occur in the low-lying areas, which are naturally flat and prone to flooding, exacerbated by a rapid urbanization caused by a 30% population increase since 2004, significantly increased these flooding problems. Increased urbanisation usually reduces the available open, permeable space, thus reducing the drainage capacity of an area. This phenomenon reduces the capacity of the entire drainage system. The DDIUP – Phase II has designed the urban drainage system for a return period of 25 years and the diversion channel and river regularization for a return period of 100 years, towards a drainage capacity that will alleviate greatly the flooding situation in the city, in the medium to long-term.

Therefore, a DDIUP "Do-nothing" option is not a feasible option, as the city of Dili and its citizens would continue to suffer flooding episodes during the rainy season, with the respective socio economic and environmental consequences.

The option to rehabilitate the drainage network falls in line with the vision in the SDP, for Dili Drainage in 2030. This Vision has guided the preparation of the DDIUP, together with the sanitation master plan, to achieve the following (non-extensive) list of objectives (G-RDTL, 2012):

- That all parts of the community benefit from improved drainage, including the poorest people, and be freed from flooding (high level of flood protection);
- Effective planning controls in place to prevent new flooding/drainage problems with ongoing development and address existing flooding/drainage problems as redevelopment occurs;
- Elimination of stagnant water in streets and channels (helps prevent malaria, dengue fever and diarrhoea) and general health improvement within the city urban area;

- Separated drainage and sewerage infrastructure allows for lower levels of infiltration and general public health is improved and (the wastewater system is assumed to be treating all wastes (wastes from toilets, wastes from washing and waste from industry) before discharge to the environment) and consequently, pollution of groundwater by sewage is dramatically reduced, health risks associated with growing kangkung in waste-contaminated water are eliminated and the water quality at beaches is safe for recreational purposes;

7.3.2 Specific Drainage Channel Alternatives

Dili has an urban space with specific limitations (narrow streets and private land) which forced the adoption of more expensive underground solutions in some areas in the city although, due to the existing flat terrain such as the Central Dili area, it is not feasible in some areas to convey the runoff from extreme rainfalls entirely via underground and secondary open channel storm drainage systems.

The drainage system has to be seen as a whole and each group of drainages, together, face severe constraints, such as the increasing impermeable areas that result from the growth of urban areas located further upstream in the watershed and which prevent water infiltration into the soil and increase the superficial outflow of drainage basins or the already built infrastructure that cannot be intervened. These conditions have forced the design team to divert flows to other existing channels such as the diversion from channels D5 and D6 to channels D3 and D4, although with a consequent overburdening of these systems. This situation is reflected in the choice of channel layout and in rehabilitation or new construction (see Table 7).

Therefore, to guarantee that the city drainage system downstream was able to maintain and/or increase its capacity (mostly focussing on controlled channel widening or new constructions to follow natural drainage lines) and avoid major socioeconomic impacts to the Díli community, *the DDIUP project decided to design and propose additional specifically located channels* to maintain the smaller scale of the required rehabilitation of the drainage network in low-lying areas but, at the same time, divert elsewhere and alleviate the entry of overwhelming volumes of storm water into these systems.

The Mascarenhas Interceptor Channel (to alleviate the highly populated Caicoli drainage system) and the Vila Verde Interceptor Channel (to alleviate the also highly populated Suco Vila Verde drainage system) [see 7.1.1] represent the effort of the DDIUP to design infrastructure intended to reduce the storm runoff that is currently discharging to the central part of Dili and improve the life expectancy of the invested infrastructure (existing and new) and reduce the scale and possible occurrence of direct flood related impacts and major temporary construction-related or permanent social-related issues and impacts on the population, within the highly dense urban area of Díli city. The training works of both systems (the Kuluhun River [receptor of the Mascarenhas channel storm water] and the Maloa River [receptor of the Mascarenhas channel storm water]) have already been designed taking into account these diversions.

Despite these channels Nevertheless, if potentially significant negative impacts are identified that have relevant scale and significance to present a review of alternative design, these will be proposed and put to the evaluation of the project Design team so that the relevant impacts can be reviewed and mitigated, where relevant.

Table 7 List of the Rehabilitated and the New Channels

Rehabilitated Channels (no alternatives)	New Channels	Alternatives Analysis
D1	D2.1, D2.2, D2.3	
D2	D3.1.1	
D3	D4, D4.1.1, D4.1.2	
D7	D10.1, D10.2	
D8	D11	
D9	D17, D17.1	
D10	D19	
D12	D20C	
D14	D28	
D15	D31	
D16	Mascarenhas Interceptor Channel	Reduce frequent floods in urban areas of Dili
I0, I1, I2, I3	Vilaverde Interceptor Channel	Reduce frequent floods in urban areas of Dili
Av Nicolau Lobato Channel	RB1 Caicoli	
D23		
D24		
D25		
D27		
D29		
D30		
D31		
D32		
D35		

7.4 Determining potential impacts of the proposed project

The potential environmental, social and economic impacts due to the project construction and development of the drainage network in Díli have been reviewed and a preliminary list is summarized inTable 8. This list has served as the basis to direct the TOR in strengthening the analysis of those components that require EIA analysis the most but will be re-examined by the EIA team, during the EIS analysis and drafting.

The EIS will provide an overview and detailed description of the nature of the various impacts (on physical, biological and social components) that may occur during the implementation of each component of the Dili drainage project, namely:

- Impacts from the Drainage channel construction
- Impacts from the construction of retardation basins (Site clearance, earthworks, and construction)
- Impacts from River Training Works (demolish existing structure, foundation and excavation works, construction of walls, outfalls, etc)
- Impacts from the slope diversion channel (site clearance, slope protection, earth work, construction of open channel, protection wall, etc)

A small, non-extensive description of the identified Moderate and High, Direct and Indirect impacts related to Dili drainage construction and operation activities is presented below, in line withTable 8, and will be presented more extensively in the upcoming EIS:

- Air Quality related impacts, associated with earthworks, material handling and drainage construction may lead to temporary dust generation, which can be suppressed through good construction site management practice.
- Climate Change related Impacts, associated with the improvement, mitigation and adaptation of the drainage network to higher return period flood risk events, is expected to be positive. The upgrading of the network will eliminate the current negative social and water quality impacts that the flooding episodes cause in the city.
- Noise related impacts, associated with earthworks, material handling and drainage construction may lead to temporary noise exceeded in sensitive areas of the city, which may be suppressed following legal “silent” hours in effect.
- Water Quality related impacts, associated with earthworks, material handling and drainage operation, with appropriate mitigation and precautions measures in place during construction, should be minor. In the operational phase, the impacts from stormwater discharge are anticipated to be negligible. A positive impact is expected with the improvement of water quality and public health in general, due to the separation of the drainage system and the sanitation system (which should be develop in parallel with the DDIUP).
- Social and economic impacts during pre-construction and Construction (land acquisition, income loss, loss of livelihood, loss opportunity, etc.). These are considered High impacts and should be mitigated through compensation schemes and mitigation measures advised by the EIS and drafted and implemented by the DDIUP Interministerial Working Group for Resettlement.

Reversely, there will be positive social and economic impacts during the Development phase (free of flooding, social and economic growth, etc), as the reduction of flooding will improve access to new business, reduced loss of material and economic goods and improvement of living conditions of the population.

Given the nature and objective of this particular infrastructure project and the expected long-term Life cycle of drainage channels, the Decommissioning Phase impacts are usually viewed as similar to the construction impacts although not likely to occur given the rarity in decommissioning of these infrastructures. Therefore, the EIA and the EMP will include guideline information on the management of the possible (but unlikely) impacts in this Project Phase (see Table 8).

Table 8 Potential Environmental and Social Impacts

Phase	Type Components	Potential impacts	Nature	Incidence	Time Scale	Probability	Reversibility	Significance
Construction	Socioeconomic	Allocation of built-up/housing areas Expropriations resulting in the relocation of the population	Negative	Direct	Long-Term	Certain	Irreversible	High
	Socioeconomic	Lost or reduction of sources of livelihood (kangkung farming, operation of kiosks, small shops, restaurants, etc.)	Negative	Direct	Long-Term	Certain	Irreversible	High
	Noise /Air Quality /Socioeconomic	Traffic congestion within construction areas and sites	Negative	Direct	Medium-term	Certain	Reversible	Moderate
	Socioeconomic	Restrictions to local access and temporary blocking of roads during construction	Negative	Direct	Medium-term	Certain	Reversible	Moderate
	Soil and Land Use	Soil erosion and flooding	Negative	Direct	Short-term	Probable	Reversible	Low
	Water Resources and Water Quality	Impact on the quality of the water resources	Negative	Direct	Short-term	Probable	Reversible	Low
	Waste Management	Increased need for water Production of domestic waste water	Negative	Direct	Medium-term	Certain	Reversible	Low
	Noise	Increase in noise levels	Negative	Direct	Medium-term	Certain	Reversible	Low
	Air Quality	Deterioration in air quality	Negative	Direct	Medium-term	Probable	Reversible	Moderate
	Waste Management	Waste production	Negative	Direct	Medium-term	Certain	Reversible	Low
	Biodiversity	Allocation of areas of ecological interest	Negative	Direct	Short-term	Probable	Reversible	Low
	Socioeconomic	Health and safety in work areas	Negative	Indirect	Medium-term	Probable	Reversible	Low
	Air Quality /Socioeconomic	Visual intrusion	Negative	Direct	Medium-term	Certain	Reversible	Low
	Culture and Heritage	Impacts on elements of heritage	Negative	Direct	Short-term	Probable	Reversible	Low
	Socioeconomic	Job creation related to construction	Positive	Indirect	Medium-term	Certain	Reversible	Moderate
Development	Socioeconomic/ Climate Change Mitigation and Adaptation	Improvement of runoff conditions and reduction of flood risks	Positive	Direct	Long-Term	Certain	Reversible	High
	Socioeconomic	Job creation Increase in economic activity	Positive	Indirect	Long-Term	Probable	Reversible	Moderate
	Socioeconomic	Improve of health and safety due to flood risk reduction	Positive	Indirect	Long-Term	Probable	Reversible	High
	Socioeconomic	Increased on revenue generation from new establishments, investors, etc.	Positive	Indirect	Long-Term	Probable	Reversible	Moderate
	Soil and Land Use	Land use suitability	Positive	Indirect	Long-Term	Probable	Reversible	Moderate
	Air Quality /Socioeconomic	Improvement in the visual environment	Positive	Indirect	Long-Term	Probable	Reversible	Moderate

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7.4.1 General Assessment Methodology

7.4.1.1 Overall Component Assessment

The assessment of the impacts of a project is not the result of the comparison between the current environmental and social situation and its predictable evolution with project, but the result of the comparison between the foreseeable future environmental and social situations with the project and in its absence.

The foreseeable future environmental and social situation in the absence of the project is often designated as "Zero Alternative" (no action alternative).

In order to identify and assess all impacts, the characteristics of each environmental and social factor will be examined, followed by the identification of impact hotspots.

The assessment and prediction of impacts will be undertaken based on a description of their effects and a qualitative characterisation based, essentially, on the parameters presented in**Table 9**.

Table 9 Impact assessment parameters

Evaluative Nature/Sense	Positive		Negative
Incidence	Direct		Indirect
Time Scale	Temporary (short term)	Periodic (medium term)	Permanent (long term)
Probability or Degree of Certainty	Certain	Probable	Improbable/unlikely
Spatial Dimension	Local	Regional	National
Reversibility	Reversible		Irreversible
Magnitude/Intensity	High	Medium	Small
Significance	High (Very significant)	Medium (Significant)	Small (Negligible)

Each parameter is described as follows:

1. The **nature** of an impact depends on the effects of the action on the environmental quality (positive - has a beneficial impact; negative - devalues or harms).
2. The **incidence** of an impact is direct when it is generated by the actions of the project itself and indirect when it is generated by the influence of the project.
3. Regarding the **Time Scale** of an impact, this aims at defining if it merely arises over a given period of time (temporary or short term), if it is occasionally evident over construction phase or lifespan of the project (periodic or medium term), or if it is evident over the entire lifespan of the project (permanent or long term).

4. The **probability** or degree of certainty of the occurrence of the impacts is established from the knowledge of the characteristics of each action and each environmental factor.
5. The **spatial dimension** reports the extent of impact, namely the geographic area, population or other affected stakeholders.
6. The **reversibility** of an impact is related to the consequences it produces over time. In other words, this is determined according to the respective effects enduring over time or ending when the cause thereof ceases. Environmental impacts are reversible when the current state of the environmental descriptor (or its normal development) can be recovered, or irreversible, when the current state of the environmental descriptor (or its normal development) cannot be recovered.
7. The **magnitude** of an impact is determined according to the degree of aggressiveness of each action and the sensitivity of the environmental factors affected. An impact is deemed, by way of example, to be of high magnitude, where it results in the disruption of an environmental factor that profoundly alters its current state.
8. The **significance** of the impact consists of the social or ecological importance that this impact represents, which is a more subjective variable since it depends on the sensitivity of the assessor. Certain impacts, in some environmental factors, may be considered to be of no or irrelevant significance, which are defined as impacts where the analysis does not merit any relevance. The assessment of the significance is influenced by the other descriptors of the impact.

To minimize the environmental impacts identified, alternative solutions will be proposed in the project (in environmental, architectural, economic and social terms) as long as technically and economically feasible. The impacts will be assessed taking into account foreseeable development without the realisation of the project (zero alternative).

7.4.1.2 Socioeconomic Component

Given the specificity of the social impacts, this chapter presents the methodology that will guide the analysis of the socioeconomic component.

7.4.1.2.1 Study Area Covered by Worley Parsons (WP)

In the light of the complementary work that will be carried out in this area, a review and update of the impact assessment, impact management measures, and policies and guidelines for resettlement presented in WP Report will be done.

Additionally, other aspects will be analysed, namely:

- The articulation of the project with the guidelines and objectives of the Dili Urban Master Plan;
- The potential temporary or permanent conflicts and interferences with accesses and pedestrian and vehicle circulation resulting directly or indirectly from the project implementation;
- The potential conflicts of the project with other existing infrastructures (roads, water supply, sanitation, and telecommunications, among others).

7.4.1.2.2 Complementary Study Area

Depending on the work carried out in this area, the impact analysis will be articulated with the one conducted for the area covered in 7.4.1.2.1, in particular considering the aspects and issues present below.

Impact identification and evaluation:

- Positive effects of the project on local communities (improved drainage, flood control, and losses reduction, improved sanitation) and opportunities created, in particular employment, revitalization of urban spaces and economic activities;
- Articulation of the project with the guidelines and objectives of the Dili Urban Master Plan;
- Temporary or permanent conflicts and interferences with accesses and pedestrian and vehicle circulation resulting directly or indirectly from the project implementation;
- Conflicts between the project and other existing infrastructures (roads, water supply, sanitation, and telecommunications, among others);
- Risks to property, housing, and health and safety of affected communities during the construction and operation phases;
- Identification of the social changes potentially generated by the project's implementation, and assessment of the resulting impacts on individuals, families, and communities, particularly on vulnerable people. The assessment will be focused on the interference with housing spaces and livelihoods, and its repercussion on the family structure and strategies. Particular attention will be given to resettlement needs and associated issues, including the disruption of local social relations and livelihoods, the need to restore them elsewhere and the ability to cope with change;
- Differentiation of the level of acceptance of local communities and affected families towards the project.

Impact management

Based on the identified impacts, an impact management strategy will be presented, integrating the following aspects:

- Definition of measures and recommendations to enhance the project's positive impacts and mitigate the negative ones;
- Definition of mechanisms for stakeholder engagement and redress complaints management;
- Policies and guidelines for the resettlement and livelihood restoration plan;
- Monitoring plan.

7.5 Analysis and evaluation

7.5.1 Collection of Baseline Data

Baseline environmental and social conditions are essential to predict the project impacts and risks. Baseline primary data will be collected for selected components whilst an extensive secondary data collection and literature review will be conducted to prepare the context and framework applicable to the study area (mainly in the AOI) and to understand the policies, guidelines, and legal and regulatory requirements focusing on the area of intervention and relevant for the project impact assessment.

Table 10 Primary and Secondary Data Collection for Baseline

Components	Primary Data	Secondary Data
Geology and Geomorphology		x
Water Resources and Water Quality	x	x
Air Quality	x	x
Noise	x	x
Soil and Land Use	x	x
Biodiversity		x
Waste Management		x
Planning		x
Socioeconomic component	x	x
Heritage and Culture	x	x

Among others, the following elements will be analysed:

- Dili Drainage Infrastructure Upgrading Project (Phase I);
- Dili Drainage Infrastructure Upgrading Project – Phase II - DEDs;
- Traffic Impact Assessment of Dili Drainage Project - Final Report (Worley Parson, 2015);
- Social Impact Assessment of Dili Drainage Project – Final Report (Worley Parson, 2015);
- Air Quality Study of Dili Drainage Project - Final Report (Worley Parson, 2015);
- Scoping Document and Draft of the previous DDIUP TOR (2015) delivered to the DNCPIA;
- Bibliography regarding the context of the country and the City of Dili;
- Timor-Leste Strategic Development Plan (2011-2030);
- Sustainable Development Goals (SDGs);
- Applicable legislation;
- Statistic data;

- Dili Urban Master Plan;
- Government owned cadastre information and GIS data, relevant to the study.

In the development of this assessment, the best international practice regarding socioeconomic assessment will be considered, such as social safeguard policies, guidelines and standards from the World Bank, International Finance Corporation (IFC) and Asian Development Bank (ADB).

7.5.1.1 Geology and geomorphology (Secondary Data)

Objectives of the baseline characterisation:

1. Geological characteristics of the AOI;
2. Geomorphological characteristics of the AOI;
3. Identification and characterisation of mineral resources in the study area.

Types of information to be collected, including geographic boundaries and time limits:

1. Geological map of the region;
2. Information concerning the existence of mining concessions;
3. Geological, Geotechnical and Earthworks Study of the AOI;
4. Search for bibliographic elements pertaining to the local and regional geology.

Sources of information:

1. Geological Research and Development Centre of Indonesia;
2. Geology and Mineral Resources of East Timor.
3. Methods of collecting information:
4. Bibliographical consultation;
5. Cartographic analysis;
6. Field inspection.

Methods of handling the information:

1. Description in text and tables;
2. Production of cartographic elements;
3. Mapping scales of the results obtained;
4. Scale 1: 25,000 and 1: 10,000 (geology map).

7.5.1.2 Water resources and water quality (Primary Data)

Objectives of the baseline characterisation:

1. General description of the hydrographical, hydrological and hydrogeological characteristics of the area of intervention;
2. Availability of water resources;
3. Identification of uses and sources of pollution in the Dili region (AOI);
4. Classification of the current state of the quality of the surface, coastal and groundwater.

Types of information to be collected, including geographic boundaries and time limits:

1. Basic cartography of the existing rivers and water treatment;
2. Characterisation of hydrogeological units;
3. Meteorological Data;
4. Data relating to the availability of usable water resources;
5. Cartography of the main uses and existing sources of pollution;
6. Data on the quality of the surface, coastal and groundwater.

Sources of information:

1. Hydrological data (Dili Sanitation and Drainage Masterplan – Phase II);
2. Military Map 1:25.000;
3. National Directorate for Water Resources Management *(in Portuguese Direção Nacional de Gestão e Recursos de Água (DNGRA)*);
4. Ambient Water quality data from available sources;
5. Dili Weather Station.

To characterize water quality, it will be necessary to undertake field work analysis. Coastal surface water samples will be collected in separate sites in Dili Bay (main water recipient of the runoff waters). The water samples will be sent to the National Directorate of Water Services (*in Portuguese Direção Nacional dos Serviços de Água* (*DNSA*)) laboratory for physicochemical analysis. The baseline will be completed with other historical data and field work.

Methods of collecting information:

1. Bibliographical research;
2. Field inspection and field survey analysis (only for coastal waters);
3. Consultation of entities.

Methods of handling the information:

1. Description in text and tables;
2. Presentation of calculations;
3. Production of cartographic elements;
4. Mapping scales of the results obtained;
5. Scale 1: 25,000 and 1: 10,000 (water resources map).

7.5.1.3 Air Quality (Primary Data)

For this primary data component, DNCPIA agreed with the proponent to use the Remote Sensing Tools by Satellite Spectrophotometry Detection. Remote sensing tools are used when the study area does not have enough air pollutant measuring equipment to allow for the characterization of the air quality seasonal variability or the information available about the emissions sources is not enough to apply an air quality model directly to the evaluated air quality.

Based on the data collected and the satellite data, the proponent develops a model to predict the baseline environmental air quality in the study area (sensitive receptors). This model will be developed using AEROMOD. AEROMOD is a local scale model used for all kinds of sources and simple or complex topography situations.

Once generated, the model will be calibrated using available results from previous in situ air quality measurements.

After proper calibration an air quality baseline maps and contour data (in GIS) will be produced for one hour, one day and annual concentration.

Objectives of the baseline characterisation:

- Identification and characterisation of the main sources of air quality pollution produced in the AOI;
- Identification and characterisation of the sensitive receptors found in in the AOI;
- Characterisation of the quality of the air in the region.

Types of information to be collected, including geographic boundaries and time limits:

- Local air quality characterization using data collected by Remote Sensing Tools by Satellite Spectrophotometry Detection in reports and studies undertaken for project study area (Draft 2014 DDIUP EIA / Air Quality Study of Dili Drainage Infrastructure Upgrading Project - Final Report (Worley Parson, 2015)). The measured parameter was Particulate Matter (PM) – PM10 (parameter used in the EHS Guidelines and other International Standards).
- Sources of pollution that may affect the quality of the air;
- Meteorological data which affect the quality of the air;
- Position and characteristics of receptors sensitive to air pollution.

Sources of information:

- Draft 2015 DDIUP TOR / Air Quality Study of Dili Drainage Infrastructure Upgrading Project - Final Report (Worley Parson, 2015);
- Dili Weather Station;
- Aerial photograph.

Methods of collecting information:

- Bibliographical research;
- Fieldwork;
- Remote Sensing Tools by Satellite Spectrophotometry Detection;
- Consultation of entities.

Methods of handling the information:

- Description in text and tables;
- Production of cartographic elements, using AEROMOD model to predict the baseline environmental air quality in the study area (sensitive receptors). Mapping scales of the

results obtained. Scale 1: 25,000 and 1: 10,000 (sensitive receivers and air quality monitoring stations).

7.5.1.4 Noise (Primary Data)

Objectives of the baseline characterisation:

- Characterisation of the environmental noise in the AOI, including the noise resulting from the traffic impact resulting from the construction phase;
- Identification and characterisation of the main sources of noise produced in the AOI.

Types of information to be collected, including geographic boundaries and time limits:

- Identification and characterisation of the zones/noise-sensitive receptors found in the AOI (i.e.: urban household areas);
- Sound levels of the "environmental noise" during the daytime and at night time, detected in the areas/sensitive receivers surrounding the AOI and located along the access roads;
- Sound levels of the “specific noise" (daytime and evening periods) from the main sources of noise existing within the AOI (traffic, industrial activities, etc.);
- Meteorological data which affect the noise.

Sources of information:

- Fieldwork (measurement of sound levels);
- Traffic Impact Assessment of Dili Drainage Infrastructure Upgrading Project - Final Report (Worley Parson, 2015);
- Aerial photograph.

Methods of collecting information:

- Bibliographical research;
- Cartography of the project and of the surrounding areas;
- Fieldwork.

Methods of handling the information:

- Treatment of the relevant data relating to existing and expected sources of noise;
- Processing of data in respect of noise measurements carried out.
- Mapping scales of the results obtained. Scale 1: 10,000 (drawing with the location of noise measurement points).

7.5.1.5 Soil and Land Use (Primary Data)

Objectives of the baseline characterisation:

- Description and characterisation of the types of soil present;
- Soil use capacity;
- Identification of the several types of use of the soils in the AOI.

Types of information to be collected, including geographic boundaries and time limits:

- Map of the soils from the region.

Sources of information:

- Map of the soils of Timor-Leste;
- Aerial photography;
- Bibliography on the region.

Methods of collecting information:

- Bibliographical research;
- Fieldwork. Conduct a reconnaissance of the most important sites (land use). This fieldwork will be carried out cumulatively with the fieldwork for the socioeconomic survey;
- Preparation of thematic cartography (The final map of land use will be prepared through the analysis of aerial images that will be reviewed and complemented with the fieldwork).

Methods of handling the information:

- Description in text and tables;
- Production of cartographic elements;
- Mapping scales of the results obtained. Scale 1: 25,000 or 1: 10,000 (maps of the soils and land uses).

7.5.1.6 Biodiversity (Secondary Data)

Objectives of the baseline characterisation:

- Characterisation of the flora and fauna of the AOI considering the ecological characteristics of the species that are classified with the status of threatened;
- Identification of sensitive areas (of ecological value);
- Types of information to be collected, including geographic boundaries and time limits;
- Ecological environment of the study area;
- Desktop review of the flora and fauna species and habitats in the AOI;
- Key areas from a nature conservation perspective.

Sources of information:

Considering the study area and the project type it will be conduct a review of available reports and studies undertaken for project area to collect information on existing sensitive fauna and flora areas, if relevant to the Project Area. No field survey will be needed, if Tasi Tolu Area is not within or adjacent to the project scope.

The main sources will be:

- 2016 Tibar Port Project Document, Scoping Document and Draft EIA, delivered to the DNCPIA, complete with the baseline data annexes and Public Consultation reports

(request pertinent to the "Ecology" Component, particularly regarding the Tasitolu area);
- Birdlife International;
- Aerial photography;
- International Union for Conservation of Nature (IUCN);
- Bibliographic elements.

Methods of collecting information:

- Bibliographical research;
- Field inspection;
- Consultation of entities.

Methods of handling the information:

- Cartography of the ecological environment;
- Cartography of habitats;
- Lists of species and their protection status and their relationship with the mapped units;
- Mapping scales of the results obtained;
- Scale 1: 25,000 and 1: 10,000 (map of habitats).

7.5.1.7 Waste Management (Secondary Data)

Objectives of the baseline characterisation:

- Identification and quantification of waste generated by the construction and operation of the project;
- Characterisation of waste management in the region.

Types of information to be collected, including geographic boundaries and time limits:

- Data on the type and quantity of waste generated by the construction and operation of the project;
- Data concerning the waste management systems.

Sources of information:

- Solid Waste Management Investment Strategy for Dili (ADB, 2015);
- Sanitary Operation Division;
- Dili Urban Master Plan;
- Contact with waste – related relevant Government and other entities.

Methods of collecting information:

- Bibliographical and internet research;
- Contact with entities and communities.

Methods of handling the information:

- Description in text and tables;

- Presentation of calculations;
- Mapping scales of the results obtained. Only figures in the text.

7.5.1.8 Planning (Secondary Data)

Objectives of the baseline characterisation:

- Analyse the current status of the study area in terms of planning and if there is likely impact with other unknown planned activities or uses designated for the area it will be necessary to identify and interpret territorial management instruments (Masterplans and other studies on territorial management).

Types of information to be collected, including geographic boundaries and time limits:

- Conduct a review of available reports and studies (territorial management instruments) undertaken for project study area to collect information of planning proposals.

Sources of information:

- Dili Urban Master Plan;
- Bibliography regarding the context of the country and the City of Dili;
- Timor-Leste Strategic Development Plan (2011-2030);
- Contact with planning related Government and other entities.

Methods of collecting information:

- Bibliographical and internet research;
- Contact with entities.

Methods of handling the information:

- Description in text and tables;
- Mapping scales of the results obtained. Scale 1: 10,000.

7.5.1.9 Socioeconomic component (Primary Data)

7.5.1.9.1 Study Area Covered by the previous TOR

The previous surveys carried out previously by Worley Parsons in the potentially affected areas will be complemented considering a methodology that will take into consideration the representativeness of certain drainage channel, in regards to typology, their environmental and social environment and the magnitude of the estimated impact.

This methodology is applicable to the Complementary Study Area in 7.5.1.9.2 and will be based on the following steps and aspects:

a) Pre-analysis of impacted Households and Infrastructure within the ADI of all channels, based of high-resolution aerial photography overlay with the drainage channel DEDs;

b) Review of the evolution of the baseline situation regarding land use and buildings/ constructions occurred between 2014/2015 and the present, along the drainage channels selected according to c);
   i) Current situation along the channels that were not surveyed entirely along their extension (for channels D.2, D.4, D.10 and D.12);
   ii) Current situation along the newly constructed channels which were subject to previously limited analysis by WP (D.20-A and, above all, the inter-channel slope channel);
   iii) Evolution of the baseline situation between 2014/2015 and the present in the areas affected by the regularization of the Kuluhun and Maloa rivers;
   iv) Evolution of the baseline situation between 2014/2015 and the present in the areas affected by the Caicoli and Hudi Laran retention basins.
   v) The following aspects not included in the Worley Parsons Report will also be analysed:
      - Articulation between the project and the objectives and guidelines defined in the Dili Urban Master Plan;
      - Direct and indirect interference of the project with other existing or planned projects;
      - Access, mobility and pedestrian and vehicle circulation.

c) Identification and selection of channels that may be representative of a specific group of "similar" channels, taking into account estimation of predicted impact magnitude and significance based on:
   - Total Number of Households/Commercial edifications/others within the ADI (per Km of channel or other more appropriate);
   - Environmental and Socioeconomic characteristics, as well as relevant specific sectoral "hotspots" located in the channel ADIs and AIIs (i.e: schools, health services, cultural monuments, etc;
   - Typology of Channel Design and typical Construction activities *vs* predicted generalised impacts;

   Based on channel representativeness selection mentioned above, perform Field Survey (interviews) by sampling, per selected channel, for further HH/Commercial characterisation and potential impact refinement, as well as consolidation of potential impacts representative to remaining group-related channels.

The stakeholders relevant for the analysis of the project's impacts will be mapped, and the procedures and means to ensure a comprehensive and adequate consultation and engagement with them will be defined

A profile of the potentially affected families and communities will be developed based on the analysis of characterization aspects, namely:

- Sociological aspects (demography, health, education);

- Habitat and quality of the urban environment (housing, complementary constructions, public places, sanitation, water supply and electricity);
- Ownership and type of land tenure, housing, kiosks and other infrastructures;
- Family structure and family responsibilities;
- Social relations networks;
- Traditional and local authorities;
- Livelihoods (leases, agricultural production, trade), resources, formal and informal work, unemployment and income generation within the affected areas;
- Assessment of the different needs, interests, values, and aspirations of the various subgroups of affected communities, including women and vulnerable individuals or groups;
- Identification of resources and needs, vulnerabilities, and resilience of families and communities;
- Evolution of the degree of knowledge and acceptance of affected families and communities towards the project, as well as receptivity to possible resettlement;
- Main trends regarding the different factors identified.

7.5.1.9.2 Complementary Study Area

As mentioned in the previous sub-chapter, the baseline methodology will be the same for this complementary study area and surveys will be carried out in potentially affected representative channels areas considering the following aspects:

- Survey of the current situation along identified representative channels within the following group of channels: D.6, D.14, D.15, D.16, D.17, D.20-B, D.28, D.29, D.30, D. 31, D.32, D.33, D.34, D.35, Av.Nicolau Lobato and Beto'o;
- Survey of the current situation in the areas affected by the regularizations of the Bemori, Becora and Santana rivers, as well as the Mascarenhas and Vila Verde interceptor channels.

Sources of information:

1. Bibliography;
2. Statistic data;
3. Field surveys and baseline characterization of the intervention area undertaken by Worley Parson;
4. Aero photographic survey of current land uses and constructions;
5. Land reconnaissance and direct observation;
6. Complementary field surveys, including interviews with Suco Chiefs, Village Chiefs and members from the affected communities.

Methods of handling the information:

1. Description in text and tables

2. Production of cartographic elements
3. Mapping scales of the results obtained.
4. Scale 1: 10,000 to 1: 2,000.

7.5.1.10 Heritage and Culture (Primary Data)

Objectives of the baseline characterisation:

- Characterisation of the cultural heritage in the AOI;
- Identification of historic buildings and sites (which may include, gardens, villages greens, canals and ridges), historic areas, historic landscapes, etc.;
- Classify the sites in accordance with the significance framework.

Sources of information:

- Conduct a comprehensive review of literature on Dili cultural heritage to gather all relevant information regarding the sites known and identified at AOI;
- Aerial photography and Military Map 1:25.000;
- Dili Urban Master Plan.

Methods of collecting information:

- Bibliographical research;
- Field inspection (site reconnaissance of all sites identified to confirm their location and collect information to characterize them);
- Consultation of entities.

Methods of handling the information:

- Cartography of all historic buildings and sites;
- Mapping scales of the results obtained. Scale 1: 25,000 and 1: 10,000 (maps of heritage).

7.6 Environmental Management Plan

The EMP is defined in article 4 (4) of Decree-Law No. 5/2011, of 9 February, as "the document that identifies the potential environmental impacts from the construction, development and decommissioning phases and the manner in which these will be managed and monitored."

The impacts identified during the assessment will be evaluated in order to establish the most appropriate strategies of the EMP and Monitoring Plan and define the project specific environmental measures that are to be implemented and the procedures to be followed for the scope of constructions works for the DDIUP.

The EMP will follow the requirements of Ministerial Diploma no. 46/2017, regarding Annex VI – Minimum Requirements for the Environmental Management Plan and will focus on 3 main

objectives: Mitigation Plan, Monitoring Plan and institutional arrangements and reporting procedures, in order for the DDIUP to address related impacts.

The EIA team and the Proponent will agree on what to include in the plan to efficiently minimize the negative impacts and enhance the positive impacts to improve the project environmental and social performance during the different construction and operation phases of the project, based on the following:

1. Summarize the EIS identified significant adverse environmental and social impacts and risks that the measures are designed to avoid or mitigate;
2. Develope Mitigation measures for any risks classified as 'Moderate' or greater in the EIS document, so that these will be reduced to acceptable levels.
3. Associate project approvals, permits, conditions and standards against related assessed impacts. Make reference to laws and contract documents, approximate location, timeframe, and the responsibility for the EMP implementation and supervision.
4. Indicate the roles and responsibilities for the proposed environmental management measures/actions and reporting requirements;
5. Develop the Monitoring Plan:
    a. Assess and monitor the impacts caused by the project during the construction and development phases;
    b. Reference an historical register of values and indicator parameters of the evolution of the environmental factors subject to monitoring;
    c. Contribute to the assessment of the effectiveness and possible correction of mitigating measures recommended;
    d. Activate warning systems and interventions in instances where the threshold values, prescribed by law and other statutes, are exceeded.

The objective of the EMP is to communicate the key environmental obligations that apply to all contractors, their sub-contractors and employees while carrying out any form of construction activity as part of the DDIUP. It is to become the main obligation reference for contractors to follow during the construction phase, and address the conditions precluded in the EMP that will be attached to the Bid and Contract Documents.

In this way, the objective of the EIS in trickling down to the implementation phase of the project cycle will be achieved, with contractors having to guarantee that the EMP conditions have been costed/included into their bid price, the Contractor has qualified and experienced staff on his/her team responsible for the environmental compliance requirements of the EMP and that they will comply with Republic of Timor-Leste national lawsin effect and applicable international guidelines.

7.7 Public Consultation

7.7.1 Background on previous DSDMP – Phase II consultations

As mentioned in 2.4, after the previous TOR and from 2015 to 2017, the DNSB and the Inter-Ministerial Working Group set up to deal with Resettlement have carried out several meetings and Public Consultations regarding to the implementation of Dili Sanitation and Drainage Master Plan, on the prepared DEDs in the most affected areas of the project, to identify the communities' feedback and preoccupations. These Public Consultations involved the Inter-Ministerial Group itself, Government Authorities, the Administrator of Municipal Authority of Dili, Village (in Tetum "Suco") leaders, Hamlet (in Tetum "Aldeia") leaders and the community leaders and representatives in the city of Dili, demonstrating that the proponent and his technical team are well aware and in contact with the main interested parties regarding this project. A list of these meetings is referred in Table 11and minutes of all Public Consultation can be consulted in Appendix H.

During this period of public consultation, the affected community raised several concerns regarding the implementation of the DDIUP.

One of the main concerns was land ownership of the area occupied by the community (i.e. they wanted to know, based on new law for land and property, if the land belongs to the community or to the State since the time they occupied it in 1978 up to the present date). Additionally, the affected communities also suggested the Government to arrange for other land to substitute their loss or, alternatively, present them with fair compensation and relocate those considered "vulnerable" in a decent and worthy manner.

Another major concern was loss of their livelihood (e.g. kankung growing in proposed RB-1 area). They also asked the Government to create alternative job vacancies for these people, making them a priority as available local unskilled manpower when time comes to select the construction team for the company that will construct the drainage infrastructure.

The communities declared that are ready to cooperate with the State and suggested to the Government technical team to disseminate the DDIUP information to the affected communities to allow for a future success of the project.

As an example of this collaboration, in the RB-1 Minutes, the Suco leader also suggested and further requested to the Government for a good collaboration with and clear information to communities in order to avoid disagreements during the project implementation and asked the communities not to build new houses in the empty areas still available and proposed for RB-1.

7.7.2 Request for Scoping Phase Public Consultation Waiver

The Public Consultations referred above have been carried out very recently and the various concerns raised by the communities are thorough and representative of the general concerns that would be raised by other communities throughout the Drainage Network within the Project Area. This means that these issues have been taken into consideration by the Interministerial

Working Group for Resettlement regarding concerns and compensation typology, as well as issues for design in the DEDs.

The proponent therefore *requested that the Environmental Authority EXEMPTS the proponent from carrying out the Public Consultation for the present TOR and focus on using the information collected since 2015 to consolidate the upcoming consultations during the next EIA stage and particularly focus on the Main Public Consultation of the Draft EIS and EMP documents. These EXEMPTIONS were approved by the Environmental Authority in the letter of 13th June 2018, as written: "DNCPIA approve the request regarding the Public Consultation waiver under the TOR phase".*

Table 11 Structure of the Public Consultation done by the DNSB and the Inter-Ministerial team

Date	Objective	Numbers of Participants
10 -09-2015	Internal meeting between the cooperative team and Vice Minister Januario to discuss about the sketch of DED DSDMP 2 for the additional project (slope channel, channel D20 Airport, channels D16-17 and the Culuhun river bridges)	6 people: • Mr. Gustavo (DNSA) • Eng. Mello Vieira • Mr. Filomeno (Urban Planning) • Mr. Joao Piedade (DNSB) • Mr. Saturnino (Cooperative Direction) • Vice Minister Januario
21-03-2016	The meeting took place at the meeting room of Municipal Administration in Matadouro, between the technical team from DNSB, Municipal Administrator of Dili and the Administrator of Nain Feto to discuss about the data of the people affected by the project that have been collected.	3 people: • Municipal Administrator of Dili • Nain Feto Administrator • DNSB representative
27-06-2016	Meeting to discuss about the families affected by the project of the Dili Drainage, in Caicoli hamlet 4 and 5.	6 people: • Dili Municipal Administrator • Director of the Land and Properties • Environmental Direction • Head of Caicoli Village (Chefe de Suco de Caicoli) • DNSB • National Direction for Building
14-07-2016	Meeting with the communities in Caicoli to present the construction of the retention basin (RB1).	11 people: • Dili Municipal Administrator • Joao Piedade (DNSB) • Department of the Municipal Representative of Land and Cadastre • AdP representative • Daniel Moniz (Cailocli community) • Head of Caicoli Village • Filomeno Freitas (Caicoli community) • Martina Mendonca (Caicoli community) • Fernando (DGSC-MOPTC)

Date	Objective	Numbers of Participants
		• DNEPCC technic • Saturnino Alves – DGSC-MOPTC technic
3-02-2017	Meeting with the communities in Suco Comoro to collect information from the affected communities regarding the project.	12 people: • President of ANATL • Administrator of Dom Aleixo • Head of Comoro Village • Beto Taci hamlet chief (in Portuguese: chefe aldeia de Beto Taci) • Naroman hamlet chief • Loro Matan hamlet chief • Anin Fuik hamlet chief • Director of Land and Properties • National Director of Land and Properties and the Cadastre • Technical team coordinator • Coodinator of the technical unity of the MOPTC general secretary • Jose Pereira- - Director
14-03-2017	Coordination meeting to discuss about the compensation of the communities affected by the project.	11 people: • Dili Municipal Administrator • President of ANATL • General Director of Water and Sanitation • Dom Aleixo Administrator • Head of Comoro Village • Beto Taci hamlet chief • The Commandant of PNTL • Director of Agriculture • Director of the Land and Properties • DNSB Director • Unity Service for Water, Sanitation and Environment
29-06-2017	Preparation meeting for the publication of data collection results for the people affected by the drainage construction project.	18 people: • General Secretary of MOPTC • National Director of Land and Properties and Cadastre • Director of DNE, MOPTC • Director of Land of Properties • National Director of Forests • National Director of Horticulture • National Director of Plants • Dom Aleixo Administrator • Nain feto Administrator • Vera Cruz Administrator • Head of Mascarenhas Village • Head of Bidau Santana Village • Head of Akadirahun Village • Head of Bemori Village • Head of Culuhun village • Head of Bidau Lecidere Village • Head of Bairo Pite Village • Technic from Inter-Ministerial team

7.7.3 Public Consultation for the EIS/EMP

The EIA team proposes the following plan to carry out the Public Consultation during the study phase for the elaboration of EIS and EMP:

- Baseline phase: Within the social component (see 7.5.1.9 and 7.4.1.2) the EIA team will prepare baseline questionnaires and carry out surveys in the channels identified as representative of all other similar channels/areas, to collect information about the predicted Environmental and Social Impacts to communities, for further support in the impact assessment;
- Compulsory EIS/EMP Public Consultation will be done in accordance with the legal requirements of DL 05/2011 and Chapter 5 of the Ministerial Diploma no.47/2017, to guarantee that public have access to the proposal of the EIS and EMP draft.

  The public consultation process will be carried out during the legal timeframe set in the legislation, in order to: a) gather baseline information (see previous bullet point); b) keep people informed and guarantee access to the project's proposed EIA/EMP documentation and objectives; and c) respond to issues/comments from interested parties, as they arise. It will have the following components:

i. *Collection of Comments:* Besides using the legally compulsory methods to collect comments, such as making the EIS/EMP copies available in the Environmental Authority Headquarters, the office of the Dili Municipality Administration and other representative locations, the EIA team will also make available an email for this purpose to receive written comments and suggestions from public, available throughout the Public Consultation timeframe (see Appendix H).

ii. Public Consultation meeting: the EIA team will organize a general meeting with the usual interested parties (broader community, Government Agencies and local representatives, NGOs, etc) to discuss the final draft of the EIS/EMP. This meeting will be announced on the radio or newspaper and within the respective timeframe, the EIA team will make available the EIS/EMP proposal as mentioned in i) above.

8 Flexibility

Since 2014 to date, the DDIUP – Phase II EIA process has undergone several steps to reach the current TOR proposal. This TOR reflects the considerable progress in the project scope, its components' dimensions, in the outreach to interested parties and predicted impacted stakeholders, and choice of design alternatives, all of which have been fed into the analysis for the drafting of the current DEDs proposed for impact assessment (see Appendix H).

The TOR contents and respective proposed analysis and assessment methodology have been adapted to the preliminary impact identification in this scoping phase and the project team is confident they are consistent with the environmental legal requirements in DL 05/2011, its subsequent regulations and international benchmarks and are technically sound to allow the Environmental Authority to approve the TOR and follow through to the next phase of the Impact Assessment Procedure, namely the environmental baseline analysis and impact assessment and management planning for the proposed project, with enough quality to be presented for final analysis and decision on the approval of the environmental license, by the Environmental Authority.

However, this TOR is flexible enough to adapt to the Environmental Authority's requests if changes occur between now and its final approval, as well as during the EIA analysis. These changes have been pre-conditions to this TOR for which the proponent has requested flexibility and decision on the part of the Environmental Authority (see 2.4) and of which the proponent is available to discuss if the Environmental Authority sees the need to further such discussion.

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Appendix A. A) Letter from DNCPIA to DNSB regarding Technical comments of the Terms of Reference (31st July 2015)

B) Comparison Table of comments between 2015 TOR and 2018 TOR (version 0)

Appendix B. Maps of DDIUP Phase II proposed Infrastructure (Sheets 1 to 8)

Appendix C. DDIUP Phase II – Drainage Networks Maps – Mascarenhas and Vila Verde Interceptor Channels

Appendix D.DDIUP Phase II – Drainage Network Maps – River Works

I. Maloa – River Training Works Design
II. Kuluhun – River Training Works Design
III. Becora/Benamauk – River Training Design
IV. Bemori – River Training Design
V. Santana – River Training Design

Appendix E. DDIUP Phase II – Drainage Networks Maps – Flood Retention Basins

Appendix F. DDIUP Phase II – Drainage Network Maps – Main, Medium and Minor Drainage Channel Network

Appendix G.DDIUP Phase II – Area of Influence - Examples

Appendix H.DDIUP Phase II – Public Consultation Minutes

i. Internal meeting for additional projects: Slope channel, D20 (airport), Channels D16-17 and Kuluhun River (Date: 10 September 2015)
ii. Dili Municipal Administration meeting room – Collect data for the communities affected by the project (Date: 18 March 2016)
iii. Rumbia Caicoli, Aldeia 04 and 05 – Families affected by the Drainage project (Date: 23 June 2016)
iv. Suco Caicoli, Aldeia 04 and 05 – Retention Basin 01 (Date: 14 July 2016)
v. Suco Comoro, Aldeia Anin Fuik, Loron Matan, Naroman and Beto Tasi – D20A and 20B Options (Date: 03 February 2017)
vi. Meeting between Governmental entities and head of Villages (chefes de Sucos) – Indemnity/compensation for the communities affected (Date: 14 March 2017)
vii. DNSAS hall – Preparation to publish data survey of thr communities affected by the project (Date: 29 June 2017)

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