January 2015

Simplified Environmental Impact Statement
TIM: National Road No.1. Upgrading Project
Road A-01 Dili – Manatuto

Contents

APPENDICES

Abbreviations and Acronyms

ADB	–	Asian Development Bank
CEMP	–	Contractors site-specific environmental management plan
DEIA	–	Department of Environmental Impact Assessment (in NDE)
DRBFC		Directorate of Roads, Bridges and Flood Control
EA	–	Executing agency
EARF	–	Environmental assessment and review framework
EHS	–	Environmental Health & Safety Guidelines (of World Bank Group)
EIS	–	Environmental impact statement
ELL	–	Environmental Licensing Law (Decree No. 5/11)
EMP	–	Environmental management plan
ESO	–	Environment and safety officer (Contractor)
EO		Environment officer (in PMU)
GRC	–	Grievance redress committee
GRM	–	Grievance redress mechanism
GOTL	–	Government of Democratic Republic of Timor-Leste
IA	–	Implementing agency
IES	–	International environmental specialist
IIC		Included in Contract
ISS	–	International social safeguard specialist
JICA		Japan International Cooperation Agency
MAFF	–	Ministry of Agriculture Fisheries and Forestry
MOF		Ministry of Finance
MPW	–	Ministry of Infrastructure
NDE	-	National Directorate of Environment
NES	–	National environmental specialist
NGO	–	Non – government organization
NRUP		National Road Upgrading Project
PISC	–	Project implementation and supervision consultant
PMU	–	Project Management Unit in MPW
REA	–	Rapid environmental assessment
ROW	–	Right-of-way
RP	–	Resettlement plan
RRP	–	Report and Recommendation of the President
JGESC	–	Safeguard Policy Statement
SEIS	–	Simplified environmental impact statement
TA	–	Technical assistance
TOR	–	Terms of reference
WB	–	World Bank

Executive Summary

i **Overview**. The Government of Timor-Leste (GOTL) has requested the Japan International Cooperation Agency (JICA) to provide financing to facilitate the upgrading of National Road No.1 (A01). The objective is to upgrade A01 as part of a comprehensive program to upgrade, rehabilitate and maintain priority road sections of the road network of Timor-Leste that provide links between major cities and towns; improvement that will be designed and implemented by Ministry of Public Works (MPW). This SEIS covers the first stage of the A01 from Dili to Manatuto Road (A01-01). The Manatuto to Baucau Road (A02-02) is also a priority for follow up study and will be a subject of another SEIS.

ii **Implementation Arrangements**. The executing agency for the upgrading and improvements of A01-01 is the Ministry of Finance (MOF) and the implementing agency will be MPW. Within MPW the key agency for implementation will be the Project Management Unit (PMU) established to manage and implement projects financed wholly or partially by GOTL's development partners. The PMU will be responsible for day to day management of the Projects, including implementation of requisite safeguards measures and requirements.

iii **The Project**. The Project will improve and rehabilitate the 56.4km long Dili - Manatuto Road (A01-01). The existing bitumen road will be improved, widened and resurfaced to bring it up to standard. Detailed design for the Project has been prepared while and the detailed designs for the other A01 road sections are in preparation. The Project will be completed by: (i) improvement, road widening and upgrading along the existing alignment following international best practices and quality standards; (ii) providing one wider traffic lane per direction, with sealed hard shoulders and / or sidewalks in villages and repairs to bridges; (iii) clearing and improvement of culverts; (iv) installing a higher capacity drainage system along the corridor; (v) fine tuning alignment by widening curves (vi) introducing new road marking and signage and other measures to improve road safety.

iv **Legal Framework**. The assessment and implementation of the Project will be governed by laws, regulations, and standards for environmental assessment and management of GOTL. The Basic Law of Environment (April 2012) covers all relevant aspects of environmental protection and the Decree Law 5/11 on environmental licensing covers environmental assessment requirements. In addition to GOTL's requirements the NRA01 must comply with JICA's Guidelines for Environmental and Social Considerations (JICA's so called "new Guidelines 2010 or JGESC). According to both Timorese law and the JGESC, the Project can be classified as Category B because the potential adverse environmental impacts are site-specific, few if any of them are irreversible, and mitigation measures can be designed readily.

v **Consultation and Information Disclosure**. Public consultations were undertaken during the preparation of this SEIS and social safeguards documents. The stakeholder consultation process disseminated information to all key stakeholders including the general public and the authorities through meetings and door to door surveys along the project corridor. Information was provided on the scale and scope of the Project works and the expected impacts and the proposed mitigation measures through meetings and surveys. The process also gathered information on relevant concerns of the local community so as to address these in the project implementation stages. Project documentation will be disclosed in a place and language accessible to stakeholders.

vi **Grievance Redresses Mechanism**. Through the Project's grievance redress mechanism (GRM) procedures will be established that can help resolve issues associated with the Project. The GRM will receive, evaluate and facilitate the resolution of affected people's concerns, complaints and grievances about the environmental and social performance of the Project. Resolution of these issues and concerns will be undertaken expeditiously and according to the procedures of the GRM. The complaints/issues registry maintained at the site project office

and by the contractor will be subject to monitoring. The GRM will aim to provide an accessible, time-bound and transparent mechanism for the affected persons to voice and resolve social and environmental concerns linked to the Project.

Table E1 – Summary of Key Environmental Impacts and Mitigation Measures

Project activities giving rise to impacts	Mitigation measures to control environmental Impact from:	Impact after mitigation	Method	Monitoring Responsibility
PRE –CONSTRUCTION				
Climate change adaptation	Risk of increased erosion and damage to road infrastructure	Positive	Include adaptation measures	PMU (design)
Surveying and demarcation of centre-line	Minor loss of vegetation during demarcation	Negative	Visual inspection	Contractor; PMU
Site clearance, digging, excavations	Discovery of cultural historical property	Positive	Stop work order	Contractor; PMU
	Removal of trees	Negative	After compensation	PMU
Mobilisation of contractor	Social disruption	Negative	Consultation	Contractor, PMU
	Health & safety management	Positive	Observation & consultation	Contractor, PMU
	Spread of communicable diseases	Negative	Pre-construction - check records	Contractor; PMU
CONSTRUCTION		Negative		
Operation of construction equipment	Emissions & dust from plant & materials	Negative	Visual inspection, complaints	Contractor; PMU
Works adjacent to water bodies or near coast	Erosion & physical changes to river bed & culverts and other areas.	Negative	Check design, visual observation consultation with users	Contractor; PMU
Sourcing of materials (river gravels, aggregates).	Extraction gravel, altering channel & erosion; quarries or borrow pits.	Negative	Visual inspection; review of extraction plan and rehabilitation	Contractor; PMU
Spoil disposal. discarded macadam pavement	Impacts to habitats & water courses	Negative	Visual inspection	
Clearing, cut & fill activities, embankments; Stockpile and staging areas lead to loss of land	Soil erosion & sediment contamination of rivers & turbidity.	Negative	Visual inspection	Contractor; PMU
Run-off, discharges, generation of liquid wastes	Impacts on water quality.	Negative	Visual inspection	Contractor; PMU
General activities - solid & liquid waste arising	Uncontrolled unmanaged waste disposal	Negative	Visual inspection	
Use of hazardous materials	Spillage, leakage, accidents	Negative	Inspection of storage & review emergency response plan.	Contractor; PMU
Accidental damage to existing services	Interference with existing infrastructure; water supply, power, telecommunications.	Negative	Plan with utility providers and avoid / reprovision.	Contractor; PCM
Activities outside road encroaches habitats.	Workers poach animals, eggs feathers gather fuel wood & impact habitats.	Negative	Inspections, camp & work sites check food supply, re-vegetation.	Contractor; PMU
Accidental impacts historical / cultural sites	Impacts on PCR or cultural property sites	Negative	Stop work & dealt appropriately	Contractor; PMU
Noisy construction plant and equipment	Impacts community & workers.	Negative	Consultation, review work schedule, GRM register.	Contractor; PMU
Vehicle parking and traffic safety issues	Traffic disruption & safety affected	Negative	Inspection, review traffic manag't	Contractor; PMU
General work activities	Worker health and safety risks	Positive	Inspection, review H&S Plan	Contractor; PMU
Presence of construction workers	Disruption, or antagonism, communicable diseases & community health	Negative	Inspection, review contractor staff managment As required;	Contractor; PMU
Site office, water use & electricity supplies.	Stress on existing resources and infrastructure	Negative	Consult with villages along road	Contractor; PMU;
OPERATION PHASE		Negative		
Operation of vehicles creating emissions	Emissions increase locally	Negative	Visual inspection &complaints;	MPW/DRBFC
Improved road surface	Resuspension of surface dust	Positive	Routine maintenance	MPW/DRBFC
Routine and ongoing maintenance	Blocked drains; gravel repair materials	Positive	Routine maintenance records;	MPW/DRBFC; ADB
Locations of culverts	Alteration of natural flood cycles	Positive	Monitor wet periods. Review floods	MPW/DRBFC; ADB
Climate change issues	Unexpected and costly failure of road & Depletion.	Positive	Visual; Review rainfall & flooding	PMU
Easy access to previously difficult to reach areas	Hunting and poaching increases	Negative	Monitoring & consultations	MPW/DRBFC; ADB

vii **Project benefits.** Project benefits will mainly result in the operational phase. Local job opportunities will occur during the construction phase and the staff employed will be able to learn new skills and obtain remuneration for the work completed. In the operational phase benefits will result from the upgrading of the road by reducing travel times and more comfortable travel. The project will also reduce travel costs by reducing wear and tear on vehicles and be advantageous due to time saving. Travelling from east to west to health care facilities in the Dili area will be easier for people living in more eastern areas and the transportation of goods and agricultural produce to market will be more efficient. The Project will also provide improved linkage to other essential air and ferry transportation hubs in Dili. The improvements will overall result in economic opportunities and advantages from the improved connectivity that would otherwise not develop.

viii **Environmental Management Plan.** Mitigation measures, environmental monitoring, and capacity development are required to minimize the environmental impacts in the design, construction and operational phases. The main issues relate to planning and design of the Project structures and roadside drainage, and control of construction impacts such as spoil and waste disposal, water quality impacts, health and safety concerns, tree felling, traffic interruption, re-provisioning of utilities and irrigation, noise and dust during construction.

ix To ensure these impacts are mitigated to the greatest extent feasible, the PMU shall update the environmental management plan (EMP) based on detailed design and integrate it into bid and contract documentation. Following induction provided by the PMU the contractor will prepare a contractors site-specific EMP (CEMPs) detailing how they propose to implement the works. The CEMP will include the Contractor's proposed actions to cover: (i) waste management and spoil disposal; (ii) tree removal and replanting (iii) utilities, irrigation and telecommunications re-provisioning; (iv) temporary drainage; (v) construction materials management; (vi) runoff control and excavation protection; (vii) noise and dust control; (viii) temporary traffic management; and (ix) worker and public safety.

x The operation of the Project road should have beneficial effects on the surrounding environment overall. The improvement of the Project road will allow faster more efficient travel and improved traffic flow through the improved vertical and horizontal alignment. The smoother asphalt pavement and improved road side gutters and drainage can be expected to reduce noise and the accumulation of road side dust and therefore air pollution from noise and disturbed dust should also be reduced.

xi **Conclusion and Recommendations.** No particular difficulties were encountered by the consultants in compiling the SEIS. The Project construction is restricted to areas within the road corridor and the land required for minor alignment improvements for curve widening. The impacts from construction and operation will be manageable and no insurmountable impacts are predicted, provided that the EMP is included in the contract documents and implemented thoroughly. MPW (assisted by PMU) shall ensure that the EMP is included in the contract documents, and the EMP provisions are implemented and monitored to their full extent. In the event that any design details change the locations or scope of the proposed Project works the environmental assessment and EMP shall be reviewed and revised accordingly. The findings of the SEIS are that the environmental impacts of the proposed rehabilitation of the Dili to Manatuto Road (A01-01) will be minor and manageable if the mitigation measures established in the EMP are implemented thoroughly. The SEIS also sets out the requirements for monitoring.

1. Introduction

1.1 The Project

1 The Government of Timor-Leste (GOTL) has requested the Japan International Cooperation Agency (JICA) to provide financing to facilitate the upgrading of National Road No.1 (A01). The objective is to upgrade A01 as part of a comprehensive program to upgrade, rehabilitate and maintain priority road sections of the road network of Timor-Leste that provide links between major cities and towns; improvement that will be designed and implemented by Ministry of Public Works (MPW). This SEIS covers the first stage of the A01 from Dili to Manatuto Road (A01-01). The Manatuto to Baucau Road (A02-02) is also a priority for follow up study and will be a subject of another SEIS.

2 The Timor-Leste Strategic Development Plan (SDP) outlines GOTL's vision for upgrading national roads. The program of the Fifth Constitutional Government includes a major program of road rehabilitation, repair and improvement. Japan International Cooperation Agency (JICA) Asian Development Bank (ADB) and World Bank (WB) are coordinating their support and work that is already under implementation. JICA's strategy aligns with the goals of the SDP and envisages continuing support for a medium-term approach to the rehabilitation, upgrading, and maintenance of the core road network with emphasis on investment projects that are of national importance and which provide an inclusive pattern of economic growth, particularly by improving the transport links needed by agriculture and the rural economy. JICA has made adjustments to its country strategy to expedite this support in line with GOTL's priorities.

3 The Project financed by JICA's loans to Timor-Leste includes feasibility study and detailed engineering design of the Dili to Manatuto road. Construction of this road is urgently needed to support road transport links to the major population centres in the east and north east; and south coast developments associated with the oil and gas industry (via Manatuto) as well as to provide access for development generally.

4 Project preparatory technical assistance (PPTA) conducted during 2011 and 2013 has assessed the technical and economic feasibility of upgrading the roads from Dili to Baucau. JICA proposes to support detailed design and safeguards due diligence under this first phase Project. This will underpin a rolling program of road upgrading by ensuring projects are prepared for construction in a timely manner. JICA may support subsequent construction projects with additional financing for civil works and construction supervision.

5 The Dili to Manatuto Road (A01-01, 56.4km approx.) is covered in this SEIS. The existing bitumen roads will be improved, widened and resurfaced to bring the selected roads up to standard. Detailed design for the core Project has been prepared.

Table 1.1 – Project Proponent Details

Address:	REPÚBLICA DEMOCRÁTICA DE TIMOR-LESTE, MINISTÉRIO DAS OBRAS PUBLICAS, Avenida da Patria, Mandarin, Dili, Timor Leste.
Telephone:	3310330
Name	Ms. Odete da Costa, Project Manager.
Email:	pmu_adb@yahoo.com

6 The executing agency for the upgrading and improvements of A01-01 is the Ministry of Finance (MOF) and the implementing agency will be MPW. Within MPW the key agency for implementation will be the Project Management Unit (PMU) established to manage and implement projects financed wholly or partially by GOTL's development partners. The implementing agency within MPW will be the Project Management Unit (PMU); established to manage and implement projects financed wholly or partially by GOTL's development partners.

The PMU will be responsible for day to day management of the Project, including implementation of requisite safeguards measures and requirements. The PMU secured the servicres of Nippon-Koei consultants to assist in the preparation of this SEIS. The consultant's team is presented in Appendix 6.

1.2 Methodology and Scope of SEIS

1.2.1 Methodology

7 The SEIS was conducted and guided by the GOTL's environmental assessment requirements and in compliance with JGESC 2010. It commenced with an environmental assessment in 2011 that has been subsequently updated based on the detailed designs provided by PMU. The Project has been categorised following GOTL's environmental assessment requirements and screened using JICA's GESC to determine the project's category and any associated critical environmental issues.

8 The SEIS is based on the detailed designs (2013) collation of environmental data gathered through reconnaissance survey, conduct of interviews and public consultations. The study involved the review of existing reports, project documents, and published reports including those published in the worldwide web.

9 The initial appreciation of the general environmental conditions, particularly land use, along the length of the project corridor was carried out through the review of the satellite imagery published by Google Earth in the worldwide web, information from the detailed design consultants and the use of available topographic maps. This SEIS covers the entire length of the sample road, spanning two administrative districts and three natural watersheds.

10 The principal impact area for this SEIS study area is an envelope of 100 meters wide on each side over its entire length. This 200 meter wide corridor can be divided into the direct and indirect impact areas. The direct impact areas includes the ROW and off-site areas to be used for the equipment repair (construction staging areas and equipment depot) and areas of gravel extraction and borrow sites that must be rehabilitated. However, off-site areas will only be determined in the pre-construction phase after contractors have completed their construction preparations. The direct impacts on site are loss of vegetation due to clearing, land acquisition and land severance and in off-site areas include removal of rock based materials from borrow or quarry sites, contamination and pollution from equipment, depot and waste disposal sites.

11 The indirect impact area is outside the ROW and takes into account impacts commonly associated with road works such as noise, dust and emissions. However, the project impact area maybe widened depending on local conditions such as near sensitive receptors such as schools, hospitals or places of worship where people congregate so that ample mitigation is formulated. For road sections that cross rivers or located near the coastline, the impact boundaries have included these sensitive areas depending on extent of the adverse impacts.

1.2.2 Objective of the SEIS Report

12 The objectives of this SEIS are to:

- Identify and describe the existing environmental conditions in the project area including the identification of environmentally sensitive areas;
- Assess the proposed works and activities to identify their potential impacts, evaluate the impacts, and determine their significance; and
- Propose appropriate mitigation measures that can be incorporated into the proposed activities to minimize any adverse impacts, ensure that residual impacts are acceptable and establish the requirements for monitoring of the Project.

1.2.3 Structure of the SEIS Report

13 This SEIS report has been presented in the following format. The report is organized into following Sections. A non-technical Executive Summary is also prepared and presented in the beginning of the report.

- Section 1 : Introduction
- Section 2 : Policy, Legal, and Administrative Framework
- Section 3 : Description of the Project
- Section 4 : Description of the Environment (Baseline Data)
- Section 5 : Anticipated Environmental Impacts & Mitigation Measures
- Section 6 : Information Disclosure, Consultation, and Participation
- Section 7 : Grievance Redress Mechanism
- Section 8 : Environmental Management Plan
- Section 9 : Conclusion and Recommendation

14 Appendices contain additional information and details referred to in the main text.

2. Legal and Policy Framework

2.1 Environmental Law in Timor-Leste

15 **The Constitution.** The implementation of the Project will be governed by laws, regulations, and standards for environmental assessment and management of GOTL. The Constitution of Timor-Leste has clearly established the importance of protecting the environment. The Constitution of Timor-Leste establishes a healthy environment as a constitutional right. The Constitution stipulates that:

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

16 As of 05 July 2012 the Environmental Basic Decree Law came into force (Decree-Law no. 26/2012). This sets the framework for other environmental legislation such as the Decree 05/2011 Environmental Licensing Law (ELL) and pending laws and regulations including the draft biodiversity law.

17 **Environmental Licensing Law.** The ELL implements a system of environmental impact assessment (EA) and licensing in Timor-Leste. Under the ELL, proponents of projects or activities that may impact the environment are required to undertake a process of environmental assessment (EA), which includes preparing an 'environmental impact statement' (EIS) or 'simplified environmental impact statement' (SEIS), depending on the level of likely impact of the project (respectively Category A and Category B), together with an environmental management plan (EMP), according to the procedure established through the ELL, and submitting this information to National Directorate for Environment (NDE). If the Minister determines to approve the project or activity, based on the recommendations of NDE, the proponent is granted an environmental license by NDE to conduct the project or activity.

18 The NDE has classified the Project as Category B according to the ELL because it involves construction, reconstruction, and extension of roads and bridges. To comply with the ELL, an environmental assessment and EMP must be prepared in the prescribed format and be submitted to the NDE for approval.

19 Article 18 of the ELL requires that the application for environmental license be made to the Department of Environmental Impact Assessment (DEIA). The proponent (in this case MPW) of a project classified as Category B initiates the procedure for SEIS and environmental license application with the submission of a Development Proposal Application Form to the (DEIA). The information to be included with the application is: (i) name of the applicant, and their identifying information and contact details; (ii) location and scale of the project; (iii) plans and technical drawings of the project; (iv) technical study on the feasibility of the project; (v) opinions or other documents on the project issued by other entities; (vi) the EMP; and, (vii) the aapplication for an environmental license.

20 Public consultation is not mandatory for Category B development projects under the ELL. However, the proponent must, in the event that the NDE/DEIA requires it, conduct public consultation, to discuss issues the project with relevant stakeholders. The proponent must also implement the EMP in accordance with the provisions of relevant legislation.

21 The GOTL's environmental classifications for environmental permitting requirements and environmental regulatory compliance required for Category B developments such as this Project are listed in Table 2.1.

Table 2.1 - Environmental Regulatory Compliance

Government of Timor Leste				
Component Description				
Sector		**Category B in accordance with DL5/11***	**Scale**	**Environmental Assessment**
Transportation.	V 1	Rehabilitation of an existing road, excluding community road (including toll roads, bridge crossing, each with two lanes	All	SEIS and EMP
Transportation	V 2	Construction of Bridges	<300m	SEIS and EMP
Associated Activities				
Quarries				
Mining Sector	I 1	Exploitation of minerals (sand and gravel)	<30,000 m^3/year & >5,000 m^3	SEIS and EMP
Mining Sector	I 2	Processing and refinement of minerals / quarrying (non-toxic)	<30,000 m^3/year & >5,000 m^3	SEIS and EMP
Hot Mix Plant				
	IV 1	p) Other: Plant releasing environmental pollutant, noise, vibration, dust and/or smells, or plant handling flammable and/or hazardous materials (small scale, determined by the environmental authority).	Site <1ha and installation area >3000m^2	SEIS and EMP

*DL5/11 = Decree Law 5/2011 Environmental Licensing, EMP = Environmental Management Plan, EIA = Environmental Impact Assessment, SEIS = Initial Environmental Examination, SPS = Safeguard Policy Statement.

22 Under the ELL the DEIA has 30 days to respond to receipt of the application for an environmental license for Category B project. NDE/DEIA may suspend the review process if additional information is required and has 10 days to review the additional information or reject the application. The NDE/DEIA will also establish the conditions and restrictions deemed necessary to protect the environment as part of the environmental license.

23 **Environmental Guidelines.** In addition to the legal requirements NDE also issues guidelines from time to time and refers to best international practice. CSI will implement this ESIP by reference to NDE guidelines and the Environmental, Health, and Safety General Guidelines published by World Bank unless the local legislation supersedes the international standards.

24 **Occupational Health and Safety.** Timor-Leste has not enacted laws or implemented regulations for working conditions, health and safety. UNTAET Regulation 2002/05, the Labor Code for Timor-Leste, is broadly relevant but it does not regulate health and safety. This Labor Code creates a National Labor Board with the mandate to provide independent advice on occupational safety and health matters as well as programs on vocational training and skills development, grant exemptions, set minimum wages and other related functions. However, the National Labor Board has not yet been established. The Occupational Health and Safety Law was drafted in 2004, but has not yet been enacted. Therefore during construction, the Project will conform to the Environmental, Health, and Safety General Guidelines published by World Bank unless the local legislation supersedes the international standards.

25 **International Conventions.** GOTL is a party to several international conventions that are relevant to environmental management. GOTL has signed and ratified three international conventions on preserving the natural environment: the United Nations Convention to Combat Desertification (UNCCD; August 2003), the UN Framework Convention on Climate Change (UNFCCC; Oct. 2006) and the UN Convention on Biodiversity (UNCBD; Oct. 2006). In late 2007, Timor-Leste signed the Kyoto Protocol to the UNFCCC, expressing its commitment to reduce global climate change.

26 None of these conventions have any direct or specific relevance for this SEIS as the Project does not encounter any areas of environmental sensitivity covered by the conventions.

2.2 Resettlement and Land Acquisition

27 National policies and legislation concerning resettlement and land acquisition are enshrined in the Constitution which states that the ownership, use and development of land are key factors for economic production and they shall be regulated by law. Section 54 of the Constitution covers the right to private property and provides that: (i) every individual has the right to private property and can transfer it during his or her lifetime or on death, in accordance with the law; (ii) private property should not be used to the detriment of its social purpose; (iii) requisitioning and expropriation of property for public purposes shall only take place following fair compensation in accordance with the law and (iv) only national citizens have the right to ownership of land.

28 The first land law of Timor-Leste was promulgated in March 2003 and was designed to serve as an umbrella law for the rest of the land and property regimen. The law established the Directorate of Land, Property and Cadastral Survey (DLPCS) as a legal entity and defined its jurisdiction, and articulated general rules concerning land tenure and property rights to be further developed by ensuing legislation. Law No. 1/2003 vests all land that belonged to the Portuguese state, and all state property acquired or built by the Indonesian regime, in the new state of Timor-Leste.

29 A decree issued by the Government in February 2011 provides for granting compensation to relocate unlawful occupants of State property based on humanitarian considerations. The Ministry of Justice (MOJ) through Ministerial Decree, which is in development, will establish the basis for calculating compensation. Another decree promulgated in July 2011 allows private property rights registration by landowners/persons in areas where cadastral surveys have been completed (following registration and verification of claims by the government) and confirmed that the claims to land are undisputed. Among the claims registered under the Ita Nia Rai program, which has been limited to urban areas, some 92 per cent of claims are undisputed. The Civil Code promulgated in 2011, which came into force in March 2012, includes a section that governs day-to-day land decisions such as the sale and lease of land.

30 The following three laws were passed by Parliament but returned by President in the past. These laws are being redrafted for resubmission to Parliament: (i) draft Land Law interprets who owns what land and in the case of conflicting claims, who has the strongest right to the land; (ii) draft Expropriation Law (EL) determines the conditions and establishes the procedures under which the state can take land for "public good" and under which it will provide fair compensation and (iii) draft Real Estate Finance Fund provides compensation as determined under the other laws.

31 The draft EL recognizes the right to private property and guarantee of fair compensation for expropriated land, as fundamental rights of citizens. Under the draft EL, the expropriation of property for public purposes will be only possible where it is not possible to acquire it amicably through private negotiations. The Council of Ministers, with advice of the Ministry of Justice, will be empowered to issue a notice of public purpose for expropriation.

32 However, land acquisition/resettlement activities under this project will follow the procedures outlined in the resettlement framework for the project, until such time as the draft EL is promulgated. The procedures in the RF are consistent with the principles and policy of the draft EL as well as with JICA policy.

2.3 Safeguard Guidelines

33 In addition to complying with country safeguards the Project will also need to comply with JGESC (2010) which sets out the policies and principles for protecting the environment and people by wherever possible avoiding impacts and mitigating and/or compensating for impacts that cannot be avoided.

34 The JGESC represents the policy in respect of safeguards and avoiding, minimizing or mitigating adverse impacts on people and the environment. The JGESC presents the safeguard framework to: (i) reflect the policy objectives and relevant policy principles and safeguard requirements governing preparation and implementation of projects and/or components; (ii) explain the general anticipated impacts of the project and/or components; (iii) specify the requirements that will be followed for Project screening and categorization, assessment, and planning, information disclosure, meaningful consultation, and grievance redress mechanism; (iv) describe implementation procedures, including budgets, institutional arrangements, and capacity development requirements; (v) specify monitoring and reporting requirements; and (vi) specify the responsibilities and authorities of the borrower/client, JICA, and relevant government agencies in relation to the preparation, submission, review, and clearance of safeguard documents, and monitoring and supervision.

35 The Project can be classified as Category B because the potential adverse environmental impacts are site-specific, few if any of them are irreversible, and mitigation measures can be designed readily. The appropriate level of environmental assessment for environment category B proposals is an SEIS. There are no apparent potential institutional constraints or barriers that could adversely affect project success.

3. Description of the Project

3.1 Background and Need for the Project

36 The Project is classified as Category B because it involves construction, reconstruction, and extension of roads and bridges. The existing road infrastructure needs to be improved because the standards and conditions of many of the roads in Timor-Leste are inadequate to meet rapidly growing demand for efficient travel. This situation limits national development and economic growth.

37 The Project is part of the road network that connects the districts in the southern and eastern parts of Timor-Leste with Dili, the capital, via Manatuto. The project road is part of an important trade link since it provides road connectivity to the east and south part of the island, which is the source of international trade and freight movement by land route from the south and east of Timor-Leste and vice versa.

38 During the Indonesian regime the road received maintenance and some of the major bridges and cross drainage structures were constructed. But the civil unrest and struggle for independence resulted to severely damaged road condition particularly after 1999 elections. Since independence (post 2002) the road has received basic emergency repair in its severely damaged sections to keep it passable to vehicular traffic. A decade or more of lack of strengthening and absence of bituminous overlay has left this vital road in very poor condition.

39 The GOTL has recognized the importance of developing physical infrastructure including road network as part of its program to reduce poverty in the country. With the realization that improvement of the road infrastructures will contribute to economic growth and poverty reduction. The overall objective of this Project is to improve accessibility to market opportunities and economic and social services, reduce vehicle operating costs, as well as generate employment opportunities and income.

40 The existing conditions of the Project road vary and are good in some places but only fair to poor and unacceptable in many places. The road is sealed in most sections and earthen shoulders are often in poor condition and overgrown with grass and other plants. Most of the bridges are in fair condition, however some bridges will be repaired and subject to detailed design some bridges may be rebuilt. The culverts are in fair to poor condition but many are blocked and damaged and some require major improvement and repair.

3.2 Location

41 The road link A01-01 is located along the north coast of Timor-Leste in the districts of Dili and Manatuto (Figure 2.1). The The project area is the length of the road and the area of direct impact will be within 20m from the centreline of the Project centreline.

42 The road crosses four sub districts. Cristo Rei and Metinaro are part of Dili District and Laclo and Manatuto Kota are part of Manatuto District. In Dili District the sucos of Camea and Hera are part of Cristo Rei Sub District; Sabuli and Duyung are part of Metinaro Sub District. In Manatuto district Umakaduak is part of Laclo Sub District and Sau and Ailili are part of Manatuto Kota Sub District. Total length of national road upgrading project between Dili - Manatuto is approximately 56.4 km.

3.3 Existing Road

43 The current widths of the existing road from Dili-Manatuto is a standard 4.5m carriageway (varying from 4.2m to 5.0m), except for a stretch of approximately 2.2km from Km0+000 to Km2+200 (which is about 5.5m wide). The hard shoulders are from 1.0m to 2.0m wide. The proposed widening of the sections of A01 due for upgrading are summarized in Table 3.1. The widening will be less than 4m and as little as 1.5m in some places (subject to detailed design).

Figure 3.1 - Location Dili to Manatuto Project road

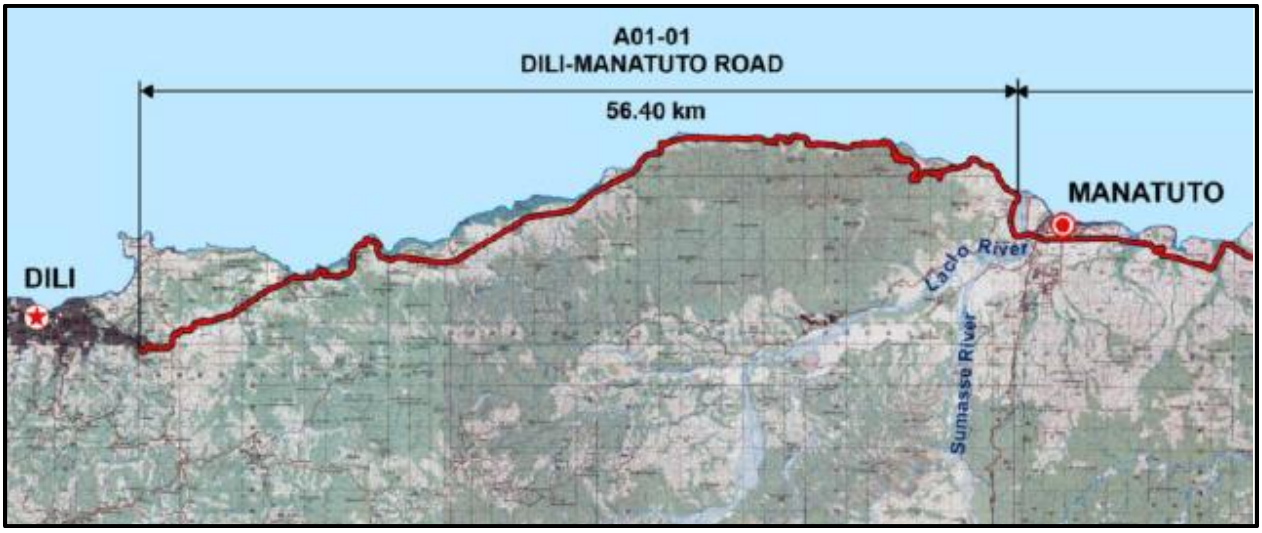


Table 3.1 Current and proposed widths on Project road

Road Location	Start (Km)	Finish (Km)	Length (m)	Current formation width (m)	Current pavement width (m)	Proposed pavement width (m)	Proposed formation width (m)*	Formation Widening required (m)#	Pavement Widening required (m)@
Becora to Hill top	0.000	2+200	2200	7.5 to 9.5	5.5	6.0	10.0	0.5 to 2.5	0.5
Hill top to Hera west	2+200	8+500	6300	7.5 to 9.5	4.2 to 5.0	6.0	10.0	0.5 to 2.5	1.0 to 1.8
Hera to Duyung west	8+500	19+000	10500	7.5 to 9.5	4.2 to 5.0	6.0	10.0	0.5 to 2.5	1.0 to 1.8
Duyung to Manatuto	19+000	27+500	8500	7.5 to 9.5	5.0	6.0	10.0	0.5 to 2.5	1.0
Duyung to Manatuto	27+500	58+300	30600	7.5 to 9.5	4.2 to 5.0	6.0	10.0	0.5 to 2.5	1.0 to 1.8

Source: Nippon Koei Co Consultants, JICA Road Network Upgrading Project (RNUP) 2013.
@ = Based on pavement width. # = Based on formation width.
Proposed pavement width and formation width may be wider (up to 8m and 12m respectively) on some curves subject to detailed design.

44 The western end of A01 connects with the Moto Ulum Bridge at the eastern edge of Dili City. The first section to be improved starts at the border in the Suco of Becora, runs for 8.4km eastwards through to Hera in Dili district. None of this stretch is within 500m of the coast. The

second section of road then continues east for another 44km eastwards to the outskirts of Manatuto (Figure 1.2). The section ends at the bridge before the ring road at Manatuto. About 10 km of the second stretch runs within 100m of the coast (Table 3.2).

45 Average daily traffic (ADT) on the A01-01 (Dili – Manatuto) is about 2,000 vehicles/day (including motorcycles) at the junction of A01 and the access road to the Presidential House in Hera. The traffic volume decreases to 920 vehicles at Beheda Bridge (Km48) and to 730 vehicles near the junction of Manatuto Bypass (Km58). The major portion of the traffic on the subproject road consists of motorcycles (more than 40%) with a few cars and 4WD (up to 30%) and buses (10%). The rest are trucks, pick-ups, vans taxis and other public motor vehicles. Some trucks carry people as well as goods in and out of the area.

Table 3.2 - Terrain and road height above sea level

Start	Finish	Terrain	Ground Height	Distance to sea
0+000	4+800	M	50m or greater	1000m or greater
4+900	8+500	F	30m or greater	1000m or greater
8+500	10+600	F to F/R	3m or greater	100m or greater
10+700	10+900	F	3m or greater	<100m
11+000	11+100	F to F/R	3m or greater	100m or greater
11+100	11+400	F	3m or greater	<100m
11+400	11+900	F	3m or greater	100m or greater
12+000	14+100	F to R	3m or greater	100m or greater
14+200	14+600	F	3m or greater	<100m
14+700	16+100	F to M to F	3m or greater	100m or greater
16+200	16+400	F	3m or greater	<100m
16+500	30+400	F	3m or greater	100m or greater
30+500	31+200	F to R	3m or greater	100m or greater
31+250	31+350	F	3m or greater	100m or greater
31+400	34+000	F to M to F	3m or greater	100m or greater
34+100	34+200	F	3m or greater	100m or greater
34+300	34+500	F	3m or greater	100m or greater
34+600	34+800	F	3m or greater	<100m
34+900	35+000	F	3m or greater	100m or greater
35+100	36+600	F	3m or greater	<100m
36+700	36+800	F	3m or greater	100m or greater
36+900	37+000	F	3m or greater	<100m
37+050	37+150	F	3m or greater	<100m
37+200	37+600	F	3m or greater	<100m
37+700	38+000	F	3m or greater	100m or greater
38+100	38+200	M	3m or greater	<100m
38+300	40+200	M	3m or greater	100m or greater
40+300	40+500	F	3m or greater	100m or greater
40+600	41+200	R	3m or greater	<100m
41+300	41+500	F	3m or greater	100m or greater
41+600	42+400	F	3m or greater	<100m
42+500	43+000	F	3m or greater	<100m
43+050	43+150	F	3m or greater	<100m
43+200	44+000	F	3m or greater	<100m
44+100	51+400	M	3m or greater	100m or greater
51+500	51+600	F	3m or greater	<100m
51+700	52+000	F	3m or greater	100m or greater
52+100	53+600	F	3m or greater	<100m
53+700	53+800	F	3m or greater	<100m
53+900	54+300	F	3m or greater	100m or greater

Start	Finish	Terrain	Ground Height	Distance to sea
54+400	56+400	F	3m or greater	100m or greater

F= flat, R= rolling, M = mountainous. Vulnerable = Vulnerable to storm surge <2masl and within 100m of coast.
Source: based on Nippon Koei Co Consultants, JICA Road Network Upgrading Project (RNUP) 2013.

46 The existing alignment passes by some villages and isolated settlements. The Project road is generally steep through the hilly terrain from the origin at Becora (Km0+000) to Acanuno (Km4+800) and is generally quite flat through Hera (Km4+800 to Km8+500). The Project road is predominantly flat or rolling through the terrain from Km8+500 to Km44 except for short steeper sections through the hilly terrain near the headlands at Km15 and Km32. From Km44 to Km51 the road ascends to steeper hillier sections through mountainous terrain and well away from the coast. From Km51 to the end the subproject road is generally quite flat and nearer to the coast.

3.4 Proposed Works

47 Upgrading works include improvement of the existing road, bridges, construction of drainage structures and slope protection works to achieve the national road standard of 6m pavement plus 2 x 1m shoulders and drainage as shown in the typical cross sections (Figures 3.2 & 3.3). The proposed works will involve widening of the pavement from 4.2m to 6m and sealing with asphalt. The width of shoulder will vary from 0.5m – 1m. Half meter shoulders will be adopted for some narrow sections. The width of the shoulders in school zones, hospital zones and other important areas shall be 1m. Street furniture will be installed for village urban areas (towns and large villages) including concrete curb and drains. Pavement markings will be provided from beginning to end of the project. Shoulders will be improved to provide support for the pavement structure.

48 **Clearing and Grubbing.** The Project will involve removal of materials including trees, stumps, and top-soil. Roots, logs, vegetation, wastes and debris will be satisfactorily disposed at designated and approved locations. Tree timber will be returned to the owner for reuse of all. Topsoil will be stockpiled for reuse.

49 **Removal of Structures and Obstructions.** This project will involve the removal of structures, wholly or in part and backfilling the resulting trenches, holes, and pits; and satisfactory disposal at designated and approved locations of all building materials, fences, structures, old pavements, abandoned pipe lines, masonry ditches, culverts, bridge sections and any other obstructions which are not designated or permitted to remain.

50 The proposed works will include removal of all existing asphalt pavement, selective replacement of unsuitable sub-grade materials and construction of new road-base and asphalt pavement.

51 **Drainage. Improvements** to the road include provision of adequate drainage including replacement, modification or repair of culverts and masonry ditches. Drainage works will involve replacement and/or deepening of existing masonry ditches, construction of crossing drains, extension or replacement of existing culverts and construction or installation of new culverts.

52 Drainage design considerations for drainage have included:

- Cleaning drainage and waterways of accumulated debris.
- Construction of headwalls and drainage outlet protection structures such as chutes, weirs, aprons and splash pads to prevent stream bed scouring.
- Construction of catch-basins, inlets, manholes and junction boxes to contain flow and prevent spillage.
- Construction of river training dikes and revetment walls to prevent scouring of river banks.

Figure 3.2 – Typical Cross-Section (flat or undulating areas)

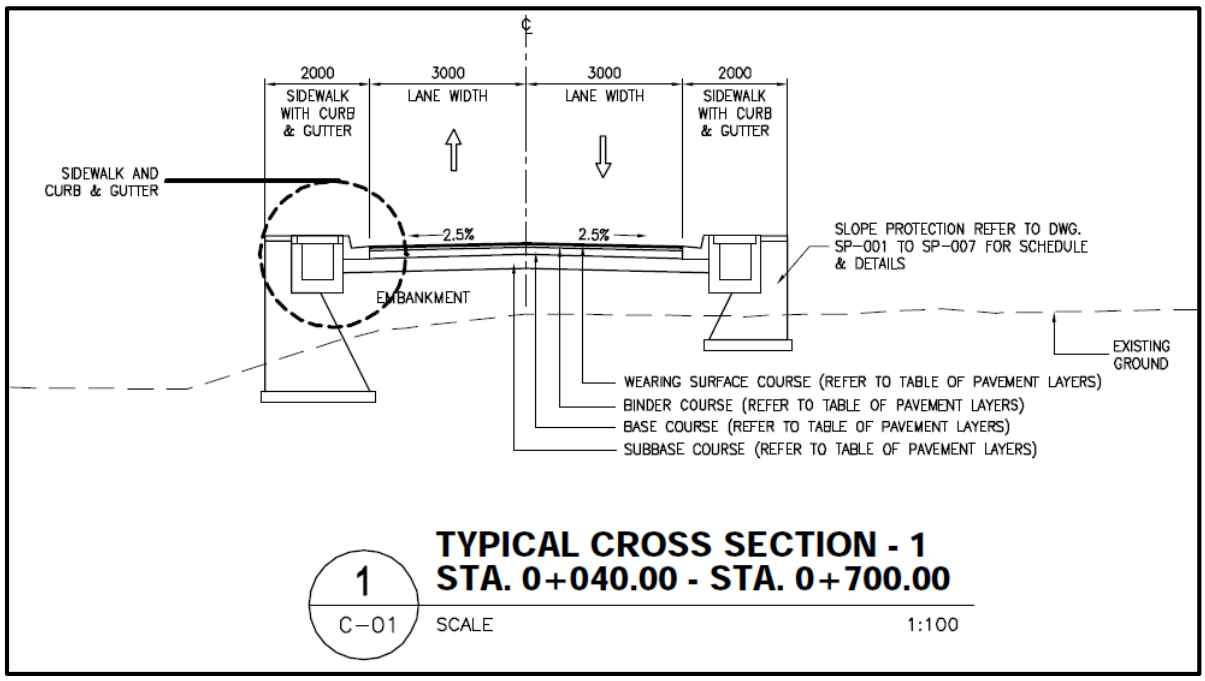
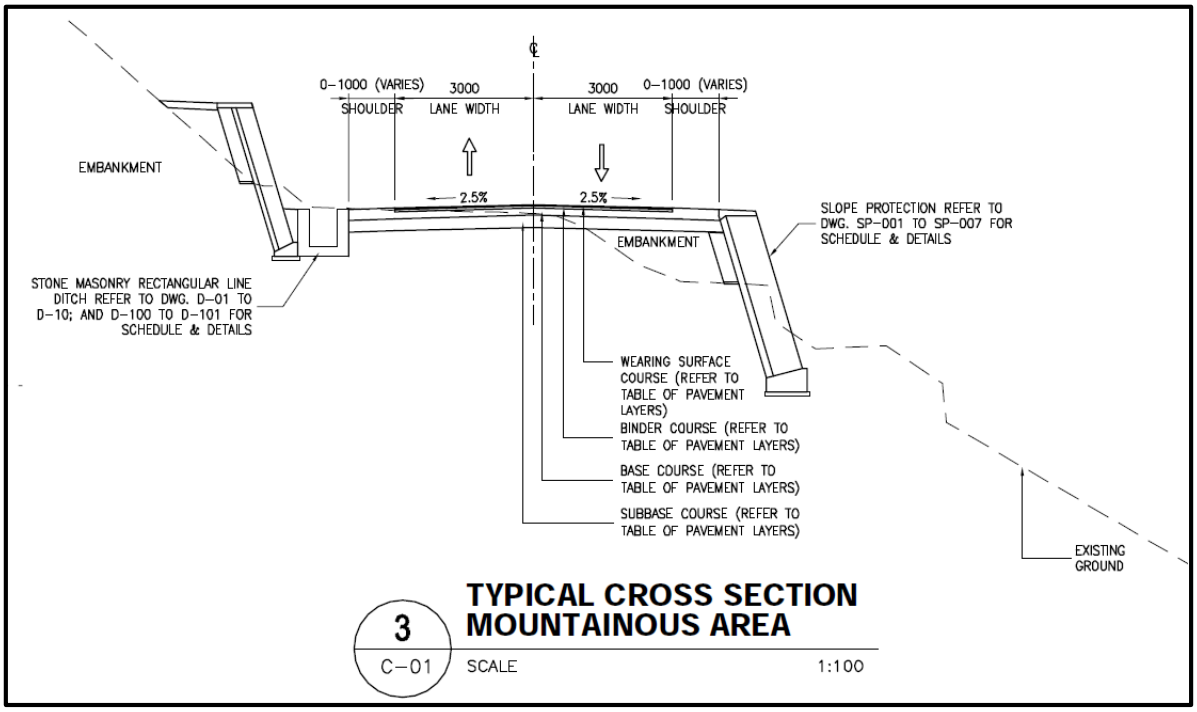


Figure 3.3 – Typical Cross-Section (mountainous areas)



53 Earthworks and Sources of Materials. The project works include both excavation of earth or rock materials from high sections and filling of low sections on uphill and downhill sides of the road. Approximately 245,000m3 of earth or rock materials will be excavated and about 398,057m3of fill will be needed.

Table 3.3 - Estimates of earthworks and structure works

Structures and Works	Dili to Manatuto
Removal of existing pavement (to 20cm depth)	271,101m^2
Unsuitable material	4,000m^3
Total unusable for disposal	58,220m^3
Bulk Excavation (soil & rock – m^3 - assume 100% reuse)	184,833m^3
Bulk Fill (required rock based materials – m^3)	398,057m^3
Embankment borrow material	213,174m^3
Surplus for disposal or reuse in another project	Nil
Bridges (new works proposed at 3 locations)	3
Culverts existing	268
Culverts replaced or repaired	268
Proposed new culverts	63
Repairs & new lined drains (>160 locations)	>20,000m
Bitumen (m^3 approx = 1 tonne.)	70,000m^3

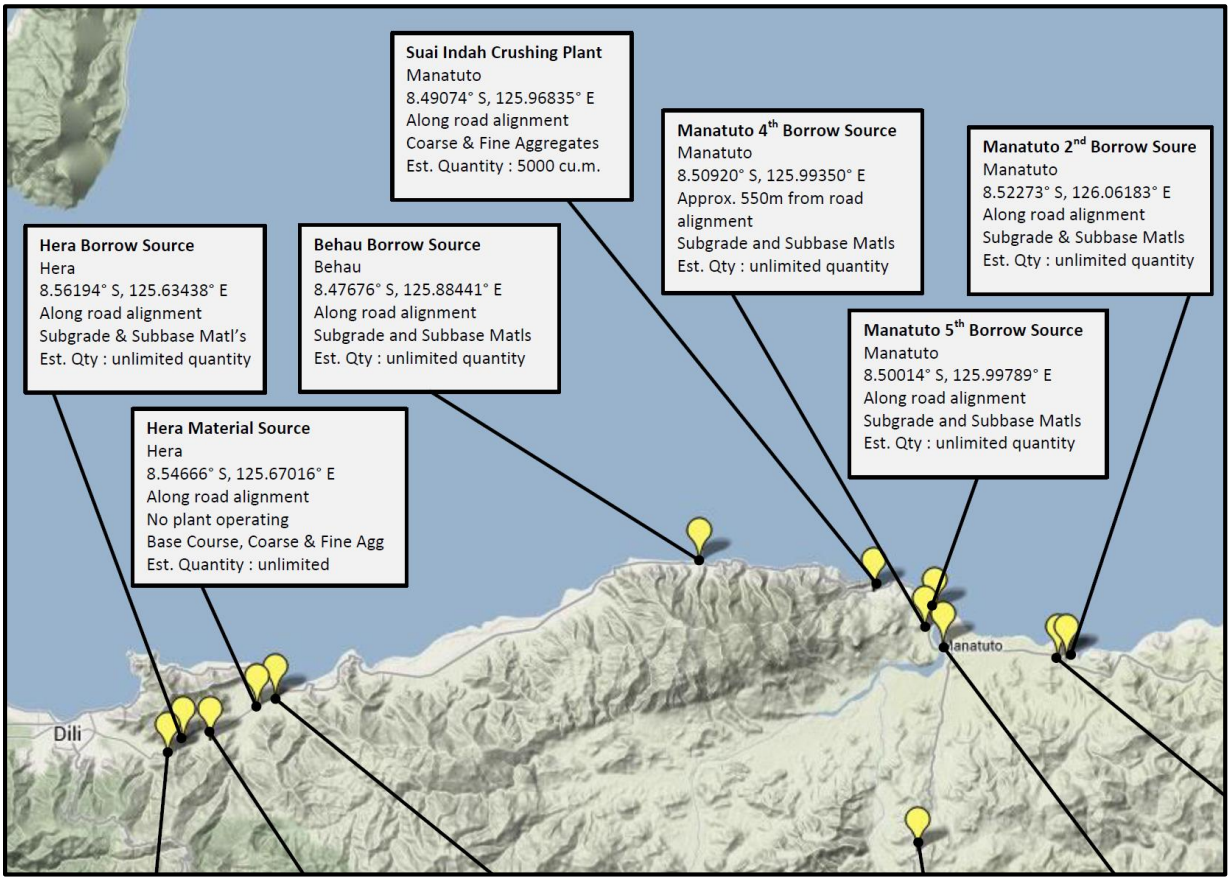
Source: Nippon Koei Co Consultants, JICA Road Network Upgrading Project (RNUP) 2013.

54 The materials from common and rock excavation work in the Project area are expected to be suitable as borrow soil. Since the excavation volume was estimated to be much less than the required quantity of borrow soil there will be a significant need for bulk fill, even assuming that all the cut rock materials and soil can be used for bulk fill construction. It is expected that excavated materials will be insufficient or not suitable and therefore additional materials may be excavated from designated sources as preliminarily identified in Figure 3.4. Excess unsuitable materials and existing pavement shall be disposed at designated approved locations.

55 **Riverbed Gravels.** Generally, the local riverbed gravels are suitable as road construction materials. A few large rivers cross the Project road. No laboratory tests were carried out therefore the suitability of materials is based on observation (subject to confirmation). Riverbed gravels in the several rivers are composed of schist, slate and amphibolite. Based on observation these materials should contain enough strength as aggregates for asphalt concrete and suitable as mixture to any aggregates and sand. However, laboratory tests will be required to confirm its applicability for asphalt concrete. Sands from several rivers were observed as applicable for structural use.

56 **Existing Quarries.** There are a few small scale existing active areas and redundant small quarries within short travelling distances from the Project (Figure 3.4) where aggregates are available but there is no hot mix plant near the Project area. Contractors will need to install the necessary plant. The crushers and hot mix plant must have an environmental permit and be licensed (under the ELL) before the construction works can begin. There are some quarries and borrow pits that have been used in the past for obtaining aggregates. If these quarries and pits can provide further quantities of suitable materials they can be reopened and local suco leaders and NDE should be consulted to clarify if these locations can be used and also if they require an environmental permit and license (under the ELL) before the construction works can begin.

Figure 3.4 – Potential sources of rock based materials



57 **Slope Stabilization and Retaining Structures.** A number of sections along the Project road are unstable and in some locations the road has failed and attempts to stabilize the road have been made through installation of gabion basket walls. The detailed design proposes additional measures to address stability in critical sections such as bioengineering, stone masonry retaining walls, breast walls, and gabion walls. A detailed geotechnical investigation of the road was conducted as part of this works. A number of locations have been identified where remedial action is required to stabilize geotechnical weaknesses affecting either the existing cut and fill batters or the integrity of the rock formation. Details of slope stability problems found during the geotechnical field investigation are provided in Table 3.4 and Table 3.5 showing sites of large scale slope instabilities along the A01-01 road.

58 Stone masonry retaining walls are usually used to retain cut slopes on areas with deep excavation to be able to minimize earthwork and slope disturbance and to preserve uphill structures. They are typically used to retain back slopes on cuts that are prone to landslides and on embankment formations. They are also used as containment structure for embankment formation. The height varies from a minimum of 1.5 m to a maximum of 5.0 meters. Breast walls are also made of stone masonry but shorter in height. Breast walls are used to prevent minor landslides and to contain materials from minor slips. They can be constructed in conjunction with bioengineering works.

59 Gabion Walls are typically used to retain fill slopes. These will be placed typically to support the fill side of the formation on a slope. They can be used to remedy existing slope failures provided that they are suitably founded, i.e. in or on stable material. Gabions can also be constructed in conjunction with bioengineering works. A variety of gabion combinations and stone masonry walls have been used at various locations in the design.

Table 3.4: Sites of Large-Scale Slope Disaster along the A01-01 Road

No.	Location	Disaster Type and Scale	Picture
1	Sta.1+290~390	Landslide L:70 m W:60 m D:10 m	
2	Sta.3+500~630	Embankment Failure L:120 m W:25 m D:8 m	
3	Sta.4+080~250	Landslide L:180 m W:110 m D:10 m	
4	Sta.42+900~43+300	Slope Failure L:400 m W:10 m	

W: Width, L: Length D: Depth
Source: The Survey Team of JICA Preparatory Survey on Road Network Development Sector Project in RDTL, 2011

60 **Bio-engineering Measures.** Bioengineering involves preparation of excavated back slopes and embankment slopes and planting of selected vegetation and trees on the slopes that will help reduce soil erosion, improve soil stability, minimize seepage of water to the ground and help prevent landslides. Several techniques have been considered for use in the Project as follows:

- Live stakes –for repair of small earth slips and slumps that are frequently wet, through the use of local suitable species which creates a living root mat, that eventually stabilize the soil;
- Vegetation – serves as cut slope protection. Sodding or grass planting will protect the road slopes from erosion when the developed roots hold the slope soils together;
- Live fascines – these are long bundles of branch cuttings bound together and installed with live and dead stout stakes;
- Brush layering – consist of live branch cuttings of rooting plants installed almost perpendicular to the slope, to provide immediate earth support as a result of the overlapping layers;

- Coconut netting – made from coconut fibre twine woven into high strength nets for extreme slope stabilization and protection for stream/river banks and channels.

61 **Bridges and Culverts.** There are a number of culverts for stream crossings and retaining walls along the Project road. Maintenance is the first option, followed by repair and reconstruction. Additional culverts, new embankments and lined drains are proposed. This work can be accomplished comfortably in one dry season (May to November). Upgrading and reconstruction will be further elaborated at the detailed design stage. Increased maintenance is also proposed for the operational phase

62 At the current level of traffic, the existing carriageway width of 4.0-5.0 m would be sufficient for most of the bridges provided that they are maintained well. However structural examination of the bridges indicates most of the bridges are too weak to undergo modification and due to the current state of the dilapidations the bridge improvements proposed are to replace each bridge with a new reconstruction. Constructing a new bridge beside an existing bridge is difficult because of existing bridge condition and structure. Therefore a detour route for each bridge will be made and traffic will be rerouted before reconstructing new bridges in place of the old ones.

63 At this stage it is assumed that all three bridges will be replaced at Mota Ulom (Km0+000, 69m box culvert) Lainlidun (Km39+962, 30m new bridge) and Beheda (Km47+613, 40m new bridge). Improvements will also include repairs and reconstruction of bank protection with works to the substructure of the bridges. These works will be scheduled for the dry season (May to November).

64 **Road Safety Measures.** In order to address the concerns raised during consultations, road safety measures for this project involves provision for adequate and continuous reflective pavement markings that will delineate the boundary between opposing and parallel traffic and pedestrians; traffic humps on entering and exiting villages; covered drains adjacent to the road asphalt paved shoulders where pedestrians especially school children can walk; adequate road signs that will serve as warnings (36), information signs (10). The overall Project will also include a road safety program.

3.4.1 Recruitment of Manpower

65 Mobilization of manpower needed for construction activity will include provisions and recruitment of manpower by the contractor to be. Manpower will include engineers, technicians and surveyors, heavy equipment operators and assistants, mechanics, general laborers and security. As far as practicable manpower will be sourced using local people, especially for semi-skilled and unskilled work according to the contractor requirements.

3.4.2 Mobilization of Heavy Equipment

66 Heavy equipment will be mobilized early in the construction phase. Heavy equipment requirements will include backhoes, bulldozers, dump trucks, vibration rollers, motor graders, asphalt cutters, asphalt excavators, asphalt hot mix plant, asphalt finisher, road rollers and tire rollers.

3.4.3 Development and Operation of Basecamp

67 The development and operation of the basecamp will take place in the pre-construction phase. The basecamp will include contractor's office equipment store and maintenance yard, material stockpiles, warehouse, workshop and staff accommodation etc.

3.5 Alternatives

68 Alternatives to the road upgrading have been considered including the "do nothing scenario", alternative alignments, and alternative transport modes. Considering strategic,

environmental, social, economic and financial factors, there are no practical alternatives to the proposed project.

69 The “do nothing scenario” alternative is not practical as it will not be in alignment with the government’s vision for upgrading national roads proposed in the Timor-Leste Strategic Development Plan (SDP). The “do nothing scenario” option is not recommended as the road is already in an advanced state of dilapidation and no action would frustrate economic and social development objectives. Although no direct cost would be incurred, the demerits of the “do nothing scenario” option are: (i) traveling time and transportation cost will increase as the road deteriorates (ii) the settlements and ecosystems near the road will be threatened by increased risk of traffic accidents (iii) sea water may be contaminated by fuel and other hazardous materials spills from accident vehicles resulting in damage to vulnerable fauna and flora.

70 A viable alternative route does not exist without construction of a completely new road which would entail significant delays and much land acquisition. The existing route can be widened without major land acquisition and is the route considered early in the planning phase; as designated by the government. An alternative route will not contribute to the economic and social development of the communities in the existing road corridor. An alternative route would mean effectively abandoning the existing road linking the various villages which would then not benefit from economic development related to trade growth along the improved road.

71 Alternative transport modes are not viable at this stage and the infrastructure for rail, air or sea travel is not sufficiently developed and an alternative transport mode would not be in line with economic and social development objectives. The proposed Project is preferred based on economic, environmental, financial, and social factors.

3.6 Cost estimate

72 The detailed cost are in development but initial estimates indicate a total budget of about $50million will be required for the whole 54.6km route.

4. Description of Existing Environment

4.1 Physical Environment Baseline Conditions

4.1.1 Air Quality

73 Air quality monitoring was not undertaken on the Project road. In general, air quality is acceptable and the World Bank's Country Environmental Assessment (2009) concluded that outdoor air pollution in the country is currently a minor problem. Ambient air quality concerns are mainly limited to larger urban areas/towns and heavily trafficked routes. Gaseous pollutants of carbon monoxide (CO), sulfur dioxide (SO2), nitrogen dioxide (NO2) from traffic are well dispersed in the open terrain and there is potentially adequate dispersion in the wide main thoroughfares of the towns and villages.

74 Air quality appears to be generally acceptable with the exception of dust. Dust arises owing to the poor condition of the roads and dust arising when vehicles pass over unsealed shoulders of roads in many places. Dust concentrations will be higher, if only intermittently, within about 10m of the Project road when dust rises as vehicles pass along the unpaved road shoulders. However dust levels are not high enough to obscure vision significantly, based on field observations except in a few sections where there is no sealed surface on the roads.

4.1.2 Noise

75 Noise from vehicles is not a concern in the areas around the Project road at present as traffic is confined to occasional vehicles. Noise levels are generally within acceptable limits for the public and there were no complaints about current noise levels from the public during consultation. There is no criterion for road traffic noise in Timor-Leste.

76 The UNTAET guideline on ambient noise was introduced in 2002. The Timor-Leste ambient noise standard is Leq55dB(A) for residential sensitive receivers and is the same as for World Bank. The World Bank standard applies an ambient criterion of Leq55dB(A) for residential areas, hospitals and schools. Where the background exceeds the ambient standards the criterion is background +3dB(A).

77 Based on observation in the settlements and towns where traffic runs throughout the day the criterion of Leq55dB(A) for residential, school and hospital sensitive receivers is potentially exceeded at some times. As the criteria are potentially exceeded at some times of the day it is recommended that in order to make a consistent assessment for all locations the existing criterion of background +3dB(A) will be applied in the assessment for both daytime and night time.

4.1.3 Meteorology and Climate

78 The climate in northern Timor-Leste is tropical, hot and dry with occasional heavy rains and temperature varies within a narrow range over the whole year. The average temperatures are largely affected by altitude since there is little temperature variation on either a diurnal or a seasonal basis under the tropical climate conditions in Timor-Leste.

79 Variations in rainfall and temperature can occur over short distances due to the steep topography. Topography has a strong influence on rainfall quantity, with marginal to low rainfall observed along the northern coast of Timor-Leste (<1,000mm / year). There are two annual seasons. The main rainy season is from December to March but varies in length according to location.

80 Rainfall is characterized by tropical strong showers. Heavy downpours in combination with steep terrain often increase surface runoff and cause extensive soil erosion/landslides. An unusually heavy rain hit the central and western part of the county in June 2010, causing serious damage to roads and pathways in the mountainous area. Strong winds occasionally hit the rural areas destroying houses and farm crops.

81 The monsoon type climate is characterized by a clear distinction between wet and dry seasons. Northwest monsoon winds prevail from December to March, bringing the principal wet season to most parts of the country. At other times of year the dry season is caused by southeast trade winds which prevail from May until October, except for the south coast and southern slopes where the wet season persists until July. The average annual rainfall is typically between 900mm and 1200mm. Therefore although severe rainfall events have generally been less in the subject areas in northern Timor-Leste, with lower rainfall along the northern coast (<1,200mm/year) than the south it has been noted that on some occasions as much as a quarter of the total annual rainfall can be received in a single day.

82 This type of rainfall not only causes extremely high rates of erosion and agricultural and infrastructure damage, it also runs off rapidly and may not effectively recharge groundwater sources. Given the rainfall pattern over the region of the Project, it is important that season be considered in planning the implementation of the improvement programme, Major earthworks should be planned for the dry season (May to November) particularly for areas susceptible to flooding and landslides and for works near rivers.

Figure 4.1: – Rainfall data for Dili

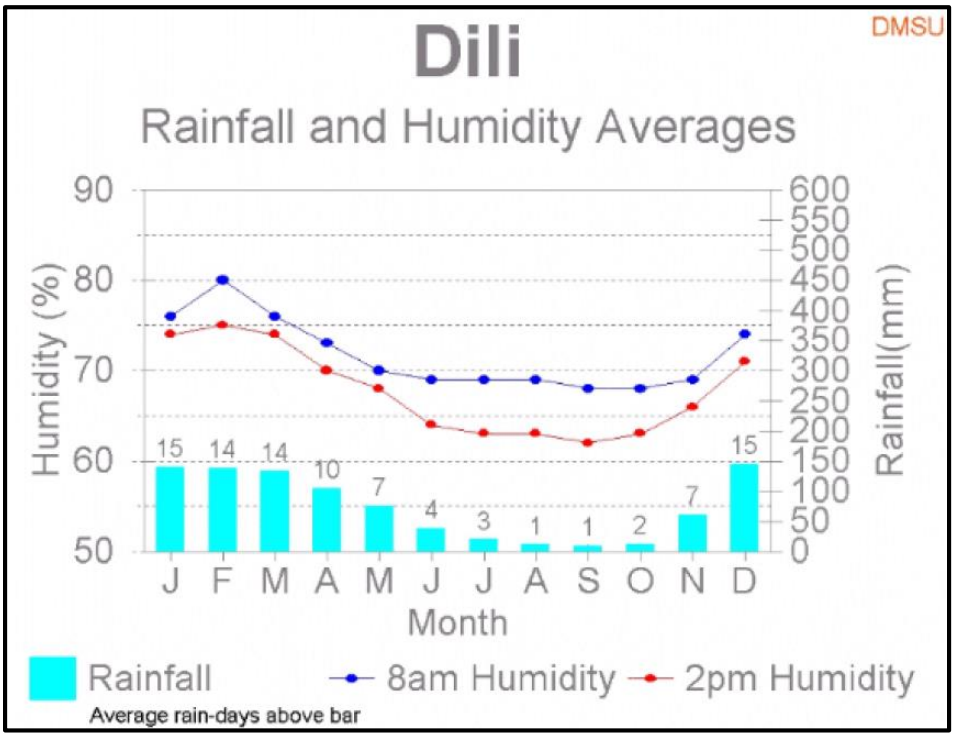


Figure 4.2: – Rainfall data for Manatuto

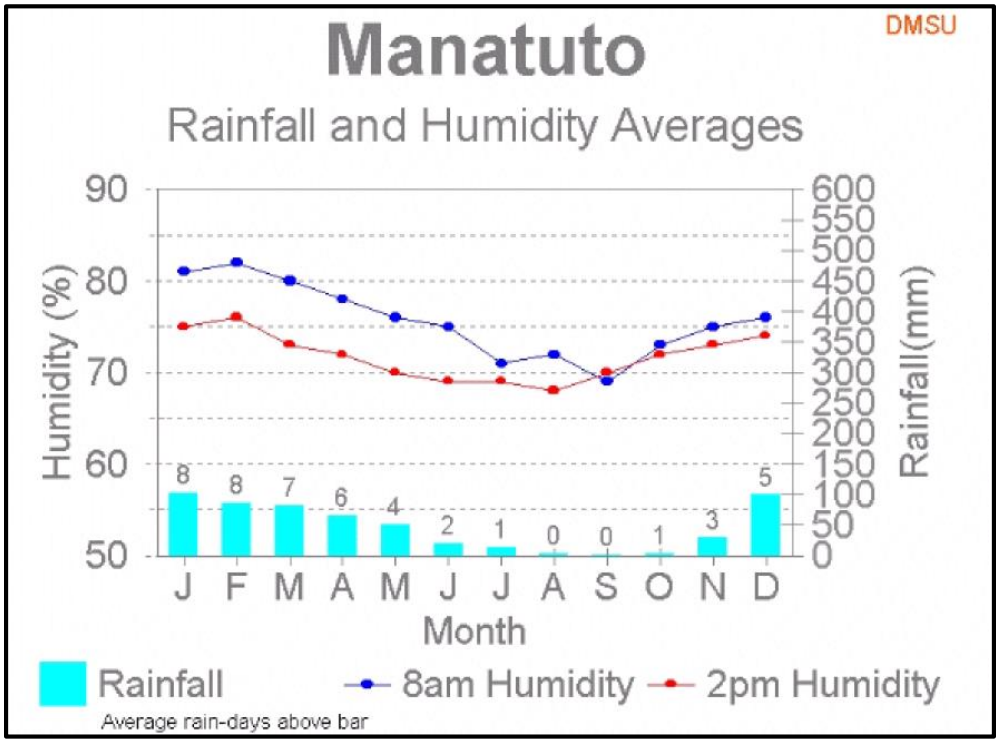


Table 4.1 Rainfall in Project districts

District	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave*	Elevation
Dili	156	125	147	115	74	43	22	17	15	26	70	138	940	0-100
Manatuto	116	118	84	57	38	23	12	1	6	11	27	80	573	0-60

Source: Department of Meteorology, Government of Timor Leste

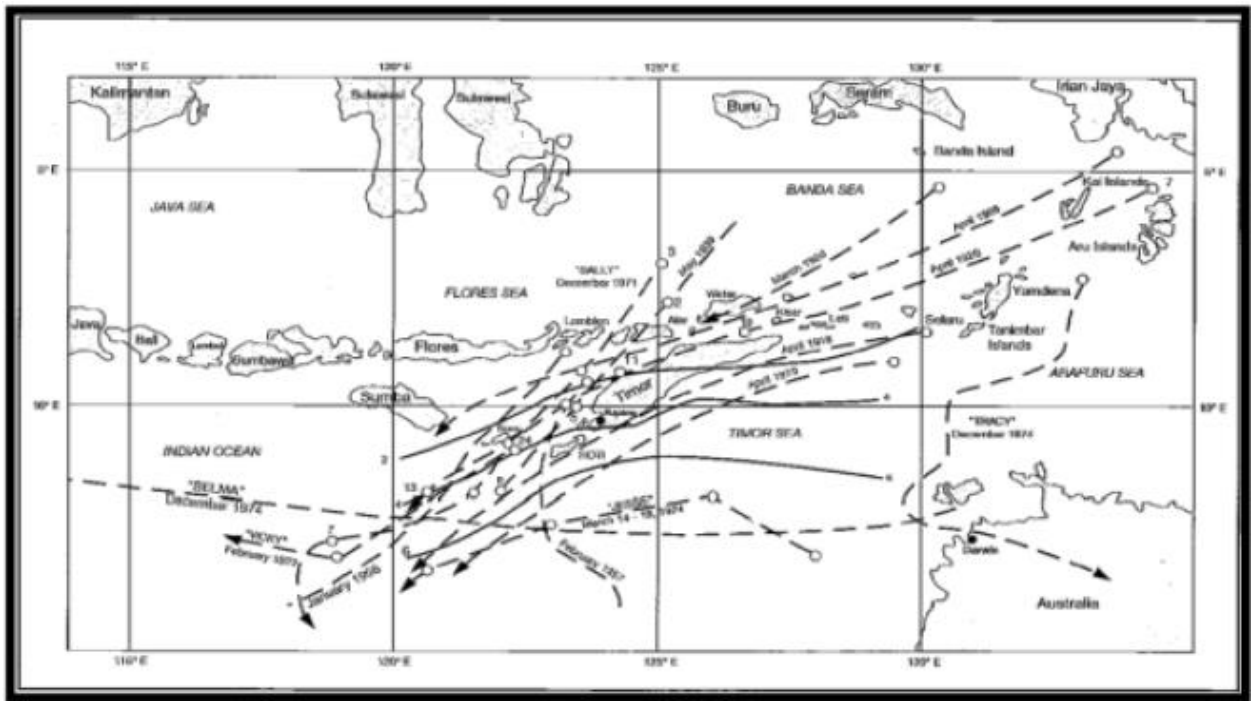
83 The average minimum temperature in Manatuto ranges from 22oC (September) to 25oC (December, January, February) while the average maximum temperature ranges from 30oC (September) to between 32oC and 34oC. Highest temperatures in Manatuto have been recorded as 35oC to 41oC (April). In Dili temperatures can be slightly lower despite being at sea level, average minimum temperatures ranging between it is about 20oC and 24oC and average maximum temperatures ranging between 30oC and 32oC. Daily and monthly variations in temperature can be significant. Refer to Figures 4.1 & 4.2.

4.1.4 Extreme Weather Events

84 **Cyclones.** The tropical cyclone season in East Timor normally occurs from November to April. The mean occurrence over the Timor-Leste region is around 0.2 per year (Kirono 2010). A severe cyclone has not been recorded since January 1993, when 400 houses were destroyed. Figure 4.3 shows some tropical cyclone paths.

85 **Flooding.** Flooding is a common problem in Timor-Leste, especially in the low-lying coastal plains along the southern shores. On a smaller scale, flooding from overflowing rivers also occur in the project area, especially in low-lying areas like Manatuto Town. Large amounts of sediments and gravel washed out from the upper catchments, during high intensity rainfalls, are deposited in low-lying downstream river sections.

Figure 4.3: – Tropical Cyclone Path in Timor-Leste



86 Anthropogenic effects, such as deforestation, shifting cultivation, and subsequent soil erosion, are contributing to increased sediment loading of rivers and have a multiplier effect on flooding. This was confirmed in Manatuto town as some residents expressed that they experienced flooding every year or every rainy season with the inundation reaches up to 1m level. The floodwater, however, subsides in 2-3 hours.

87 The analysis of climate projections (completed 2009 under ADB TA 7100 made an assessment for Timor-Leste that were derived from global and regional climate models, and verified by Timor-Leste data. The general indications were that (i) mean temperature is expected to increase over the coming decades (ii) mean annual precipitation is expected to increase slightly, especially over the wet season, (iii) tropical cyclones and accompanied extreme rainfall events could be less frequent (about 8 per decade currently) but more intense and (iv) sea level is also expected to rise in the 21st century and the probability of occurrence and intensity of extreme wave height is likely to increase. The key issues for the road infrastructure projects were increases in sea level rise and increasing heavy rainfall events. Recommendations for climate change adaptation strategies were also made under TA 7100.

88 The International Climate Change Adaptation Initiative, Pacific Climate Change Science Program (ICCAI PCCSP) has concluded that temperatures and rainfall are changing in Timor-Leste. However limited air temperature data means it is not possible to establish temperature trends although it is known that sea surface temperature in the Timor-Leste region has increased by 0.15–0.2°C per decade over the period 1950–2009. ICCAI PCCSP concluded that air temperature has increased by a comparable amount over the same period. This review also notes there is decrease in annual and dry season rainfall from 1952–2009 but as ten years of data are missing the confidence in this long-term trend is low. The ICCAI PCCSP has also summarized satellite data and nearest tidal gauge data that indicate sea level has risen near Timor-Leste by about 9mm per year since 1993 and that the rise is larger than the global average of 2.8–3.6mm per year; this higher rate of rise may be related to natural periodic fluctuations caused by phenomena such as the El Niño-Southern Oscillation.

89 The ICCAI PCCSP assessment is based on the review of new research (2011) and projections for the 21st century and it concludes with high confidence that surface air temperature and sea‑surface temperature will continue to increase. Rainfall is predicted to shift towards the wet season as wet season rainfall is confidently projected to increase and dry season rainfall is projected to decrease although little change is expected in the annual mean rainfall; the confidence for rainfall predictions is lower than for temperatures predictions. It is confidently predicted that the intensity and frequency of days of extremely high rainfall will increase but little change is projected in the incidence of drought. The increasing trend in mean sea level rise is confidently projected to continue.

90 The ICCAI website covering Pacific Climate Futures reviews likely projections based on several climate models. Inspection of this source indicated that (for the AB1 intermediate emissions scenario) the most likely climate future is warmer with little change in rainfall and annual mean air temperature increases of 0.8°C and annual mean rainfall is unchanged relative to 1980-1999.

91 CURCH et al (2011) analysed sea level rise over the longer term and noted the regional distribution of the projections of sea level change for 2090 compared to 1990, The changes associated with the East Timor region indicate that the area has predicted regional sea level above average (>38cm <40cm at 2090). This coincides with the general projections of above-global-average rise towards the western Indian Ocean and in a band extending around the oceans at about 40°N and 40°S where Timor-Leste is located.

92 The review of the overall projections for Timor-Leste (ICCP PCCSP) also indicates the broad picture emerging for temperature and rainfall. Air temperature and sea surface temperature will increase in the future in Timor-Leste. Increases in average temperatures will also result in a rise in the number of hot days and warm nights, and a decline in cooler weather. There is uncertainty around rainfall projections as model results are not consistent. However, projections generally suggest a decrease in dry season rainfall and an increase in wet season rainfall over the course of the 21st century. Wet season increases are consistent with the expected strengthening of the West Pacific Monsoon. Little change is projected in the frequency of droughts throughout the 21st century but typhoons will be slightly less frequent but more intense. Model projections show extreme rainfall days are likely to occur more often.

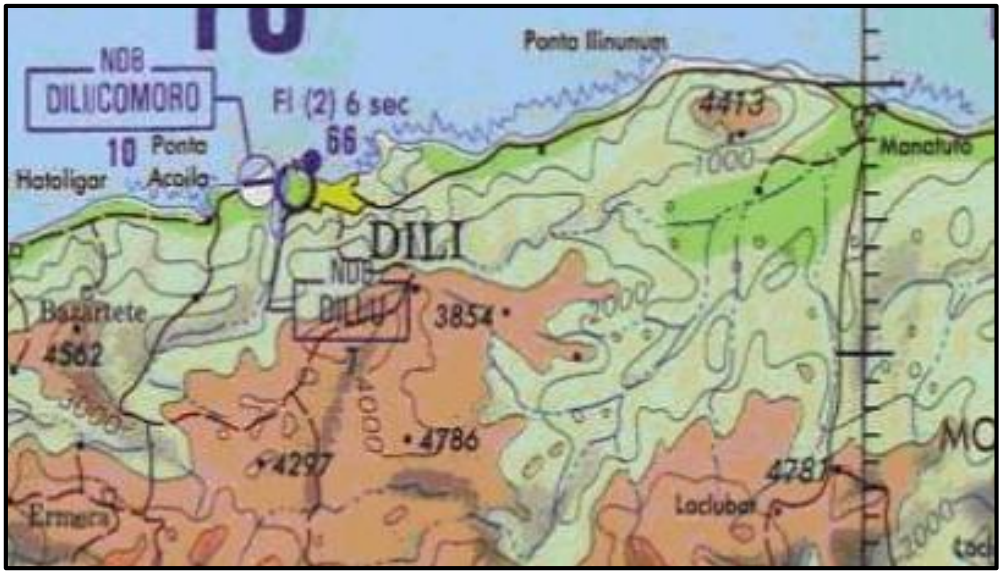
93 Action is needed to integrate climate change adaptation measures into planning and investment. Overall the more recent information on climate projections indicates a broadly similar picture to the review made in TA 7100. The strategies proposed in TA 7100 should therefore still be relevant and applicable to RNUP. The adaptation strategies are reviewed in Chapter 5 of this SEIS.

4.1.5 Topography

94 Timor-Leste's landscape is dominated by mountain ranges which are estimated to cover about a third of the land area (UNESCAP, 2003). Among the prominent mountain ranges is the Ramelau Range with the highest peak elevation of 3,037 m above sea level represented by Foho Tatmailau. The rugged topography of the country is exemplified by the fact that more than 40% of the land has more than 40% slope (MOI, 2009).

95 The topography of Dili and Manatutu districts through which the subproject road runs is mostly flat to undulating land near the coast with occasional steeper slopes and mountainous sections around the headlands. The topography of Dili District through which the first 5km of the subproject road runs is 55% mountainous with a flat to undulating land (45%) from Km5 onwards.. The topography along the Hera to Manatuto stretch of the Project road is mostly flat (59%) with undulating and rolling land (17%) and occasional mountainous headlands (21%). In between the headlands the road runs through coastal lowlands and through the back of the beaches and coastal salt flats in several areas. The general topography along the road is shown in Figure 4.3.

Figure 4.4 – Topographic Map of Project Area



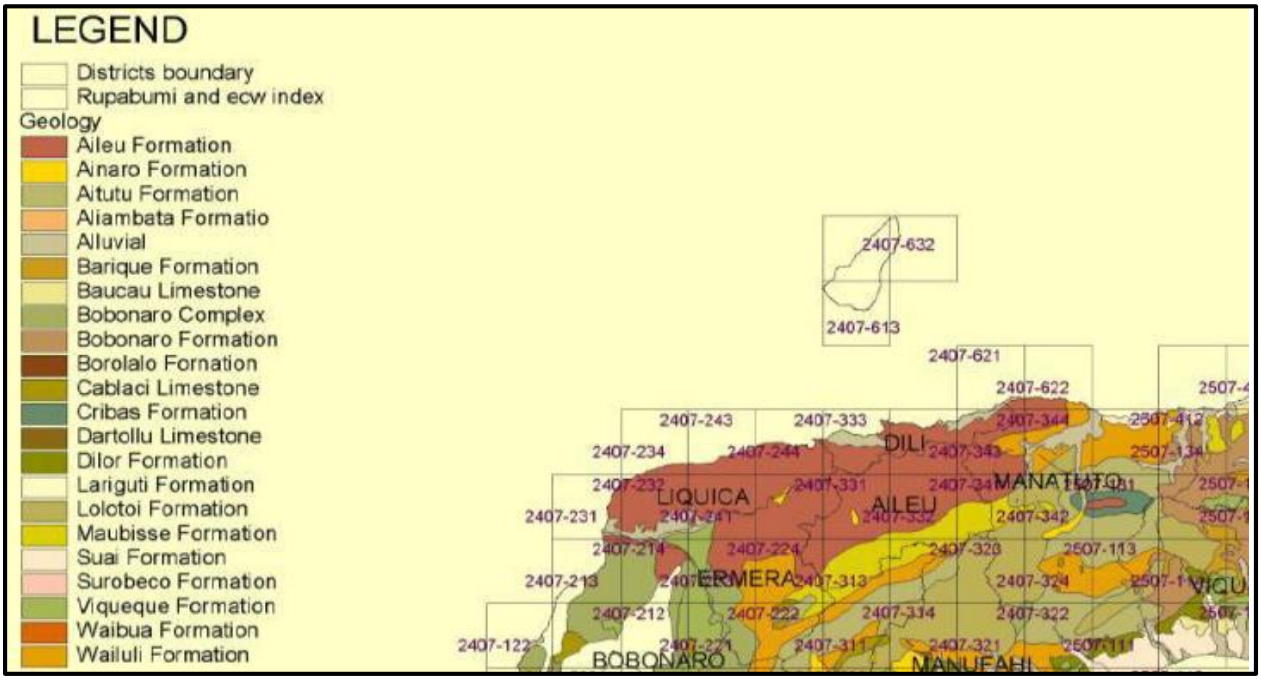
4.1.6 Geology and Soils

96 **Geology.** Timor Island is located in a tectonic region known as the Banda Arc. The Banda Arc is a west facing horse-shoe shaped tectonic boundary to the east of Indonesia which marks the collision zone of the Indo-Australian Pate, the Pacific Plate and the Eurasian Plate. Timor Island originated due to the collision between the northwestern edge of the Australian continent and a former oceanic subduction zone and it is an aggregation of continental fragments (part of Australian plate), deep marine sediments, oceanic crust and Quaternary sediments. Seismic data suggests that Timor Island is an accretionary prism (or wedge) formed from marine sediments and slices of the old Australian cratonic rocks.

97 In this area, geological basement consist of the Pre-Permian Lolotoi Complex which has thrusted over the younger formations, Permian Atahoc and Cribas FM, Triassic Aitutu FM, Jurassic-Cretaceous Wailuli FM and Middle Miocene Bobonaro Scaly Clay. The Lolotoi Complex is composed mostly of basic schist and amphiborite (Laclubar metamorphic massif). Atahoch and Cribas Formation are black pyritic shale, silty shale, limestone and sandstone etc. exposed in only a small area around Atahoc village. Aitutu Formation includes a calcilutite, shale and sandstone sequence and contains a basal radiolarian limestone. Wailuli Formation is predominantly clay, marine shale, marl and fine-grained limestone.

98 The Alieu Formation occurs widely in northern part of central Timor including the general location of the sub-project. The Alieu Formation consists of a series of shales, phyllites, slates and occasional low-grade metamorphosed eruptive rocks. Interbeds of quartz-phyllites occasionally occur. This rock displays lustrous surfaces due to the presence of chlorite and mica. This formation has been repeatedly exposed to deformation especially in the north coast. This deformation plus the pervasive presence of minerals such as chlorite and mica structurally weaken the rock. These factors are contributory to the susceptibility of certain sections of the subproject road to landslip.

Figure 4.5 - Geological Map of Timor-Leste



99 **Soils**. The geotechnical assessment shows that the alignment traverses several soil types; scaly clay, river terrace deposits and alluvial sediments, through very condensed gravel and sand sequences. The fluvial fan is mainly composed of coarse (gravel and sand) granular deposits.

100 The steep mountainous slopes, with their moderately thin layers of soils are particularly prone to erosion when vegetation is removed and soils are exposed to rainfall and surface water flows. Thus, water quality in the mountain streams and rivers can be rapidly degraded when soils are eroded and flushed in to them, and result increased. Figure 4.5 provides the geologic map of Timor-Leste.

4.1.7 Seismicity

101 Timor Island is prone to earthquakes being located in a tectonically active region, along the collision zone of the Australian plate and the Eurasian Plate. Compilation of major shallow earthquakes in Indonesia from 1897 to 1984 by the Southeast Asia Association of Seismology and Earthquake Engineering (SEASEE, 1985) showed a number of earthquake (magnitude 6 to 6.9) with epicentres located offshore north of Timor Island. A magnitude 8 or greater has been recorded in 1963 with epicentre located offshore southwest of Timor Island.In 2011 a very shallow (depth of 1.1 km) earthquake occurred with magnitude of 5.6 and epicentre located on-shore south of Dili. Figure 4.5 shows the compilation of historic earthquakes in the region of Timor Island from 1990 to present (after USGS).

102 **Instability and landslides.** Timor-Leste is unique among the major islands of the Sunda archipelago in that it is not of volcanic origin. Timor-Leste is a continental fragment, composed largely of limestone and other sedimentary deposits. The island is geologically young, with steep and unstable slopes, deep valleys and prone to flash floods.

103 The young geological age and the high rate of tectonic uplift, combined with the presence of weak, poorly consolidated strata, produces intractable stability, slope failure, and erosion problems in many areas. Landslides and erosion are one of the most common environmental risks in the project area, resulting from interactions between water flow and soil.

104 Intermittent occurrence of heavy rain, slow erosion-deposition, rapid mass washing processes, including rock falls and landslides, the and weaknesses underlying in the rocks coupled with the steep terrain, make erosion and sedimentation significantly active geological processes in Timor-Leste. Several landslides have been observed along the Project alignment. The main cause of landslides is the nature of the sedimentary rocks, low mechanical strength of the underlying strata during spells of persistent torrential rain, topography and intensity of rainfall. Saturation, poor drainage, undercutting and erosion of the road earthworks are also contributing factors. Table 4.1 provides information extracted from the geological report. Very wet conditions can trigger slope failures and in many areas road construction is feasible only during the dry season.

Figure 4.4: – Earthquakes in Timor-Leste Region 1990 - Present

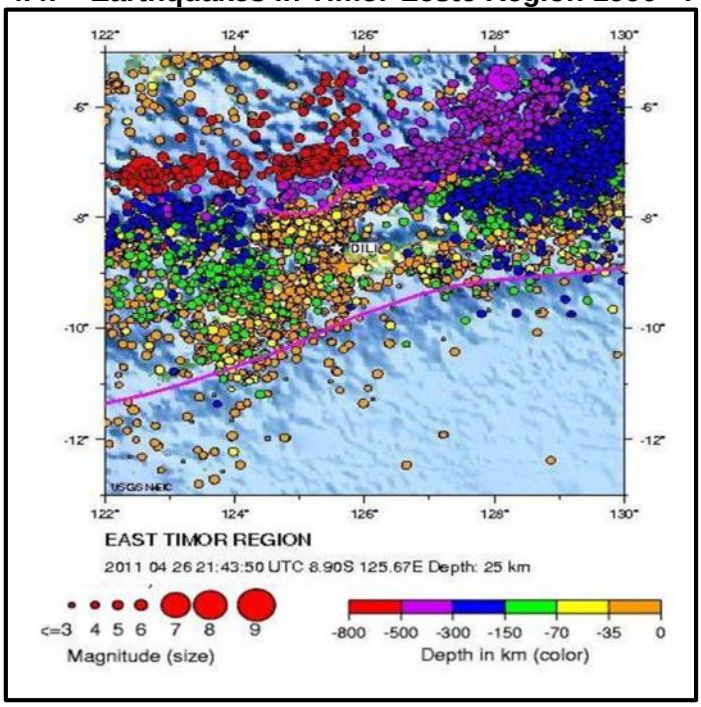


Table 4.1 – Key Areas of Unstable Geology and Landslides on A01-01

Slope Site No.	Stationing (Approximate Only)		No. of	Depth	Disaster	Area Coverage
	From	To	Hole	(m)	Type	Approx. Only
1	1 + 290	1 + 390	3	15.0	Landslide	5.0 ha
2	3 + 500	3 + 630	2	`15.0	Embankment failure	2.5 ha
3	4 + 080	4 + 250	6	15.0	Landslide	7.5 ha
4	42 + 900	43 + 300	6	10.0	Slope failure	7.0 ha

Source : JICA Preparatory Survey on Road Network Development Sector Project in RDTL, 2011

4.1.8 Hydrology and Water Resources

105 **Hydrology.** In Timor Leste surface water is scarce as most rivers are intermittent. Lake Iralalaro in the eastern part of the country is the one lake of significant size. The rivers, their tributaries, streams, rivulets and some small reservoirs in the foothills serve agriculture and domestic water supply but there are no capture fisheries for human consumption. Water levels in the rivers drop to nothing in the dry season. There is no reliable data on the quantity or quality of available groundwater resources in the country and baseline surface and ground water quality data are not available for Timor-Leste.

106 The waterways discharge and the corresponding catchment areas, lengths and difference in elevations reflect the watershed cover which comprises bare surfaces, steep or rolling grassed areas or rocky surface areas. Prolonged exposure of the bare surface to rainwater saturates the surface material. Sediments are then carried by run-off affecting the quality of nearby waterways; which occurs only during wet season.

107 **Surface water.** As many rivers flow intermittently and do not flow in the dry season, the presence of thick river gravel deposits in most of the rivers and streams suggests that water is diverted to interstitial and subsurface flow for most of the year (March to November).

108 The existing alignment traverses a number of waterways. The Dili and Manatuto districts provide the catchments for several big rivers. In the subproject area there are the Moto Ulum (at Becora, Km0.0), the Lekiluak, (at Hera, Km8.5) Lanlidum (Km 40+500) Beheda (Km48+100) and Laclo at Manatuto as well as several small streams. Manatuto town, at the eastern end of the Project road lies within Laclo watershed which has perennial courses of water. The Laclo River originates from Aileu, southwest of Manatuto District. It has an estimated length of 93 km and drains an area close to 1,400 km2.

109 The rivers and streams are not really an important water resource to the people in the project area for most of the year. The area does not provide much in the way of aquatic resources for subsistence or trade, but the hills provide water for drinking, bathing, and crop irrigation. The rivers are not navigable and do have potential for hydropower. Transportation is on the roads.

110 River flows are the highest from December to April. But most of the rivers such as Moto Ulum, Lekiluak, Lanlidum and Beheda are usually dry from May to November unless there is unusually heavy rain. When they do discharge they carry high sediment loads, depositing large quantities of gravels and sands in the lower reaches. During the wet season some of the bridges, causeways and culverts are regularly inundated, cutting off roads and villages.

111 **Water quality.** Water quality is generally threatened by the high levels of erosion and by the increasing amount of domestic waste that is discharged untreated into the environment. Widespread clearing of forests and other ground cover throughout the country has reduced the ability of the soil to retain water and will contribute to the scarcity of surface water.

112 None of the rivers near the Project road is subject to industrial pollution. The rivers Moto Ulum and Beheda are grossly polluted with general garbage from nearby settlements. The nearest sources of industrial pollution are the Hera Power Plant (Km9) and Pa que industrial Tak Hong and the Manatuto Electricity Sub-station near Manatuto; but these are all a long way from the rivers.

113 Water quality monitoring was not undertaken during the environmental assessment. Decree Law No. 5/2009, on Licensing Regulations, Sale and Quality of Drinking Water is the appropriate standard for comparison purposes for impacts on water supply for human consumption. No standards for ambient water quality or water quality criteria have yet been declared in Timor-Leste, therefore the World Bank's Environmental, Health, and Safety (EHS) General Guidelines will apply to the implementation of the Project.

114 **Coastal waters, wetlands and mangroves.** Sea water quality is generally good in many areas based on observation but heavy rains in the wet season result in large quantities of nutrients, silt, soil and gravel being released into rivers and transported to the coast as a result of removal of vegetation from land due to poor farming practices and illegal logging. This results in poor coastal water quality, particularly near the estuaries of rivers, and brown sediment plumes can be observed many hundreds of meters out to sea and up and down the coasts. This has potentially devastating effects on corals and the coastal reef communities in those areas. Rains also erode nutrients, silt and soil from areas where vegetation has been removed along the coast but these materials are often retained within the mangrove communities and salt flats that proliferate along the coast. However there are only a few areas where the Project road runs close

to the mangrove at Km11 Km17 Km25 Km28 and 53Km (Figure 4.6). There are no significant wetlands near the road but paddy fields have been developed along the estuary at Manatuto.

4.2 Biological Environment Baseline Conditions

4.2.1 Vegetation Cover and Flora

115 The land cover data of Timor-Leste gives an indication of its present condition. While statistics of land cover have yet to be reconciled, the land cover mapping done by ALGIS in 2008 using remote sensing data showed that forest (various types of forests) is the dominant land cover of Timor-Leste. It is estimated that various types of forest covers 53.9% of Timor-Leste's land area, various types of cultivated land (agriculture) makes up about 28.7% and other land cover types, (including savannah, grassland, large towns and cities, bare, etc.) make up only 2%. Other researchers doubt the accuracy of this data believing that the forest cover is overestimated and that savannah formation is the predominant land cover in Timor-Leste.

116 The Project road stretch passes through agricultural areas and villages and small towns. The human impact on the vegetation is most pronounced in the areas where grasslands created by cycles of forest clearance for agriculture and their reversion to fallow gradually transformed the forest to short grassland with some occasional trees and shrubs.

117 Woodlands and savannas occur extensively from sea level to low-mid altitudes. These include savanna woodlands with an open, low over-storey dominated by gum trees (Eucalyptus alba) palm and / or acacia and teak (Tectona grandis). Open forest dominated by medium to tall Eucalyptus urophylla is also found at higher altitudes.

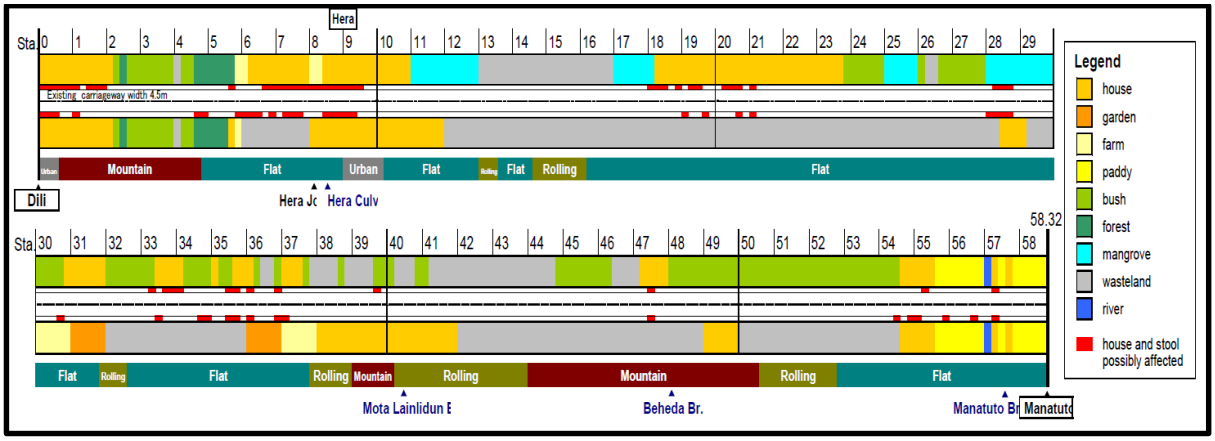
118 The areas on and near the beaches along the Project road have stands of fan palm (Borassus flabeliferer) tamarind (Tamarindus indicus) and mesquite (Prosopis sp.) is common near the road as it passes through the salt marshes and other areas. Savannas occur extensively from sea level to the higher ground near the headlands and the open over-storey is dominated by gum trees (Eucalyptus alba). The type of trees and vegetation in the project area vary as topography and type of soil change except for perennial shrub and grass species that grow in all areas.

119 Major vegetation and land use pattern of the project areas have been categorized into private lands such as houses and garden, cultivated land, farm, paddy, natural forest, mangrove, bush and wasteland as shown in Figure 4.6.

120 Savanna areas with scattered trees (Eucalyptus sp.) are common on the higher ground between Km0 – Km5 and Km48 – Km54 with predominant vegetation being grass and medium growth trees that are sparsely distributed. Mangrove is present, mostly on the north side of the road at Km12, Km17, Km25, and Km28. During site reconnaissance the crops found in the project area were rice, banana, coconut, papaya, guava, orange, corn, mango, sugarcane and the main productive trees were palm, albizia tree/ai-samtuku, madre de cacao, pine, ai-bobur, eucalyptus, leuceana/ai-kafe, teak, jackfruit, bamboo, avocado, cacao, fire-tree and various shrubs and grasses.

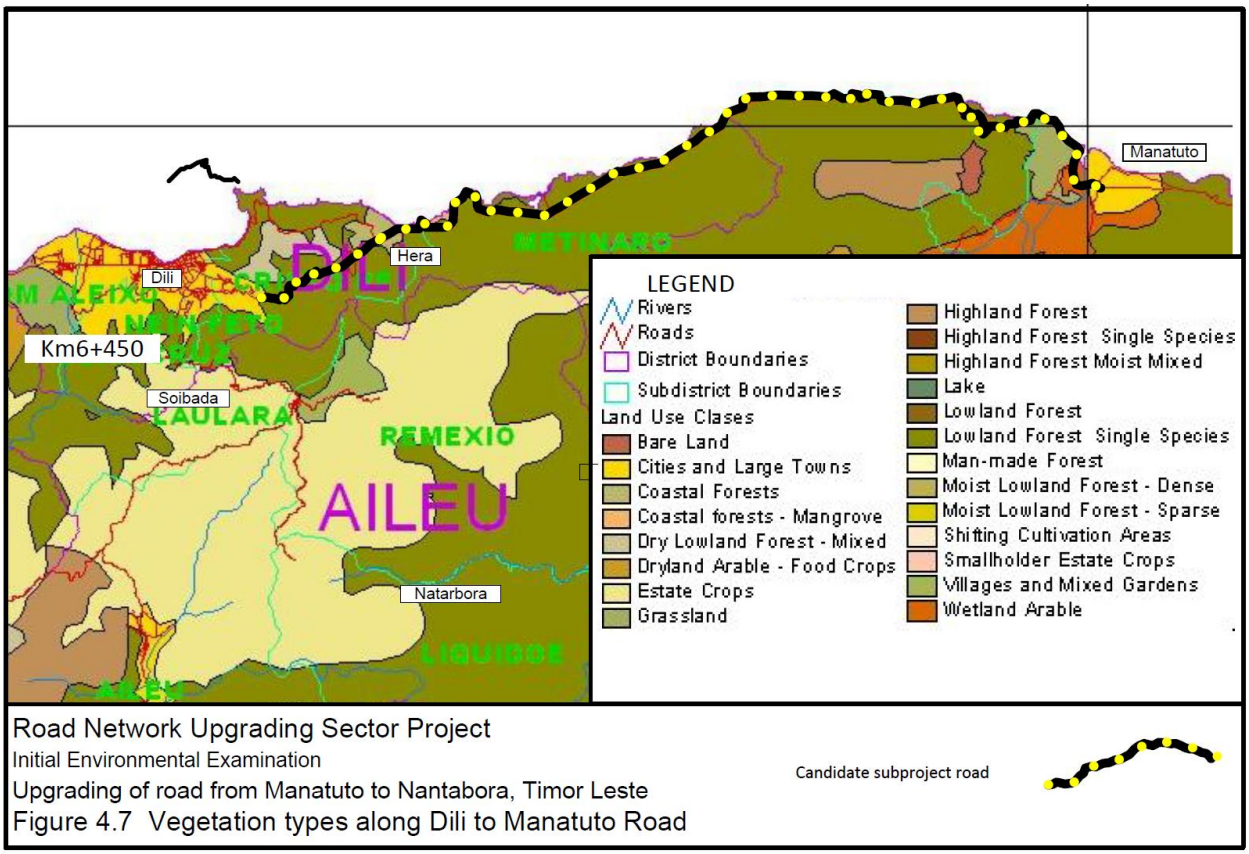
121 Figures 4.6 and 4.7 illustrate the major vegetation and land use patterns near the road from Dili to Manatuto section. As shown, the largest part of vegetation and land use is unused land (wastelend 40%) where grassland is degraded or bare land is dominant in the hill slopes and low flat lands. It extends between Hera and Metinaro and around the bridges in Beheda in Manatuto District. House & garden land use is mostly observed close to the urban areas of Dili and Manatuto. Productive land uses consisting of house/garden, farm and paddy fields are about 35% while forest, bush and mangroves comprise 25%.

Figure 4.6 - Major vegetation and land use pattern near the project



(Source: JICA Preparatory Study, 2011)

Figure 4.7 - Major vegetation types in the project area



(Source: PMU / ALGIS)

4.2.2 Protected Areas and Important Bird Areas

122 **Protected Areas.** Timor-Leste is still in the process of developing its biodiversity protection and conservation legislation and it has acceded to international conventions. The country acceded to the Convention on Biological Diversity (CBD) on 10 October 2006, and became a Party to the Convention on 8 January 2007.

123 With the effort of the government to preserve the remaining diverse land cover, a number of locations have been declared protected. The sites in the project areas are shown Figure 4.8.

New Diatuto and Aitana Mountain protected areas are located in Manatuto District but more than 40km distant from the Project area. Unprotected areas recommended for protection are at Behau, Kuri Mountain and Lamsanak that are north and south of the Project road. Areia Branca (”Cristo Rei”) Beach and hinterland is designated area for protection.

124 **Important bird areas.** There are designated and candidate important bird areas (IBA) in Timor-Leste (Appendix 2) as shown in Figure 4.8. The Important Bird Areas within the administrative region of Manatuto are Mount Diatuto, Mount Makfahik, Mount Sarim and Mount Kuri. Mt Kuri is to the south of the Project road at about Km40. The others are far to the south and more than 40km from the Project.

125 Areia Branca (”Cristo Rei”) Beach and hinterland is protected. This area is situated on the north of the project and is adjacent between about Km3 and Km5 of the alignment. Howeve there is little habitat next to the road as it is dominated by geological instabilities and landslides that will be stabilised under the Project.

126 Timor Island lies in a bio-geographic region known as Wallacea and within the Timor and Wetar Island Endemic Bird Area (EBA). This area has been colonised by birds, animals and plants from both Asia and Australasia, but through long isolation have developed exceptionally high levels of endemism. There are 35 restricted-range species as occurring in the Timor and Wetar Island region; 31 of which are found on Timor Island, 23 are endemic to the EBA and 8 are endemic to Timor. Appendix 3 provides the threatened and restricted-range species recorded in Timor-Leste.

Figure 4.8 – Proposed and Designated Protected Areas

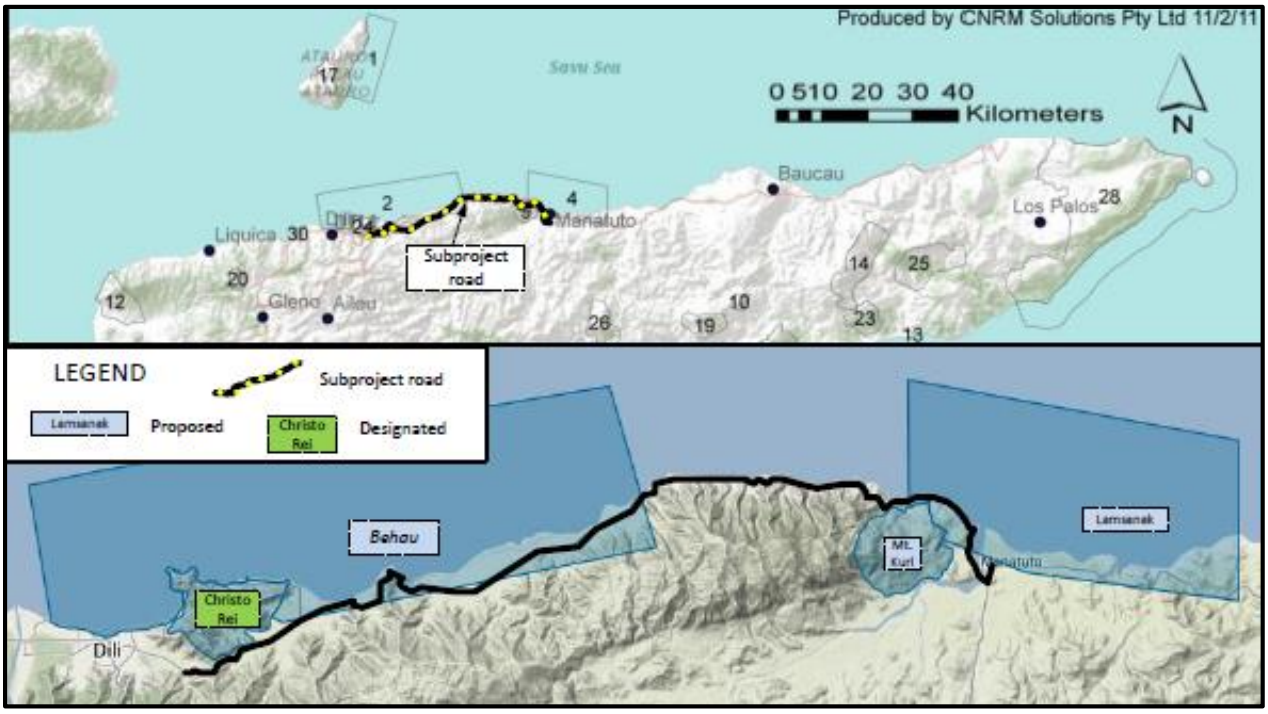
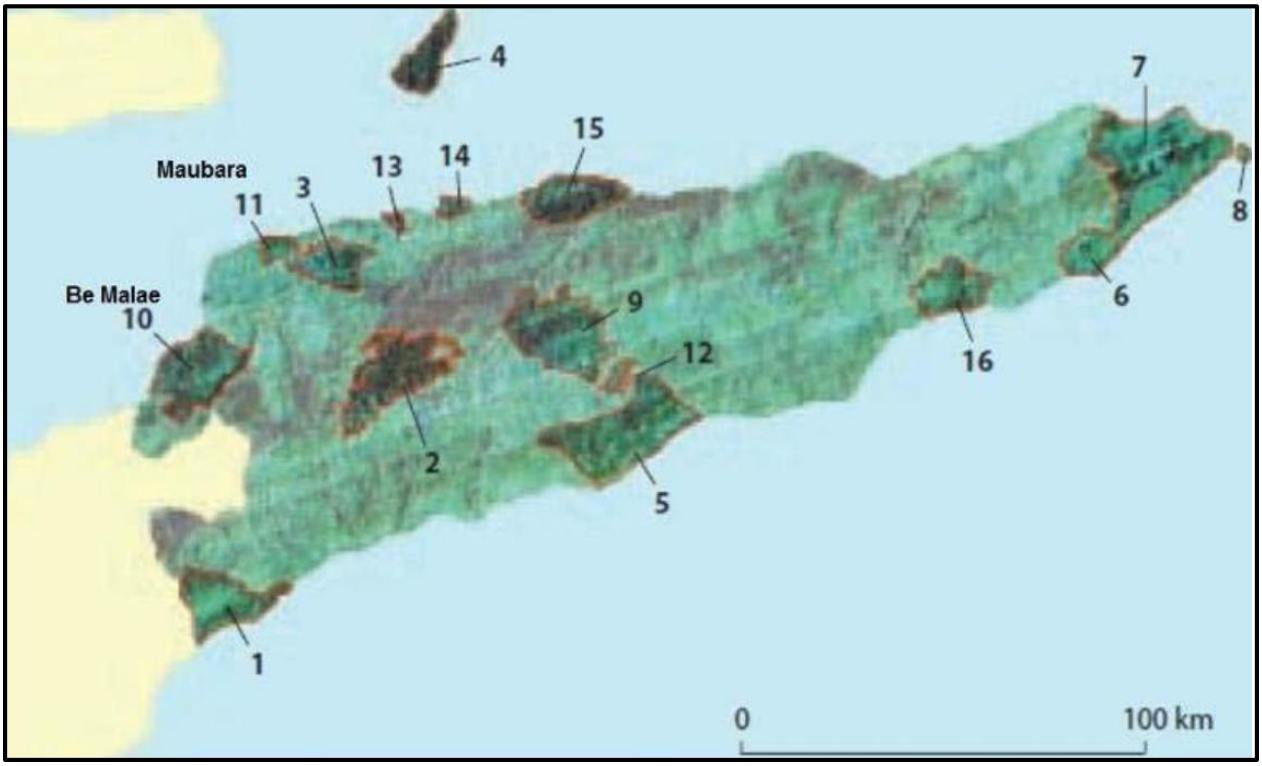


Figure 4.9 – Important Bird Areas of Timor Leste



4.2.3 Fauna

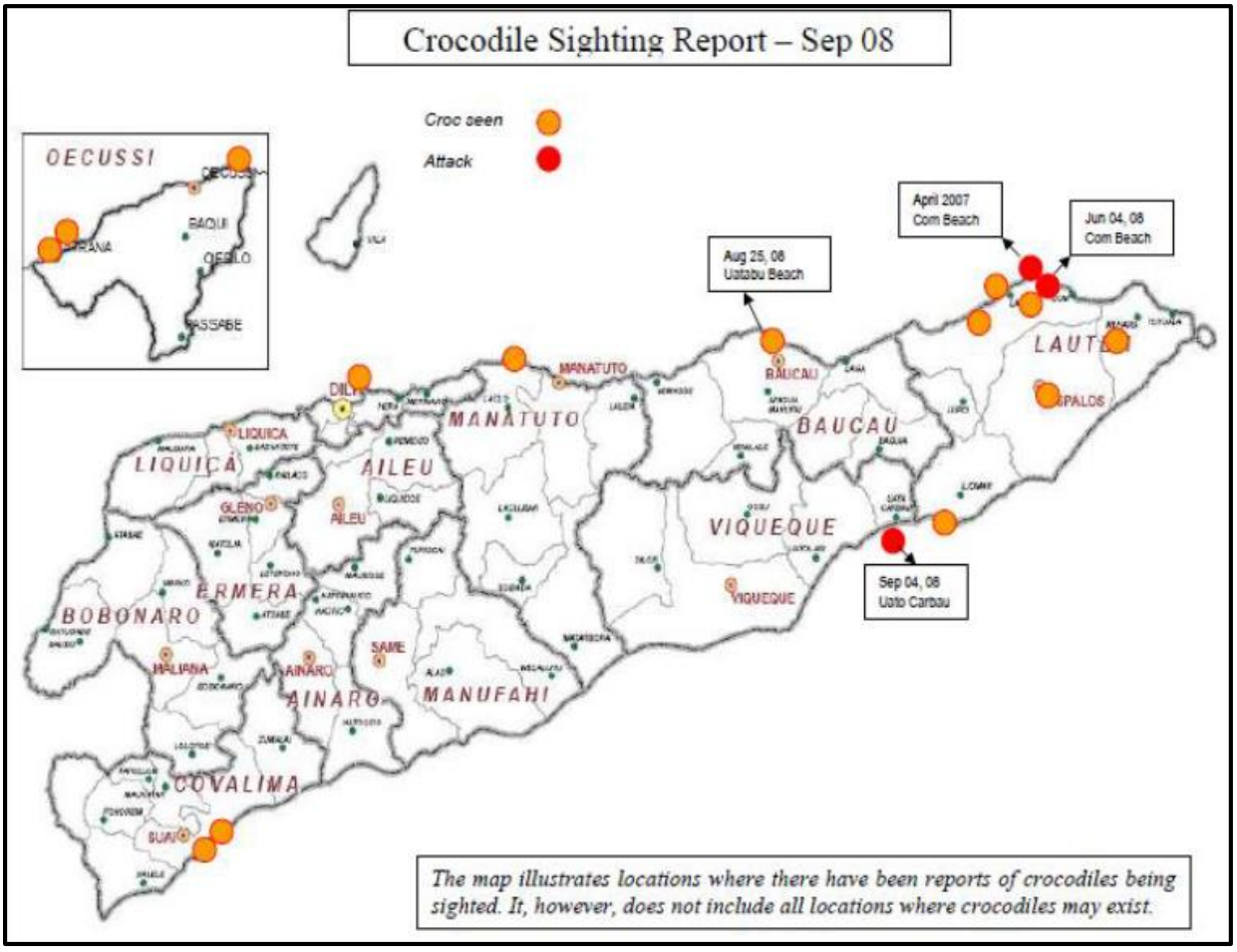
127 **Protected species.** Section 3 of Regulation No. 2000/19 on Protected Places provides the species of animals that constitute endangered species within Timor-Leste are: (i) sea tortoises; (ii) sea turtles; (iii) marine mammals, including bottlenose dolphins, whales and dugongs; (iv) crocodiles; (v) all animal and plant species listed in the Convention on the International Trade in Endangered Species (CITES); and (vi) any other plant or animal species designated as endangered by the Transitional Administrator. Threatened bird species in IBAs in Manatuto District include Turacoena modesta, Treronpsittacea, Cacatua sulphurea.

128 In existing waterways in the Project area, the residents mentioned that there are freshwater species that still exist in some waterways near the alignment. These include Clarius melanoderma, Tilapia Mas, Kabosu, Batabis, swamp eel (Monopterus albus), crab and lobster.

Figure 4.10 –Crocodile seen at Laclo River July 2013

129 The saltwater crocodile (Crocodylus porosus) is known to inhabit the coastal swampy area west of Manatuto at about Km52 close to the Project area (Figures 4.9 & 4.10). This crocodile is in the red list of endangered species compiled by the International Union for Conservation of Nature (IUCN), which gives it the conservation status of “least concern”. Locally the UNTAET 19/2000 regulation currently protects the crocodile because it is listed under CITES. It inhabits the rivers and swamps close to the sea and mangrove area where brackish waters are available. Figure 4.6 shows location of crocodile sightings.

Figure 4.10A – Locations of Crocodile Sightings

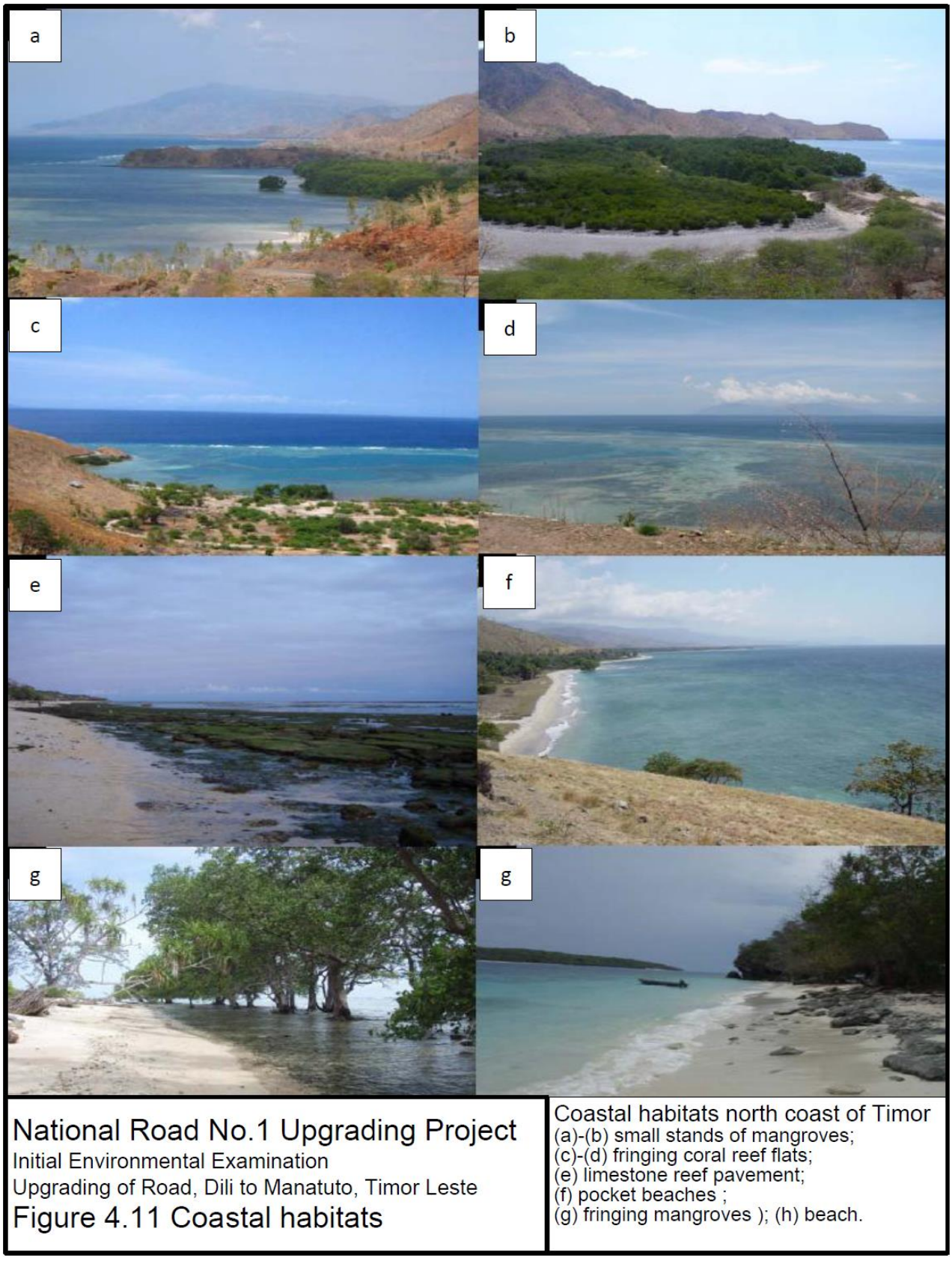


4.2.4 Coastal habitats

130 In the subproject stretch numerous white sandy beaches are interspersed between rocky outcrops. Near the settlements there is more intensive agriculture. The dominant vegetation type along most of the subproject road is arid open woodland. There are also bare areas (including salt flats and beaches) while the vegetation is dominated by savannas, of open shrubland, open woodland and coastal palm forest.

131 The north coast of Timor-Leste is highly valued for its contribution to local livelihoods, particularly through ecotourism and fisheries-based activities. The coastal and marine habitats within the subproject area consist of a mosaic of small stands of mangroves, fringing coral reef flats, limestone reef pavement, beaches, rocky outcrops, coastal ridges, mudflats and salt marshes. Figure 4.12 shows the main coastal and marine habitats along the north coast of Timor-Leste. Photo-reconnaissance was conducted at regular intervals along A01-01 and some photographs are presented in Appendix 4.

Figure 4.11 – Coastal habitats



132 The coastal habitats present spectacular scenery and have ecotourism potential, because of the habitats and wildlife species. Ecotourism is in development in the area that would provide income to local communities in support of conservation. The Nature Conservancy has conducted some studies in 2009. The Department for Protected Areas and National Parks has proposed some coastal areas along the subproject road as conservation sites however the authority has indicated that although the boundaries of the protected areas have not yet been declared the subproject road did not pass through any sensitive parts of the proposed protected areas. The land use may be redefined at a later stage and impacts must be reassessed if necessary at the detailed design stage.

133 Data from detailed surveys of flora and fauna along the subproject road was not available, however some additional information on tree species and habitats has been obtained from broad-scale habitat mapping of the coastal and shallow marine habitats of the north coast of Timor-Leste using satellite imagery. Typically the marine nearshore zone is characterised by a narrow reef flat dominated by seagrass in shallower water and corals in deeper water. The coral reef, seagrass and mangrove habitats on the north coast are not extensive and this imposes limits on available marine resources and levels of harvest (particularly reef fisheries and mangroves).

134 Within the coastal habitats, mangroves are numerous. About 20 mangrove communities are present on the north coast but the biggest stretches in this section of the Project road are mostly on the north side of the road at Km12, Km17, Km25, and Km28. Mangroves on the north coast are present in inlets and areas with calmer, protected waters, mouths of the rivers and streams, and marshy or swampy regions. The mangrove communities include species of Sonneratia alba, Ceriops sp, Avicennia sp, and Rhizophora sp.

135 Firewood is the primary source of energy for most of the population and is widely collected. Mangrove trees are harvested for timber and fuel wood and in some instances hinterland mangroves have been removed. The loss of mangroves remains a coastal management issue and previous estimates indicate that total mangrove cover has been reduced by approximately 30% between 1940-2000, from 9,000ha to just 3,035ha and the coastal mapping has revealed further significant coastal habitat loss (estimated at >40% loss between 2000-2008 making 80% loss of total mangrove habitat since 1940).

136 The coastal woodland (non-mangrove) areas were variable and included both open forest and closed palm land. Although the boundaries between coastal and non-coastal habitats are not always clear, some key species appear to dominate the coastal zone; in particular, Tamarindis indica (Tamarind), Zyzyphus mauritiana (Ber or Jujube) and Borassus flabellifer (Akadiru / Sugar Palm) Corypha utan (Cabbage palm), and Livistona speciosa (fan palm).

137 These habitats are vulnerable to further loss due to increasing pressure (limited extent and over-exploitation) on coastal-marine habitat resources (for fuel, timber and food). This underscores the need for mitigation measures to protect the habitats from exploitation during the project construction.

4.3 Socio-Economic Environment Baseline Conditions

4.3.1 Population and Demography

138 **Population.** In 2010 the national census indicated the total population as 1,066,582 persons and an annual population growth rate of 2.41% since 2004. Dili District has the highest population density followed by Ermera and Manatuto districts. The population of Manatuto is less than 20% that of Dili which has the fastest growing population. Household size has also risen significantly. These large differences imply gaps in livelihood levels and socioeconomic development between the districts. Gender balance in the Project districts is presented in Table 3.7. The figures show no significant difference in gender ratio between these districts.

Table 4.2 Population

No.	Districts	Population		
		Male	Female	Total
1	Dili	124,388 (53.15%)	109,638 (46.85%)	234,026 (100%)
2	Manatuto	21,844 (51.11)	20,898 (48.89)	42,742 (100%)
	Total	**146,232 (52.84%)**	**130,536 (47.16%)**	**276,768 (100%)**

Source: Population and Housing Census, Suco Report Vol. 4, 2010, Government of Timor-Leste

Table 4.3 Population Growth Rate and Average Household Size

No.	Districts	Population		Annual Growth Rate	Average Number of Household Members		
		2004	2010		2004	2010	Difference
1	Dili	173,730	234,026	4.30	5.60	6.70	+ 1.1
2	Manatuto	36,897	42,742	2.28	4.10	6.00	+ 1.9
	Total	**311,375**	**389,061**				

Source: Preliminary Report of Population Census 2010, Government of Timor-Leste

139 The RAP has estimated that a total of 721 households will be affected in one way or another by loss of land, structure, business or fences and livestock. The compensation procedures have been prescribed in the RAP.

4.3.2 Livelihoods and Poverty

140 **Livelihoods.** Most of the population along the Project road relies on agriculture. However, low output, high post-harvest losses, and limited alternative sources of income have resulted in rising numbers of poor people in rural areas. High population growth (about 3% annually) rapid urbanization and a small formal sector have resulted in slow rates of job creation in urban areas and have contributed to poverty rates rising.

141 The main occupations of the people residing within Dili-Manatuto road sections are subsistence farming and livestock raising. Due to the lack of transportation facilities and necessary inputs, farm production is not sufficient to provide their livelihoods throughout the year. Therefore, people have to look for other sources of income such as working as labourers, selling daily goods in kiosks or stalls, working in government and non-government organizations, weaving home crafts from palm leaves and engaging in traditional salt making, etc. Some small quarries are in operation near this Project stretch, mostly for limestone exploitation. Occasional settlements and local carpentry and basket weaving workshops are the main forms of employment after agriculture.

142 About two-thirds of households in Manatuto are engaged in some form of subsistence production: 61% growing cassava, 57% growing coconut, and 62% growing maize. About 30% of the households are involved in production of higher-value crops such as rice, some 56% grow various fruits and 51% grow vegetables, with only a third of households growing coffee. Large livestock typically includes cattle, buffalo, ponies, pigs and goats. The population of 20,100 gives an average of 2.4 heads per household. About 6,063 households in Manatuto raise large livestock. The agricultural sector accounts for 81% of the labor force aged between 15 and 64 years.

143 **Poverty.** Damage to infrastructure and the dislocation of the population during the independence struggle made East Timor's poverty problem worse. Local studies indicate that a higher proportion of the rural population are poor, compared to the urban areas. About 75% of the poor live in rural areas and 25% live in urban areas. Half of the population is reported to live below the national poverty line of $0.88 per day. The electrification ratio for all householders is only 20% and in rural areas 95% of the households are without electricity. About 48% of the

population does not have access to safe drinking water supply, and 69% does not have access to adequate sanitation facilities.

144 The poverty incidence in Manatuto is 73%, which is the third highest poverty rate in Timor-Leste. The district accounts for 4%of the total population but 6% of the total poor. The depth of poverty, i.e. how far below the poverty line the poor fall is 25%. About a quarter of the population does not consume enough food, which, in terms of population suffering from food shortage, gives the district the highest food security in the country.

4.3.3 Agriculture

145 Major crops produced in the project areas are rice, maize, cassava, sweet potato, potato, mung bean, peanut and soya bean. The total area planted with rice is 4,332ha which produce 34,015.8 tons of rice in 2009 (Table 4.4). The area planted with mung bean, soya bean and peanut and its production are shown in Table 4.5.

Table 4.4 - Area and Production of Rice by District

No	District	2006		2007		2008		2009	
		Area (ha)	Production (ton)	Area (ha)	Production (ton)	Area (ha)	Production (ton)	Area (ha)	Production (ton)
1	Dili	67	93,8	0	0	0	0	67	227.8
2	Manatuto	4,091	8,182	3,450	5,175	3,450	5,175	4,265	33,788
	Total	**4,158**	**8,275.8**	**3,450**	**5,175**	**3,450**	**5,175**	**4,332**	**34,015.8**

(Source: MAF, 2010)

Table 4.5 - Area and Production of Vegetables

No.	Districts	Mung Bean		Soya Bean		Peanut	
		Area (ha)	Production (ton)	Area (ha)	Production (ton)	Area (ha)	Production (ton)
1	Dili	7	5	8	6	12	11
2	Manatuto	204	143	38	30	33	36
	Total	**211**	**148**	**46**	**36**	**45**	**47**

(*Source: MAF, 2010)*

4.3.4 Fisheries

146 There are five key village fisheries communities identified by Ministry of Agriculture and Fisheries (http://www.peskador.org) near the beaches along the coast from Dili to Manatuto. The fishing communities at Hera, Metinaro and Manleu are all >300m from the project road and would not be affected by the road works. The road runs closer to the beach at the fishing communities at Behau (80m) and We-Ua(Marmer, 3m). The fishermen use nets and hooks and line to fish in these areas and haul their boats on to the shore when not in use. Care will be needed not to impact on the fishing operations where the road is near the beach.

4.3.5 Industrial Development, Public Utilities and Local Markets

147 There are no major industrial areas along the Project road. There is a power plant in Hera providing electricity to Dili and Manatuto. The naval base of the Defense Force of Timor Leste is also located on the coast at Hera; which has harbour facilities. There is a large power generating station at (Hera Km10) and a distribution substation at Manatuto. Small markets are available in each district along the road that are usually open twice a week.

4.3.6 Access to Social Infrastructure and Facilities

148 **Education.** The types of education establishment in the project districts are shown in Table 4.6. About 47% of the population (18 years and older) of Timor-Leste have not received an education. The 2010 census indicates the percentage of educated population is about 71.94% for Dili District and 51.40% for Manatuto District. The proportion of females without education in the districts is 58% which is higher than that of males (42%). Dili is the centre for higher education due to limited of higher education facilities in the districts.

Table 4.6 – Attendance at Educational Establishments

No	Education level	Dili District			Manatuto District		
		Male	Female	Total	Male	Female	Total
1	Pre-primary	4,716	4,449	9,165	602	215	817
2	Primary	30,137	25,149	55,286	5,891	6,818	12,709
3	Pre-Secondary	13,793	13,197	26,990	1,957	1,961	3,918
4	Secondary	28,155	24,629	52,784	1,684	2,198	3,882
5	Polytechnic/Diploma	1,335	912	2,247	44	100	144
6	University	12,705	8,566	21,271	133	249	382
7	Non Formal	277	335	612	79	40	119
	Total	91,118	77,237	168,355	10,390	11,581	21,971
	% educated			**71.94**			**51.40**

Source: Population & Housing Census, Suco Report Vol. 4, 2010, Government of Timor-Leste

149 **Health and Sanitation.** There are numerous health facilities and hospitals in Dili District. There are 13 health posts and six community health centres in Manatuto District. The nearest hospital is located in Dili. Two-thirds of the population of the Project area has access to basic sanitation (pit latrine, septic tank, flush toilet).

150 **Water Supply.** Dili, Hera and Metinaro have access to drinking water from improved sources making use of collected water in the Dili and Hera area. Manatuto has access to drinking water from improved sources making use of river and spring water in the area. In Manatuto Town, in particular, water is drawn from Laclo River through a perforated pipes encased in wire screens holding infill filter media consisting of gravel and cobles.

151 This is transmitted with the aid of gravitation force to an underground reservoir at the Nunululi pump station which is then distributed to the public through pipe connections. As reported 89% or 6,415 households in Manatuto District still treat the water before drinking through boiling, filtration or adding chemicals.

152 The rivers, their tributaries, streams, rivulets and some small reservoirs in the foothills serve agriculture and domestic water supply. Water levels in the rivers drop to nothing in the dry season. However according to responses in public consultation even in the dry season local people are apparently able to obtain sufficient water for daily activities from spring sources in the hills. Domestic supply is generally obtained from pipes that link to a pump. The pumps either take water from uphill streams or from uphill impoundments and occasionally from wells. River water is used for irrigation and livestock in some areas. These sources are in many cases pumped into a local piped distribution system.

153 **Power.** In Dili district most of the population have access to electrical power. In Manatuto district about 30% of the population have power supply. However along the Project road the electrical power lines on poles from the power stations at Hera and Manatuto provide supply to the villages from the Timor-Leste grid. The National High Voltage Power Transmission Network Project is generally providing sufficient and stable power supply throughout most of the nation

since the end of 2012. The low voltage distribution network runs on poles adjacent to the subproject road and will need to be protected during the works. Many of these poles and lines have been reprovisioned in recent years and are generally relocated away from the road. However before the Project improvement works commence a check should be made to make sure no poles need to be moved and ensure continuity of power supply. The subproject road works must be programmed not to create any impacts on these facilities and maintain security of power supply.

4.3.7 Human Issues and Quality of Life

154 **Cultural and historical sites.** The subproject districts are home to a number of cultural and historical sites but generally these are not near the subproject road.

155 There are two religious prayer sites located quite near the road where statuettes of saints are placed; that people use as sacred praying places. These sites are in Hera between the monument and university (Km 7+400 -15m from road edge - unnamed) and at Beheda (Km 47+600 - Ponte Santo Antonio <3m from road edge). The Ponte Santo Antonio site is a grotto with spring water that was built in the Portuguese era. The community believe in its health giving properties. No rituals are carried out at the site but the community will not agree to move it to another place.

156 There is a traditional ancestral meeting place called "Analidu ". The place is marked by a circular stone plinth structure and was pointed out by the Ilimanu village elders during door to door consultation in 2010. The site is located almost on the beach below the curve at Km39+600. It is accessed from the village of Ilimanu that is just west of the Lainlidum Bridge (Km39+900). According to the village elders the function of plinth structure is to mark the place where villagers meet to discuss important matters and seek guidance from ancestors. The site must be protected during the construction.

157 There is also a cultural structure along the Project road used as a traditional store house as called "Uma Lulik". The house functions as storage for several kinds of crop plant especially rice. The store house is located in Suco Umakaduak, Laclo Sub District west of Beheda (Km47+000).

158 There are two cemeteries visible from the Project road. The largest cemetery is in Hera on the north side (left) at Km9.8 (Figure 4.10). The wall of this cemetery is just 1m from the current road shoulder but the fence to the Hera Power Station yard on the other side is more than 13m away and the power poles are about 11m from the cemetery wall. Another cemetery is located at Km30+600 (right). The nearest grave to the road in this cemetery is set back by 30m from the road.

159 There are commemorative roadside markers in many places that apparently mark the location of fatal vehicle accidents. These are generally about 5m from the edge of the road pavement.

Figure 4.12 – Locations of Religious and Cultural facilities

160 **Schools.** Schools are located at some distance from the road in many locations (e.g. Km9+400, Km18+300, Km33+600, Km9+400) but these are not in proximity to the subproject road. The boundaries of the school playgrounds and gates are generally near to the road (within 10m) but the noise sensitive facades of the school buildings are generally set well back from the subproject road by more than 30m; outside the corridor of direct impact. However schools are particularly vulnerable to construction impacts and the scheduling of works near schools should be scheduled after discussions with the school principals to avoid impacts.

161 **Housing and shops.** Traditional shops and houses are located at intervals all along the subproject road and residential development is spread out in patches along the roads (Figure 4.6). The ROW is not marked out in detail but in the villages the front facades of the houses are generally set back from the road by >10m (outside the corridor of direct impact) with the front fences and walls or temporary structures just a few meters from the existing road edge in some places. Some land acquisition will be required in a few places but relocation of properties or resettlement does not seem to be a significant issue based on observation. Land acquisition requirements are determined in the Resettlement Plan.

162 **Gender.** Men and women share responsibilities. The gender role of men prevails in public affairs and women focus more on domestic affairs, trade and business, financial affairs, education, health care, purchasing goods, home renovation and social and marital affairs. However women are not usually well represented in some sectors of the economy.

163 The project features training and capacity building measures such as gender responsive HIV/AIDS/STI awareness building for Contractors staff in the pre-construction and construction phases. Anti-trafficking will also be reinforced with a contractor awareness programme during the pre-construction phase.

164 The impact of the Project on women should not be significant. Threats to women's ability to trade from stalls will be compensated through the RAP especially during construction. Stalls that are affected by land acquisition will be relocated and compensated. Contractors will be encouraged to employ women wherever possible. Overall there should be positive impacts after construction period with better transportation between towns as the road conditions are improved.

5. Anticipated Environmental Impacts & Mitigation Measures

5.1 Introduction

165 This assessment is based on the detailed drawings produced by the PISC in November 2013. Determining the scale of impact depends on (i) spatial scale of the impact (site, local, regional, or national / international); (ii) time horizon of the impact (short, medium, or long term); (iii) magnitude of the change in the environmental component brought about by the project activities (small, moderate, large); (iv) importance to local human populations; (v) compliance with international, national, provincial, or district environmental protection laws, standards, and regulations; and (vi) compliance with guidelines, policies, and regulations of Timor-Leste and JICA.

166 Where potential major negative impacts are identified, mitigation measures are developed to reduce them to acceptable levels. Where this is not possible, major negative impacts can act as a trigger for further detailed environmental impact assessment. There are several types of impacts to be considered. Direct impacts are caused by a project activity, and occur at the same time and place and can be created during both project construction and operation. Indirect impacts, which may include growth-inducing impacts, are caused by a project activity, or the overall project, and while they are later in time or farther removed in distance, they are still reasonably foreseeable. The indirect impacts for this project are expected to be generally positive in the form increased economic activity as a result of improved transportation. The cumulative impacts of the improvement of the road network, that this project forms part of, will also be beneficial in the medium to long term albeit with some short term disruption to some short sections of roads during construction.

167 Short-term impacts, like the noise and fumes associated with heavy equipment occur during road construction and are usually without long-lasting effects. Long-term impacts, on the other hand, could affect regional land use and development patterns and even mobility and migration. The project, however, is limited to relatively small-scale road rehabilitation works with additional maintenance (as required) for an existing road. There is little scope for long-term environmental impacts arising from such works and measures in the Project area.

168 Impacts created during construction activities are dependent on a number of factors including:

i) the temporary use of land and its rehabilitation post-construction;

ii) ‘best practices’ being employed during construction activities;

iii) coordination and cooperation with local authorities in terms of impact management;

iv) strict enforcement of environmental clauses and conditions included in project bid documents, the contract and technical specifications; and

v) adherence to the EMP contained in the SEIS and construction environmental management plan (CEMP) prepared by the contractor and submitted to, and reviewed by, PMU.

169 This process is explained further in Section 8.

5.2 Pre-Construction Impacts

170 Pre-construction impacts are limited to the following activities: climate change adaptation measures (incorporated into design); vegetation removal during surveying and demarcation of corridor and extent of works; site clearance, digging and excavations; and, restrictions on land use associated with foregoing and/or need for resources and materials. Planning for materials extraction and identification legitimate sources of materials must also take place in the pre-construction please.

5.2.1 Climate Change Adaptation and Resilience

171 Technical assistance provided to GOTL in Preparing the Road Network Development Project Climate Change Assessment (ADB TA 7100-TIM) identified some significant risks to infrastructure arising from climate change. In that study the most significant risks to the infrastructure, arising from the anticipated hydro-meteorological changes, were anticipated to be from sea level changes and increased storm surge wave height and increased intensity of short duration rainfall.

172 The report proposed an integrated solution for each of the roads under that study that are generally applicable to other national roads in Timor-Leste. The proposed integrated adaptation measures include both civil-engineering and bio-engineering solutions for each of the sample roads. Together, these are expected to provide the most efficient and appropriate set of treatment options for the Project road to cope with anticipated (projected) climate change as well as bringing the roads up to a maintainable condition.

173 Considering sea level changes and storm surge, in low lying coastal areas the combined effects of higher sea levels and larger storm induced waves will increase the risk of damage to the road infrastructure. For the purpose of the TA7100 study the altitude of low lying areas is defined as less than or equal to 2m. The main impact of this hazard is erosion of the embankment by wave action and the frequency and severity of flooding. Flooding being due to inundation by seawater at high tide and storms and surface runoff after intense precipitation and the backwater effect from the high sea level. The impact of flooding is to saturate road pavement, embankment and sub-grade material leading to structural failure. In order to assume a conservative case and make an assessment of a worst case situation a trigger of 2masl or less was used to identify low lying areas near the coast potentially subject to flooding. These areas have been further investigated in the detailed design stage.

174 Where the intensity of short duration rainfall events is increased, runoff significantly increases in small catchments. The main impact of this hazard is an increased flooding incidence due to insufficient hydraulic capacity of the longitudinal and transverse drainage systems. While the extent of the flooding may be small, the impact of the flooding is significant in the area inundated. The main impacts are increased erosion, safety issues associated with water on the carriageway and weakening of the pavement due to saturation. The increased erosion will arise from the higher volume of runoff.

175 Erosion is already a serious problem in Timor-Leste due to the steep topography, the shallow soils and poorly consolidated geological sediments. The shallow soils, especially on the steep topography, result in poor vegetation cover that increases runoff and provides little protection against erosion. The steep topography increases runoff and reduces the time of concentration for individual catchments. The poorly consolidated soils are susceptible to erosion due to the age of the geological formations and ongoing uplift. The increased runoff due to the higher precipitation and the shift in precipitation from the drier months to wetter months will exacerbate the problems. The main impacts of the increased erosion will be higher sediment loads and the risk of damage to the drainage system. The higher sediment loads will increase the deposition of sediment in the drainage system. The intensity of short duration precipitation events and increased runoff is a significant concern in this Project.

176 Engineering adaptation strategies have been developed for each significant infrastructure risk. These strategies focus on protecting the infrastructure from the impact of the environmental hazards resulting from climate change. The strategies involve a combination of capital and maintenance works to ensure a reliable and safe transport link is provided.

177 Sea level changes and increased storm surge wave height are a potential concern for this Project because the elevation is less than 4masl on some places. Therefore the PMU and design and supervision consultant (PISC) supporting the PMU will need to include strategies to combat sea level changes and increased storm surge wave height.

178 Therefore the PISC has included the following strategies in the detailed designs to combat sea level changes and increased storm surge wave height for the Project as a whole:

I. Realignment: Where the elevation of the road is so low that the sea will intrude on both sides of the road the preferred strategy is to relocate the road away from the coast. Where horizontal realignment is not an option, realign the vertical alignment to raise all areas of the road above 2masl.
II. Erosion protection: Where the road will be subject to risk of erosion from wave action the preferred strategy is to construct an earth levee bank with rip rap protection or a sea wall against erosion by wave action.
III. Increased maintenance: The quantity and frequency of maintenance is increased in response to the faster rate of physical deterioration.

179 The PMU and PISC have included the following strategies in the detailed designs to combat more intense short duration precipitation in areas identified as vulnerable.

- Increase capacity of transverse drainage system: Where the intensity of short duration precipitation events increases, the capacity of transverse drainage system will be increased by providing additional relief culverts.
- Improved longitudinal drainage: The ability of the longitudinal drainage systems to accommodate the higher quantity of runoff due to the higher precipitation rates will be improved by lining drains and providing larger drains.
- Erosion protection: Areas in the vicinity of the road, at risk of erosion, will be protected using bio-engineering techniques. In addition, steeply graded streams in the vicinity of the road will be provided with check dams to reduce sediment loads on the road drainage system.
- Increased maintenance: The quantity of maintenance is increased in response to the faster rate of physical deterioration.

5.2.2 Vegetation Removal during Surveying and Demarcation

180 Minor impacts upon terrestrial habitats and flora of the Project area are expected as a result of the surveying and demarcation of centre-line. Surveying and demarcation will cause minor degradation of local ecology through the clearance of small areas of this vegetation but in order to minimise loss of trees the specimens that are not within the paved area or hard-shoulder but are in the embankment will not be cut unless for justifiable engineering or safety reasons.

181 Plant species present within the impact area are either introduced species or ubiquitous native species, which are highly tolerant of disturbances. However there is no vegetation that has any conservation significance nor is it representative of the original vegetative cover. There are some gardens, plantations and individual trees, on or very close to the road along the shoreline that could require removal. The RAP has estimated that households will loose total of 3.387 timber and fruit trees that will be affected in one way or another by widening of the road. However experience on other projects being implemented by the proponent shows that not all specimens in the ROW need to be cut. Avoiding trees in the embankment as far as possible will reduce this number further. The compensation procedures have been prescribed in the RAP.

182 Measures to be included in the project to ensure minimization of impacts from vegetation removal include:

- Vegetation clearance during surveying and demarcation activities, especially of trees along the river banks and road-side, will be minimized. Major trees (especially in suco areas) to be removed will be clearly marked, only marked trees will be removed;

- In order to minimise loss of trees the trees that are not within the paved area or hard-shoulder but are in the embankment will not be cut unless for justifiable engineering or safety reasons;
- The contractor will be responsible for providing adequate knowledge to construction workers in relation to existing laws and regulations regarding illegal logging. Contract documents and technical specifications will include clauses expressly prohibiting the felling of trees, not requiring to be cleared by the project, by construction workers for the term of the project; and
- Construction workers will be informed about general environmental protection and the need to avoid un-necessary felling of trees wherever possible.

5.2.3 Accidental Discovery of Physical Cultural Resources

183 Any site clearance, digging and excavation activities undertaken during pre-construction can un-earth physical cultural resources (PCR) including sites. In the event this occurs, work shall cease immediately and the relevant authorities shall be informed. Activities shall not re-commence until the authorities have signed-off that the site/resources have been dealt with appropriately and that work may continue.

184 The Contractor shall be responsible for complying with the requirements of authorities, and the PMU shall monitor the same. The contractor will include a section on “chance finds” in the Contractors Environmental Management Plan (CEMP). Mitigation measures for potential impacts on PCR include:

- Site agents will be instructed to keep a watching brief for relics in excavations.
- Should any potential items be located, the PMU will immediately be contacted and work will be temporarily stopped in that area.
- The PMU with the assistance of the PISC will determine if that item is of potential significance and contact MPW to pass the information to the relevant department in GOTL (i.e. Secretary of State for Culture) who will be invited to inspect the site and work will be stopped to allow time for inspection.

185 Until GOTL has responded to this invitation work will not re-commence in this location until agreement has been reached between GOTL and PMU as to any required mitigation measures, which may include structured excavation.

5.2.4 Restrictions on Use of Land

186 A resettlement framework has been prepared for the Project overall. A resettlement plan for this Project sets out the resettlement impacts and measures required to mitigate them including compensation for temporarily or permanently affected land and resources. Provided that the approved resettlement plan is implemented, resettlement impacts including restrictions on use of land will be mitigated.

5.2.5 Mobilization of the Contractor and Construction Camp

187 The mobilisation of the contractor and initial establishment of site office, works yard and work sites will bring about interaction between local people and construction workers. Prior to contractor mobilization to the site, PMU will work with the contractor to establish the communications protocol between the project and communities as per the Project’s communications plan. The contractor will identify one member of their staff to be the liaison between the suco chiefs and elders and contractor, as well as between the contractor and PMU.

188 The contractor will adopt good management practices to ensure that fuels and chemicals, raw sewage, wastewater effluent, and construction debris/scarified material is disposed of in

controlled conditions to reduce the risk of contamination. Measures to minimise disturbance by construction workers and presence of the works site/area include:

- Suco (village) protocols discussed with workers as part of awareness and mobilization training;
- The contractor is to ensure that workers' actions outside work site are controlled and Suco codes and rules of conduct are observed at all times;
- The contractor will identify one member of their staff to be the liaison between the Suco chiefs and elders and contractor, as well as between the contractor and PMU;
- Worker camp location and facilities will be located at least 500m from settlements and agreed with local communities and facilities approved by PMU and managed to minimize impacts;
- Adequate signage and security provided at the site office and works yard and prevention of unauthorized people (especially children) entering the area;
- Hire and train as many local workers as possible by using labour from each suco as the work proceeds from suco to suco;
- Provide adequate housing for all workers at the construction camps and establish clean canteen/eating and cooking areas;
- Construction camp(s) will be established in areas with adequate drainage in order to prevent water logging at the camp and formation of breeding sites for mosquitoes in order to facilitate flow of the treated effluents;
- Potable water, clean water for showers, hygienic sanitation facilities/toilets with sufficient water supply, worker canteen/rest area and first aid facilities will be provided. Separate toilets shall be provided for male and female workers;
- Portable lavatories (or at least pit latrines in remote areas) shall be installed and open defecation shall be prohibited and use of lavatories encouraged by cleaning lavatories daily and by keeping lavatory facilities clean at all times;
- Wastewater effluent from contractors' workshops and equipment washing-yards will be passed through gravel/sand beds and all oil/grease contaminants will be removed before discharging it into natural streams. Oil and grease residues shall be stored in drums awaiting disposal in line with the agreed waste management section of the EMP;
- Predictable wastewater effluent discharges from construction works shall have the necessary permits from NDE and local authorities before the works commence;
- As much as possible, food shall be provided from farms nearby or imported to the area. Bush meat supplies from protected areas will be banned to discourage poaching. Solid and liquid wastes will be managed in line with the provisions of the waste management section of the EMP;
- Use of guns and hunting equipment by workers will be banned and workers will be dismissed for taking or using green timber or hunting or being in possession of wildlife (see 5.4.1);
- Entry to the protected, IBAs and/or sensitive areas (beaches, mangrove areas) by workers will be banned;
- Provision of adequate protection to the general public in the vicinity of the work site, including advance notice of commencement of works, installing safety barriers as required by villagers, and signage or marking of the work areas;

- Provision of safe access across the works site (particularly during construction of drains) to people whose suco and access are temporarily affected during construction works;
- At all times workers should respect village and land owner's boundaries and recognize and follow village rules and terms of conduct (especially addressing women and elders);
- Avoid damage to productive trees and gardens, water resources and springs;
- As per provisions set out in Poverty and Social Assessment, implement HIV/AIDS/STIs awareness and prevention for the contractor's workers and adjacent communities;
- Land used for campsites shall be restored to the original condition as far as practicable and the area shall be planted with appropriate trees / shrubs as soon as practicable after it is vacated and cleaned; and
- Work and camp sites will be cleaned up to the satisfaction of and local community after use.

5.2.6 Contractors Environmental Management Plan

1. Preparation by the Contractor EMP (CEMP)

189 MPW/PMU shall ensure that the Contractor will be primed and instructed of the need to prepare a site specific Contractor EMP (CEMP) for construction stage impacts by including the EMP (including Table 8.3 of this SEIS) in the bidding and contract documentation for civil works and by providing disclosure of the IEE. Prior to commencement of construction works the Contractor will prepare method statements or CEMP (based on the EMP) on how the Contractor will implement the mitigation measures in the EMP. The site specific information will legitimate include material The content of the CEMP mitigation measures is included in the construction mitigation section. The CEMP will demonstrate the manner (location, responsibilities, schedule/timeframe, budget, etc.) in which the Contractor will implement the mitigation measures specified in the EMP. The CEMP will be updated as necessary to respond to any unanticipated impacts that may arise as the subproject is implemented.

190 The CEMP will be agreed in advance with MPW/PMU in the project preconstruction phase. The requirements in the contract will include full implementation of the agreed CEMP based on the EMP in this IEE. MPW shall require the Contractor to engage capable and trained staff and / or site agent to take responsibility as Environmental and Safety Officer (ESO) for the environmental management at the working level. One month before construction commences the Contractor will demonstrate to PMU that the CEMP will be properly resourced and a qualified/experienced safety officer has been identified by the Contractor as per the tender.

191 The PMU will audit the effectiveness of the implementation of the EMP for the design stage mitigation by DSC and contractor's implementation of the CEMP for construction phase and review mitigation measures as the subproject proceeds. The effective implementation of the CEMP will be audited as part of the loan conditions and the executing agency (MPW) will be prepared for this.

192 The following sections or method statements shall be included in the CEMP based on the EMP and the CEMP shall be prepared by the Contractor in the preconstruction stage for approval by PMU and implementation by the Contractor:

A) Waste Disposal (covering spoil disposal, general waste and hazardous waste);
B) Quarries, borrow areas and construction materials management;
C) Blasting and vibration;
D) Asphalt, hot mix plant, rock crushers and bitumen supply;
E) Erosion control and runoff;
F) Bridge repairs and river protection;
G) Water contamination prevention;

H) Dust and noise minimization;
I) Tree cutting and replanting;
J) Enhancement planting;
K) Construction camp operations, sanitation and diseases;
L) Power and utilities protection;
M) Drainage system, irrigation and water resources;
N) Safety precautions - workers and public;
O) Temporary traffic management; and
P) Accidental discovery of archaeological assets, sites or resources.

A) Waste Disposal (general waste, spoil disposal and hazardous waste)

193 The Waste Disposal section of the CEMP will include methods for waste management and spoil disposal for handling, storage, treatment, transport and disposal of solid and liquid wastes, hazardous materials, hazardous wastes and excavation spoils. The CEMP will also provide details of a trip ticket system to ensure that Contractor dispose excavation spoils in approved areas. Such system will be designed so that the PMU and DSC could readily monitor the volume and disposal site of excavation spoils, and to ensure that the total volume of spoils disposed will not exceed the maximum capacity of disposal sites approved by local authorities.

194 **The Waste Disposal - General Waste** section of the CEMP will include method statements and consideration of all matters related to general solid and liquid waste disposal including:

i) Expected types of waste and quantities of general waste arising;
ii) Waste reduction, reuse and recycling methods to be employed;
iii) Agreed reuse and recycling options and locations for disposal / endorsement from NDE and local groups;
iv) Methods for treatment and disposal of non-hazardous solid and liquid wastes;
v) Methods of transportation to minimize interference with normal traffic;
vi) Establishment of complaints management system for duration of the works;
vii) Programme for waste disposal at the areas designated in the Environmental licanse (e.g. Tibar landfill etc if required by NDE).

195 **The Waste Disposal - Spoil Disposal** section of the CEMP will include method statements and consideration of the following:

i) Locations and quantities of spoil arising.
ii) Agreed locations for disposal / endorsement from NDE and local groups.
iii) Methods of transportation to minimize interference with normal traffic.
iv) Establishment of acceptable working hours and constraints.
v) Agreement on time scale and programme for disposal and chain of custody.
vi) Agreement on publicity/public consultation requirements and use of signed waiver (for disposal on private land and advance permission / signing etc.).
vii) Details of a trip ticket system to ensure that Contractor dispose excavation spoils in approved areas. Such system will be designed so that the PMU and DSC could readily monitor the volume and disposal site of excavation spoils, and to ensure that the total volume of spoils disposed will not exceed the maximum capacity of disposal sites approved by local authorities.
viii) Programming issues including the time of year and available resources.
ix) Discussion of the PMU/MPW inspection/monitoring role.

196 **The Waste Disposal - Hazardous Waste** section of the CEMP will include method statements and consideration of all matters related to hazardous solid and liquid waste disposal including:

i) Methods for collection, handling, treatment and disposal of solid and liquid hazardous wastes.
ii) Establishment of regular disposal schedule and constraints for hazardous waste.
iii) Discussion of the PMU/MPW inspection/monitoring role.
iv) Programme for waste disposal at the areas designated in the Environmental License (e.g. Tibar landfill etc if required by NDE).

B) Quarries, borrow areas and construction materials management.

197 In the preconstruction stage the Contractor will review the requirements for provision of construction materials and include it in the Quarries, Borrow Areas and Construction Materials Management section of the CEMP. The CEMP will seek, as far as is reasonably practicable, to minimize the use of non-renewable resources and rock based materials and also to balance cut and fill requirements and contribute to the minimization of impacts due to extraction of rock based materials. As a first priority, where surplus materials arise from the removal of the existing surfaces these will be used elsewhere on the subproject or other subprojects for fill (if suitable) before additional rock, gravel or sand extraction is considered. The TA team2 has estimated that almost 100% of cut materials may be reusable as bulk fill in many areas.

198 The Quarries, Borrow Areas and Construction Materials Management section of the CEMP will include method statements and details of arrangements to be made to facilitate the timely production and supply of construction materials to avoid impacts due to unnecessary stockpiling outside the subproject site.

199 The CEMP will include as a minimum consideration of the following:

i) Required volume of materials, potential sources and estimated quantities available.
ii) Impacts to identified sources and availability.
iii) Excavated slope material for reuse and recycling methods to be employed.
iv) Required endorsements that should be obtained by the Contractor from NDE and local groups for use of legitimate sources.
v) Measures to be employed to mitigate nuisances to local residents.
vi) Methods of transportation to minimize interference with normal traffic.
vii) Constraints of regular delivery schedule to reduce stockpiling on site.
viii) Programme for reuse of slope excavated material for reuse
ix) Programme for delivery of quarry and borrow materials.
x) Discussion of the PMU/MPW inspection/monitoring role.
xi) Agreement on publicity/public consultation requirements.

C) Blasting and vibration.

200 There is no reason to expect that blasting will be required at this stage however it may be required in special circumstances. Alternatively the Contractor may wish to keep open the option to use blasting if unexpected conditions are encountered that prevent the use of powered mechanical equipment to remove rock. In the event that blasting is to be considered, even if only in special circumstances, the Contractor shall include a section on Blasting in the CEMP that will include method statements and consideration of the following matters:

i) Use of only controlled blasting methods in line with the rules set down by the local authorities and NDE.
ii) Limitations to permissible times and intervals between blasting
iii) Details of the prescribed manner of blasting and precautionary measures to be included.
iv) Prior notice to all local residents.
v) Undertaking prior condition surveys of residences within 500m of the blast sites. All residents within 500m of the blast sites.
vi) Measures to keep LGUs and public informed of the plans and progress of blasting.

vii) Measures to for temporarily evacuated and provisions for alternative accommodation if required.
viii) Discussion of the PMU/MPW inspection/monitoring role.

D) Asphalt, hot mix plant, rock crushing and bitumen supply

201 The rock crushing activities will generate noise and dust and pavement works will generate gas and odour from the asphalt hot-mix plant and noise from the compaction of the pavement. The Contractor shall include a section on Asphalt, hot mix plant, Rock crushing and Bitumen supply in the CEMP that will include method statements and consideration of the following matters:

(i) Estimation of volumes of rock based material and asphalt required.
(ii) Use of existing cement batching, aggregate and hot mixing plant or proposals for new installations.
(iii) Locations of cement batching and aggregate mixing plant as far as possible from settlements and habitation.
(iv) Locations of cement batching and aggregate mixing plant in agreement with the local town or municipality and to be approved by PMU.
(v) Licences for operation of plant and approval from the relevant local authority and NDE.
(vi) Dust suppression equipment to be installed.
(vii) Proposals for storage, handling, use and disposal of residual bitumen in line with the waste disposal section of the CEMP.
(viii) Duration and timing of the proposed operation and cement batching and aggregate mixing plant.
(ix) Discussion of the PMU/MPW inspection/monitoring role.

E) Erosion control and runoff

202 Erosion Control section of the CEMP will include method statements to ensure that construction works will not cause excessive runoff and siltation of adjacent waterways within the subproject site. The Erosion Control section of the CEMP and slope stabilization measures in the detailed designs will be implemented and maintained by the Contractor during construction to protect the works. The CEMP will have sufficient provisions to ensure stabilization of cut slopes and other erosion-prone areas, minimize hydrological impacts, flooding and erosion of river banks and adjacent areas and to protect the works under construction.

1. The CEMP will include the following to control erosion and runoff:
   i) Climate and rainfall for the area and checking weather forecasts.
   ii) Terrain and typical locations particularly susceptible to erosion and runoff.
   iii) Protection of the works and potential impacts to the environment.
   iv) Erosion control methods to be employed, locations and installation timing.
   v) Limits to stockpiling on sites near waterways and irrigation channels.
   vi) Discussion of the PMU/MPW inspection/monitoring role.
   vii) Agreement on publicity/public consultation requirements.

F) Bridge Repairs and River Protection

203 The subproject proposes to repair bridges and replace or construct new culverts Careless construction and poor materials control can cause physical blockage to rivers and streams resulting in adverse impact on water quality and flow regime. Therefore the CEMP will have sufficient provisions to ensure control physical aspects of Bridge Repairs and River Protection including the following matters:

i) Programme for work near rivers (for the dry season as far as practicable).
ii) Avoidance of blocking rivers and streams through improper disposal of rock based materials.
iii) Methods to be used to avoid dropping bridge sections or culvert into rivers/streams.

iv) Covering of open surfaces to reduce runoff and bank erosion.
v) Dewatering and cleaning of cofferdams.
vi) Location of settling basins or containment units.
vii) Discussion of the PMU/MPW inspection/monitoring role.

G) Water contamination prevention

204 Work near rivers and streams has the potential to cause water pollution. In order to prevent water contamination the CEMP will include coverage of the following to be undertaken by the Contractor:

i) Disposal of solid waste from construction activities away from rivers.
ii) Design of storage areas for lubricants and other construction storage/stockpiles.
iii) Handling of stockpiled materials to avoid leakage and prevent runoff.
iv) Location of stockpiling or borrow sites and storage for hazardous substances.
v) Responses to complaints, complaints monitoring and investigation of water quality.
vi) Scheduled work duration in near rivers shall be as short as possible.
vii) Immediate stabilization of slopes after works are completed.
viii) Prohibition of washing of machinery and vehicles in surface waters.

H) Dust and Noise minimization

205 Earthworks and rock crushing activities will cause dust impacts. All construction works will involve some noisy activities and it is good practice to control dusty materials and noisy activities at source so that nuisances do not occur. The Dust and Noise control to section of the CEMP will include method statements and minimize impacts to sensitive receptors (residential areas, schools, hospitals, etc.) due to construction works, sourcing and transport of construction materials, and other project-related activities. In order to prevent dust and noise nuisances the Dust and Noise control to section of the CEMP will include the following:

i) Use and availability of water for damping down dust in wet and dry seasons.
ii) Alternative use of dust barriers / segregation between the works and sensitive receivers.
iii) Locations and timing of works within 500m of settlements including night works.
iv) Reporting of complaints to PMU in line with the grievance redress mechanism.
v) Compliance of heavy equipment and machinery with best practice on pollution.
vi) Ban on smoke belching vehicles and equipment.
vii) Covering vehicles transporting loose construction materials.
viii) Speed limits on vehicles unpaved areas near works.
ix) Methods to reduce the need for large stockpiles and planning of supplies of as per the Construction Materials Management section of the CEMP.
x) Location of stockpiles and enclosing or covering when not in use.
xi) Description of any monitoring proposed by Contractor in addition to the PMU/DSC monitoring role.

I) Tree Cutting and Replanting

206 All areas either side of the subproject road are already disturbed. Near the settlements ths s due to clearance for agriculture. In many other places the natural vegetation inside and immediately outside the ROW for a few metres has been cut down to make way for power distribution poles that were set out in recent years. The habitats outside this corridor are vulnerable to further loss due to increasing pressure (limited extent and over-exploitation) on coastal-marine habitat resources (for fuel, timber and food). This underscores the need for mitigation measures to protect the remaining habitats from exploitation during the project construction.

207 Tree-cutting and Replanting section of the CEMP will include method statements in line with the usual procedures of DRBFC (agreed if necessary in advance with the DOF) to ensure there is no indiscriminate tree-cutting by clearly defining areas where vegetation removal is

necessary. To be based on subproject requirements and that replanting or remuneration paid to local tree owners shall be completed after consultation with owner and compensation as per Resettlement Framework and usual DRBFC process (in-kind following consultation and negotiation). The Tree-cutting and Replanting section of the CEMP will include method statements line with the agreed procedures for:

i) Advance notice to PMU on any trees that need to be cut to complete the detailed designs.
ii) Confirmation and identification of trees to be cut and locations by chainage following the detailed designs.
iii) Planning cutting and any replanting and compensatory planting with the local forest authority and District DRBFC.
iv) Ban use of wood as a fuel for the execution of any part of the subproject works.
v) Avoiding construction camps, asphalt mixing plants, material storage sites in forest or mangrove areas or protected areas.
vi) Control of accidental fires and ban on burning of waste.
vii) Prohibitions on workers entering mangroves and forests for taking firewood.
viii) Justification for tree cutting as an alternative to road realignment.
ix) Obtaining permissions from land owners, authorities, and permits from NDF for cutting.
x) Methods for marking, protection of uncut cut trees and limitations to cutting.
xi) Methods and timing for safe cutting to minimize interference with normal traffic.
xii) Methods to remove trees cut timber and avoid stockpiling cut brushwood on site.
xiii) Methods to avoid under cutting adjacent tree lined slopes.
xiv) Preliminary programme for cutting trees and enhancement planting (to be updated in progress reports).
xv) Discussion of the PMU/MPW inspection/monitoring role.
xvi) Agreement on publicity/public consultation requirements.

J) Enhancement planting

208 Environmental enhancements such as such as on-site planting at used worker camps, or off-site tree planting for long term soil stabilization included in the detailed designs will be identified in the CEMP by the Contractor. The enhancement Planting section of the CEMP will include:

i) Locations of enhancement planting required in detailed design.
ii) Provide enhancement planting at construction worker campsites after use.
iii) Maintenance and monitored for planted specimens as agreed with the PMU
iv) Discussion of the PMU/MPW inspection/monitoring role.

K) Construction camps, sanitation and diseases

209 The operation of the Contractor worker camps will cause impacts from generation of raw sewage, wastewater effluent, and construction debris/scarified waste materials for disposal, air and noise pollution. Waste and control of other impacts will be in in line with other section s of the CEMP. Additional measures included in the construction camps section of the CEMP will include:

i) Proposed location of construction worker camps to be agreed with local communities and PMU.
ii) Hiring and training of local workers.
iii) Provisions to be made for potable water, clean water for showers, hygienic sanitation facilities/toilets, worker canteen/rest area and first aid facilities.
iv) Provisions for adequate accommodation for workers.
v) Provisions for wastewater effluent capture and treatment from worker facilities and Contractor' workshops and equipment washing-yards before discharging.
vi) Solid and liquid waste managed in line with waste disposal practices agreed in the CEMP.

vii) Use of borrow pits and natural depressions for construction camp waste disposal and options for completely or partially recycling wastes.
viii) Provision of food from local farm / suppliers.
ix) Ban on hunting and bush meat supplies to discourage poaching gathering green timber.
x) Ban on entry to the mangrove areas, forests and protected areas by workers.
xi) Provisions to clean construction worker camp sites after use and dispose of all waste materials to approved disposal sites.
xii) Provisions to restore land used for campsites and the area be planted with appropriate trees / shrubs as and enhancement.

210 Sanitation and diseases will mainly be concerns at the construction worker camps. The contractor will ensure that additional measures to maintain hygienic conditions in the camps and implement the social and health programmes for the subproject are included in the CEMP:

i) Measures to prevent proliferation of mosquitos.
ii) Temporary and permanent drainage facilities to prevent the accumulation of surface water ponds.
iii) Implementation of the social and health programmes for the subproject (e.g. HIV-AIDS education as required in line with social programmes.

L) Power and utilities protection and reprovisioning

211 The Power and utilities protection and reprovisioning section of the CEMP will include method statements and to minimize interruption to power, water supply and telecommunications to protect them during the works. The requirements need to reassessed and reconfirmed by the Contractor before works commence. Therefore the Contractor will include measures to protection power and utilities in the CEMP as follows:

i) Consultation with PMU and MPW and utility providers to reconfirm power, water and telecommunications systems likely to be interrupted by the works and any additional trees to be cut to make room for replacement utilities.
ii) Contact points in all relevant utilities, local authorities and local village groups to plan reprovisioning.
iii) Approach to coordination relocation of utilities ahead of construction works with the relevant utility company at the district and district levels and reconnection.
iv) Information to be provided affected communities and timing well in advance.
v) Emergency provisions and action plan for immediate repairs to utilities if accidentally damaged.

M) Drainage system, Irrigation and Water Resources

212 The natural streams and drains, irrigation channels running close to works areas and water resources on surrounding lands may be affected by construction activities. Local water supplies will need to be tapped to meet campsite and construction requirements. This section of the CEMP will include method statements and to prevent ponding/flooding within the subproject site, construction camps, borrow/quarry areas, other areas used for project-related activities and adjacent areas. The Contractor will be required to implement drainage management and provide measures to mitigate adverse impacts on water resources and surface drainage patterns and describe them in the CEMP. The Drainage System, Irrigation and Water Resources section of the CEMP will include method statements covering the following:

i) Provision of appropriate temporary drains and measures to keep storm drains and road drainage systems clear of construction debris.
ii) Identification of any irrigation channels to be avoided or reprovisioned and timing for reprovisioning in advance of the commencement of road works to satisfaction of PMU in MPW and local community.

iii) Availability of water for the works including consultation with the local authorities
iv) Arrangements to bring in water by tanker without depleting local village supplies
v) Guidelines to minimize the wastage of water during construction operations and at campsites.
vi) Preparations (in case of obstruction or damage due to the works) for immediate clearance or repairs to drainage channels, irrigation ditches and supply ponds.
vii) Arrangements for close liaison with local communities to ensure that potential conflicts related to common resource utilization are resolved quickly.

N) Safety precautions for workers and public

213 Workers and Public Safety section of the CEMP will include method statements to identify safe working practices and interfaces between the works and public to ensure worker and public safety and prevent accidents due to the construction works. Workers and Public Safety section of the CEMP will include:

i) Statutory requirements for worker occupational health and safety as governed by the labour codes of Timor Leste and National Labour Code as amended principles of rights at work. It is expected that the new Labour Code will have been approved by the Council
ii) Method statement of how the Contractor work practices will comply with statutory requirements.
iii) Arrangements to protect public safety

O) Temporary Traffic Management

214 Arrangements for vehicles accessing the subproject area will be formulated to avoid community disturbance and severance and will at least retain a passing lane along all roads used during construction. The Temporary Traffic Management section of the CEMP will include method statements and to minimize disturbance of vehicular traffic and pedestrians during construction including consideration of the following:

i) Lane availability and minimizing interference with traffic flows past the works site.
ii) Establishment of acceptable working hours, constraints and public safety issues.
iii) Agreement on time scale and establishment of traffic flow/delay requirements.
iv) Programming issues including the time of year and available resources.
v) Discussion of the PMU/MPW inspection/monitoring role.
vi) Establishment of complaints management system for duration of the works
vii) Agreement on publicity/public consultation requirements (advance signing etc.).

P) Accidental discovery of archaeological assets, sites or resources.

215 Timor Leste has an archaeological heritage and therefore the contractor will establish precautionary measures to be included in the CEMP implemented to avoid disturbance of any unexpected finding of archaeologically valuable artifacts.

5.3 Construction Impacts on Physical Environment

5.3.1 Impacts on Air Quality

216 As noted in Section 4.1, the air quality of the Project area is good due to lack of industry and very low numbers of vehicles. During the construction phase the rehabilitation works will have a minor and temporary impact on local air quality through emission of exhaust from construction vehicles and aggregate crushing plant; as well as through dust generation from vehicles transporting materials and from exposed stock-piles of construction materials.

217 Earthworks and rock crushing activities will be the main sources of dust. The works in any given section of the road will generally be of short duration and in many locations there will be

sufficient buffer distance such that no significant impact is expected from the construction works on residential sensitive receivers in terms of noise, vibration, and dust. Also works will not take place at night except in special circumstances justifiable to the PMU. Baseline data will be collected for monitoring of total suspended particulates (TSP).

218 Overall, the improvement of the road will result in reduction of dust emissions as a result of proper compaction and treatment of the road surface. There are a number of good engineering practices that can be employed to ensure that any air quality impacts generated during construction are mitigated. These include:

- Construction equipment being maintained to a good standard. The equipment will be checked at regular intervals to ensure they are maintained in working order and the checks will be recorded by the contractor as part of environmental monitoring;
- Prohibition of the use of equipment and machinery that causes excessive pollution (i.e. visible smoke) at the Project site;
- Material stockpiles being located in sheltered areas and to be covered with tarpaulins or other such suitable covering to prevent material becoming airborne and runoff of fine particles;
- Ensuring that all vehicles transporting potentially dust-producing material are not overloaded, are provided with adequate tail-boards and side-boards, and are adequately covered with a tarpaulin (covering the entire load and secured at the front, sides and tail of the vehicle) during transportation. This is especially important as there are a number of sucos along the road;
- Sprinkling of water on the road, where work is in progress within 100m of the sucos along the road and any roads being used for haulage of materials, during the dry season shall take place several times a day; and
- Periodic qualitative air quality monitoring.

5.3.2 Works in or Adjacent to Rivers and Streams

219 There are seasonal rivers at Becora (Km0), Lainlidum 40+000) and Beheda (Km47+650). The River Laclo has water flow all year round. During the works it will be necessary to carry out excavation of existing road pavement materials, for culverts and drainage works in the vicinity of rivers and streams. If the wet season cannot be avoided, where culverts are required, there could be the need to temporarily constrict water flows and dry out sections of rivers or streams depending on their size and water volumes carried, in order to place new structures. These activities can result in a risk of channel shifts and erosion, particularly of river banks that would lose their vegetation cover, most particularly during floods.

220 Stockpiled materials, if located within the floodplain, may be eroded and dispersed and patterns of water movements during ‘normal’ and flood flows affected. Movements of machinery and other activities can be expected to impact riverine fauna and flora, however because the rivers in the area are highly disturbed ecosystems, regularly subjected to flooding and channel shifts, impacts on these are likely to be minimal.

221 Potential impacts on the structure of river habitats, including their channels, banks and floodplains will be mitigated by:

- Material stock-piles will not be located within riverbeds or the islands in the centre of rivers. Similarly, they will not be located within the current area of floodplain of river in areas subject to regular flooding (i.e. once per year or more). All land used for stockpiles will be rehabilitated to its original or better condition upon completion of the works;
- Scour protection will be used as temporary measures, as needed, to ensure temporary structures do not damage river configuration;

- Movements of vehicles and machinery in river beds within the riverine habitats will be minimised at all times to reduce disturbance;
- No vehicles or machinery shall be washed in the river;
- In the event that the contractor causes damage to the river bank or other structural parts of a river, the contractor is solely responsible for repairing the damage and/or paying compensation to the riparian owners;
- Embankments and in-stream/river activities will be monitored for signs of erosion during construction;
- Re-vegetation with local fast growing species, or other plants will be carried out incrementally and as quickly as possible after work within any river habitat has been completed after consultation with the land owners and suco chiefs,; and
- Spoils, rubbish or any other surplus material will not be disposed of within any river system including riverbed, banks or floodplain areas. Suitable disposal sites will be designated in consultation with land owners and suco chiefs and approved by PMU.

5.3.3 Impacts from Materials Extraction

222 Sources of material (gravel, aggregate etc.) and quarry sites for the Project will be agreed upon prior to commencement of works. The Contractor will be required to identify sources and prepare a sustainable extraction plan (materials management plan) as part of the CEMP, for all sources of material and spoil that will be used in road works. The aggregate extraction plan will be submitted to PMU, which will approve and monitor implementation of the extraction plan.

223 To mitigate the impacts from extraction sites, in addition to the preparation of the site specific extraction plan by the contractor, the bid and contract documents will specifically require contractors to: (i) Balance cut and fill requirements to minimize impacts from extraction of aggregates; (ii) Prioritize use of existing quarry sites with suitable materials and update the list of quarries and borrow pits monthly and report to MPW/DRBFC and minimize impacts on other local resources; (iii) Procure materials only from quarries and borrow sites acceptable to PMU or licensed and authorized by NDE; (iv) If the contractors shall operate the quarry site, required environmental licenses and permits shall be secured prior to operation of quarry/borrow areas; and (v) borrow/quarry sites shall not be located in productive land or forested areas.

224 To mitigate the impacts from extraction mitigation measures identified in the EMP include:

- Properly removed topsoil, overburden, and low-quality materials and stockpile near the site to be covered and preserved for rehabilitation.
- Stockpile topsoil for later use and fence and re-contour borrow pits after use
- Use quarries with highest ratio between extractive capacity (both in terms of quality) and loss of natural state.
- Use quarry sites lying close to the alignment not on slopes, with a high level of accessibility and with a low hill gradient;
- Reinstate damaged access roads, agricultural land and other properties upon completion of construction works at each section, if damaged due to transport of quarry/borrow materials, other construction materials or any other project-related activities;
- Provide adequate drainage to avoid accumulation of stagnant water during quarry/borrow site operation;
- Avoid use of quarry sites located on river beds. If it is not possible to locate quarries out of river beds, use only quarry sites lying on large rivers as approved by PMU;
- Avoid quarry sites lying on small rivers and streams.

- Choose alluvial terraces or alluvial deposits which lie on the river beds but not covered by water in normal hydrological conditions;
- Cut berms and terraces during and after extraction in quarries in the mountainous or hilly areas to stabilize slopes, wherever slopes are important, and implement a drainage system and vegetation cover for rehabilitation;
- Dewater and fence quarries and borrow pits as appropriate, upon completion of extraction activities to minimize health and safety risks;
- Do not open additional extraction sites and/or borrow pits without the restoration of those areas no longer in use;
- Ensure borrow pits are left in a tidy state with stable side slopes and proper drainage in order to avoid creation of water bodies favourable for mosquito breeding;
- Refill borrow pits as required by NDE using surplus inert material and excavated unsuitable soils;
- Mark refilled borrow pits and cover with topsoil and plant shrubs and trees to rehabilitate as required by PMU & NDE Prevent accidental access and avoid drowning when pits become water-filled by implementing measures such as fencing, providing flotation devices such as a buoy tied to a rope, etc; and
- Conduct the excavation and restoration of sites and borrow areas, as well as their immediate surroundings in an environmentally sound manner to the satisfaction of the PMU. Sign-off to this effect by PMU will be required before final acceptance and payment under the terms of the contract.

5.3.4 Impacts from Spoil Disposal

225 In most locations the use of this immediately available material will reduce the need for additional extraction of rock based materials. The surplus material should be graded and the suitable cut materials directed for reuse as far as possible on the Project road and subsequently on other roads and other local infrastructure projects. This will reduce the need to extract other rock and gravel resources from vulnerable hillsides and river beds. The surplus can then be stockpiled at locations agreed with local authorities for use on other local district projects or other nationally planned infrastructure. The surplus shall not be stockpiled at the side of the road or dumped over the crash barriers or side of slopes as is the current practice by some contractors. Areas for disposal shall be worked out and agreed with the suco leaders and local authorities.

226 The surplus rock and soil based materials for disposal must be controlled to avoid potential impacts due to improper disposal. The CEMP submitted by the contractor will be based on the EMP in this SEIS and will include a section on spoil disposal to ensure waste from Project road improvement is managed properly. Contractors will initially review the PMU's options for stockpiling and disposal locations for cut surface materials and reconfirm or propose alternative disposal locations for agreement with the PMU and local authorities. The CEMP will cover all aspects of construction waste disposal. It is preferred that Government land is used for stockpiling and dumping of material. If private land is to be used for the purpose of dumping it shall commence only after written permission from the land owner is checked and recorded by the PMU and agreeable to NDE.

227 Mitigation measures will seek to control the impacts at source in the first place. The PISC will be responsible to report to PMU the monthly update of the cut and fill estimates in conjunction with asphalt and aggregate materials planning between the different areas and advise on overall balancing for cut and fill materials to minimize impacts on local resources. (Mitigation measures for cut slopes are covered under erosion control).

228 The spoil disposal section of the CEMP will include; (i) locations and quantities of spoil arising; (ii) agreed locations for disposal / endorsement from NDE and local groups; (iii) methods of transportation to minimize interference with normal traffic; (iv) establishment of acceptable working hours and constraints; (v) agreement on time scale and programme for disposal and chain of custody; (vi) programming issues including the time of year and available resources; (vii) discussion of the PMU inspection/monitoring role; and (viii) links to the grievance redress mechanism and complaints management system for duration of the works.

229 Mitigation measures will seek to prevent slope collapse impacts and control the impacts at source in the first place. The PMU assisted by the PISC will be responsible to monitor the progress of cutting slopes and the implementation of mitigation measures, to minimize impacts. The mitigation measures below also apply equally to discarded asphalt of macadam pavement surfaces. The mitigation measures in the CEMP will include but not necessarily be limited to:

- Spoil will be reused as far as possible for bulk filling;
- The surplus shall not be stockpiled at the side of the road near the works or dumped over the edge of the road or over the crash barriers;
- Spoil will not be disposed of in rivers and streams or other natural drainage path;
- Under no circumstances will spoil be dumped into any other watercourses (the sea, cliffs near the sea, rivers, streams, drainage, irrigation canals, etc.);
- Spoil disposal shall not cause sedimentation and obstruction of flow of the sea. watercourses, damage to agricultural land and densely vegetated areas;
- Spoil will not be disposed of on fragile slopes, flood ways, wetland, farmland, forest, mangrove and associated salt flats, beaches, religious or other culturally sensitive areas or areas where a livelihood is derived;
- Surplus spoil will be used where practicable for local repair works to fill eroded gullies and depression areas and degraded land in consultation with local community;
- Spoils shall only be disposed to areas approved by local authority;
- Spoil disposal will be monitored by PMU and recorded using a written chain of custody (trip-ticket) system to the designated disposal sites;
- Spoil will be disposed of to disused quarries and abandoned borrow pits where practicable;
- Disposed spoil will be spread in 15 cm layers and compacted to optimum moisture content, covered with topsoil, landscaped and provided with drainage and vegetation to prevent erosion in line with best practice; and
- The spoil disposal site shall be located at least 50m from surface water courses and shall be protected from erosion by avoiding formation of steep slopes and grassing.

5.3.5 Impacts on Water Resources

230 The drainage system, irrigation and water resources on surrounding lands will be affected by construction activities as follows: a) local water supplies will need to be tapped to meet campsite and construction requirements, so bringing project based water use into competition with local use; b) surface and subsurface water resources near the selected Project road sections could be contaminated by fuel and chemical spills, or by solid waste and effluents generated by the kitchens and toilets at construction campsites; c) irrigation channels run close to or cross the works areas and require reprovisioning, (d) natural streams may become silted by borrow material (earth) in the runoff from the construction area, workshops and equipment washing-yards.

231 The contractors will be required to implement the provisions of the CEMP and to provide drainage facilities to avoid ponding/flooding within the Project site, construction camps, borrow/quarry areas, other areas used for project-related activities and adjacent areas. Potential impacts on water quality are already identified in the subsequent sections (e.g., under hazardous materials and hazardous waste disposal, water quality, etc.). In areas close to the sensitive receivers, the contractors will provide appropriate drains so that the outfalls of the surface run-off from the carriageway are diverted away from the sensitive receivers. Measures will also be taken by the contractors during the construction phase to ensure that storm drains and road drainage systems are regularly cleared to maintain storm water flow.

5.3.6 Impacts on Water Quality

232 Through works adjacent to rivers and streams (culvert replacement, bridge repair, major bridge works) Project has the potential to create some temporary and minor adverse impacts on water quality including (i) increased turbidity and downstream siltation created during the removal of gravels; (ii) an increase in silt loads at culverts to be replaced and/or constructed; (iii) construction materials such as small gravels, sand, and fill, being 'washed out' into streams, rivers during rain; (iv) oil and fuel leakage and/or spills from vehicles and plant or workshop/storage locations; and, (v) discharge of waste-water and sewage from construction camp, site office and work yard to local streams and rivers.

233 Impacts can be reduced by confining activities to the dry season when there will be little or no water in the rivers and streams crossing the Project road. It will be sufficient to monitor other physical mitigation measures in place at the major river crossings where bridge repairs and replacement will be undertaken as well as on river/stream sections close to construction camps (i.e., rivers that could receive run-off/discharge from construction/workers' camps).

234 In addition to a number of the items outlined in 5.3.5 above and employed to mitigate soil impacts and erosion effects (refer to 5.3.7 below) that will also mitigate adverse effects on water quality, the following measures will be included in the engineering design and EMP:

- Lubricants will be stored in containers / dedicated enclosures with a sealed floor >50m from water bodies;
- Work in rivers will be scheduled during dry season and work duration shall be as short as possible. Bare slopes shall be stabilized immediately after works are completed;
- Stockpile areas and storage areas for hazardous substances shall be located away from water bodies;
- Washing of machinery and vehicles in surface waters shall be prohibited;
- Sediment controls such as silt fences or other sediment reducing devices (rock dams or silt barriers), to prevent both siltation and silt migration during works being undertaken in the vicinity of streams and rivers;
- Sediment control devices will be cleaned and dewatered, discharges will not be to the rivers or streams. Consultation with land owners and suco chiefs will identify suitable land-based areas for settling ponds or discharge areas;
- Diversion ditches will be dug around material stockpiles;
- Minimizing interference with natural water flow in rivers, water courses or streams within or adjacent to work sites. Abstraction from rivers will only be allowed after permission from PMU. Pollution of water resources will not be permitted;
- Solid wastes, debris, spent oil or fuel from construction machinery or plant, construction material, or waste vegetation removed from work sites will not be dumped in or near streams, rivers or waterways;

- Discharge of sediment laden construction water or material (including dredged spoil) directly into the rivers, sea, inter-tidal area or surface waters will not be permitted. All such construction water will be discharged to settling ponds or settling tanks with sufficient capacity to provide holding times that will allow settlement, prior to final discharge;
- Discharge zones from culverts and drainage structures will be carefully identified, and structures will be lined with rip-rap. Down-drains and chutes will be lined with rip-rap, masonry or concrete. Spillage ways will be lined with rip-rap to prevent under-cutting;
- Spoil and material stock piles will not be located near the coast, on the coastal side of the Project road, or within 50 m of waterways, streams or rivers, or on the edge of slopes or hills above rivers or stream and will be surrounded by perimeter diversion drains;
- Hydro-carbons, fuel, and other chemicals as required for the works, will be stored in secure containers or tanks located away from the coast, surface waters, or streams;
- Hydro-carbons, fuel, and oil spills will be contained and immediately cleaned up as per the requirements of the emergency response plan to be prepared as part of the CEMP by the contractor (and approved by PMU at the pre-construction stage);
- Surplus used oil and waste hydrocarbons will be disposed of at the Tibar oil collection site and under no circumstances should oil be discharged to soil;
- Contractor's site office and works yard are to be equipped with portable sanitary latrines or septic tank that do not discharge directly to or pollute surface waters and waterways; and
- All water, waste-water and other liquids used or generated by project works and activities will be collected and disposed of in an approved manner and in an approved location. Such disposal will not be permitted to cause either pollution or nuisance.

235 The condition of rivers near the bridges will be reported by PMU at the end of the detailed design period, either in the detailed design report or in a dedicated baseline monitoring report before the bidding documents are completed.

236 The monthly monitoring report will however specify the time of the month when the monitoring of physical mitigation measures was undertaken. Time and date of monitoring, potential sources of contaminants/pollutants during the monitoring period shall also be included in the report. Actual location of the monitoring stations shall be described in the report and plotted on a map together with GPS readings.

5.3.7 Soil Impacts and Erosion

237 The potential impacts on soil, or from erosion, during construction are from (i) sediment contamination of streams and rivers, turbidity impacts by construction activities; (ii) loss of agricultural soil or soils of productive value; (iii) extraction of materials from streams or rivers and/or borrow pits; (iv) conversion of the existing land uses such as agriculture and grassland for stockpiles of materials; (v) soil erosion and loss of protective vegetation in areas of slopes or uncompacted embankments; and (vi) soil contamination from fuel, chemicals and/or construction material spillage.

238 Earth embankments and material stockpiles will be susceptible to erosion, creating sediment laden run-off, particularly during rains and re-suspension of dust during the dry season. Stockpiles will not be permitted within 50m of streams and rivers. Works in rivers and streams will be required to limit losses of sediment into the rivers through restricting orks to the dry season and if this is not possible the use of silt fences, progressive re-planting will be implemented. Works area will be sited well back from river bank areas.

239 There will be no significant loss of soil of agricultural or productive value as the Project is generally within the existing road corridor and does not cross any lands currently being used for

gardens or plantations. The works will be largely confined to the existing road and immediate right-of-way. Excavation for materials or location of material stockpiles is not permitted on agricultural or potentially productive land (including land identified as garden land). Small strips of land and trees either side of the existing road may be acquired in some locations for the road widening and these items have been calculated in the inventory of losses in the Resettlement Action Plan. However there will not be any large scale conversion of land from productive or livelihood uses as a result of the Project works.

240 Potential impacts will be mitigated by:

- All required materials will be sourced in strict accordance with GOTL guidelines and the EMP;
- Material stock-piles, borrow pits and construction camps will only be located on unused land or non-agricultural land following consultation with PMU, land owners and suco chiefs. All land will be rehabilitated to its original or better condition upon completion of the project works;
- Excavated material will be reused wherever possible and surplus will be used to backfill borrow pits;
- In the event that the contractor causes damage to agricultural land, productive land or gardens, the contractor is solely responsible for repairing the damage and/or paying compensation based on the rates in the approved resettlement plan;
- Embankments and in-stream/river activities will be monitored during construction for signs of erosion. A standby pile of stones and rocks should be kept on hand which can be used for immediate repairs in the event that there is bank or channel erosion for work in location of stream and river;
- Gabion baskets, rip-rap or bio-engineering methods will be used to both strengthen the road and to prevent erosion upstream and downstream at bridge abutments;
- Re-vegetation of riverbanks will be achieved with fast growing species, or other plants in consultation with the land owners and suco chiefs, as quickly as possible after work has been completed;
- Random and uncontrolled fly-tipping of spoil, or any material, will not be permitted. Suitable dump sites will be designated in consultation with land owners and suco chiefs. Dump sites will not be permitted within 50m of rivers or streams or on garden land or in areas used for livelihood production by suco residents; and
- Obtaining all necessary permits or approvals for location of construction camps, material extraction sites and sources of construction materials from NED and other government agencies prior to works commencing.

241 It should be noted that a number of the mitigation measures (compacting, terracing, drainage and re-vegetation) will provide long-term environmental benefits by reducing soil erosion and sedimentation of surface waters. Replacing and repairing damaged culverts and providing well constructed drainage will reduce localized flooding.

5.3.8 Waste Management

242 Uncontrolled waste disposal operations can cause significant impacts. Mitigation measures will seek to reduce, recycle and reuse waste as far as practicable. The PMU will be responsible to monitor the contractor's progress of implementing the provision of the waste management section of the EMP and all mitigation measures. The waste management section of the CEMP will also include consideration of all matters related to solid and liquid waste disposal including the following: (i) expected types of waste and quantities of waste arising; (ii) waste reduction, reuse and recycling methods to be employed; (iii) agreed reuse and recycling options

and locations for disposal / endorsement from NDE and local groups; (iv) methods for treatment and disposal of all solid and liquid wastes; (v) methods of transportation to minimize interference with normal traffic; and (vi) establishment of regular disposal schedule.

243 The mitigation measures in the EMP will include but not necessarily be limited to the measures listed below. The contractors shall ensure implementation of these measures.

- Areas for disposal to be agreed with local authorities and suco leaders and checked and recorded and monitored by the PMU (but all waste oil will be taken to Tibar disposal site);
- No burning of waste associated with the project or the supporting activities. Burning of waste will not be allowed anywhere on the Project;
- Segregation of wastes shall be observed. Cleared foliage, shrubs and grasses may be given to local farmers for fodder and fuel. Organic (biodegradables) shall be collected and disposed of on-site by composting (burning waste not be allowed anywhere within the Project site footprint or in the camps);
- Recyclables shall be recovered and sold to recyclers;
- Residual general wastes shall be disposed of in disposal sites approved by local authorities and PMU;
- Construction/workers' camps shall be provided with garbage bins;
- Disposal of solid wastes into flood ways, wetland, rivers, other watercourses, farmland, forest, mangrove and associated salt flats, beaches, places of worship or other culturally sensitive areas or areas where a livelihood is derived canals, agricultural fields and public areas shall be strictly prohibited;
- There will be no site-specific landfills established by the contractors. All solid waste will be collected and removed from the work camps and disposed in local authority designated waste disposal sites; and
- Waste disposal areas approved by local authorities shall be rehabilitated, monitored, catalogued, and marked.

5.3.9 Hazardous Materials and Waste Disposal

244 Use of hazardous substances such as oils and lubricants can cause significant impacts if uncontrolled or if waste is not disposed correctly. Oils and lubricants discharged to mangroves can kill the roots and destroy the mangrove. Mitigation measures will seek to control access to and the use of hazardous substances such as oils and lubricants and control waste disposal. The PMU will be responsible to monitor the contractor's progress of implementing the hazardous materials and waste section of the EMP to avoid or minimize impacts from use of hazardous substances such as oils and lubricants.

245 The hazardous materials and waste management section of the EMP will include consideration of all matters related to hazardous waste disposal including the following: (i) expected types and volumes of hazardous materials and waste; (ii) methods for treatment and disposal of all hazardous wastes; (iii) approvals and environmental licenses required; (iv) methods of transportation to minimize interference with normal traffic; and (v) establishment of regular disposal schedule as agreed or as condition of granting of environmental license.

246 The mitigation measures identified in the EMP include:

- Ensure that safe storage of fuel, other hazardous substances and bulk materials are agreed by PMU and have necessary approval/permit from NDE and local authorities.

- Hydrocarbon, toxic material and explosives (if required) will be stored in adequately protected sites consistent with national and local regulations to prevent soil and water contamination.
- Equipment/vehicle maintenance and re-fuelling areas will be confined to areas in construction sites designed to contain spilled lubricants and fuels. Such areas shall be provided with drainage leading to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency;
- Fuel and other hazardous substances shall be stored in areas provided with roof, impervious flooring and bund/containment wall to protect these from the elements and to readily contain spilled fuel/lubricant;
- Segregate hazardous wastes (oily wastes, used batteries, fuel drums) and ensure that storage, transport and disposal shall not cause pollution and shall be undertaken consistent with national and local regulations;
- Ensure all storage containers are in good condition with proper labelling in English and Tetun;
- Regularly check containers for leakage and undertake necessary repair or replacement;
- Store hazardous materials above flood level;
- Discharge of oil contaminated water shall be prohibited and separated oil shall be disposal of at Tibar disposal site;
- Used oil and other residual toxic and hazardous materials shall not be poured on the ground;
- Used oil and other residual toxic and hazardous materials shall be disposed of in an authorized facility off-site;
- Adequate precautions will be taken to prevent oil/lubricant/ hydrocarbon contamination from mobile equipment of river channel beds;
- Washing of project vehicles in rivers and streams is strictly prohibited;
- Ensure availability of spill clean-up materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored;
- Spillage, if any, will be immediately cleared with utmost caution using absorptive clean up materials to leave no traces;
- Spillage waste will be disposed at disposal sites approved by NDE which is Tibar disposal site;
- All areas intended for storage of hazardous materials will be quarantined and provided with adequate facilities to combat emergency situations complying with all the applicable statutory requirements;
- The contractors shall identify named personnel in their EMP in-charge of storage sites for hazardous materials and ensure they are properly trained to control access to these areas and entry will be allowed only under authorization.

5.3.10 Emergency Response

247 The contractor will be responsible for preparation of an emergency response plan within the CEMP which will covers landslides, containment of hazardous materials, oil spills, and work-site accidents. The plan will detail the process for immediate notification to PMU, handling, and

subsequently reporting, emergencies, and specify the organizational structure (including responsibilities of nominated personnel).

248 The plan will be submitted to PMU for approval. Implementation of the plan will be monitored by PMU. Any emergencies, and how they were handled, will be reported in the contractor's monthly progress reports.

5.3.11 Effects on Existing Services and Utilities and Infrastructure

249 The PMU and Contractor will consult with all relevant authorities to ensure that they minimise any disruptions to existing infrastructure and services. This includes suco water supplies, telecommunications infrastructure and electricity supply wherever applicable.

250 Plans will be obtained from utility/service providers showing all underground facilities and/or services in order to avoid damage or disruption during works. Where plans and drawings are not available, the contractor will review by field observation and report locations to PMU in the pre-construction stage. Mitigation measures to be included in the CEMP in the pre-construction stage will require the contractor to:

- Reconfirm power, water supply, telecommunications and irrigation systems likely to be interrupted by the works and any additional trees to be cut near utilities;
- Contact all relevant local authorities for utilities and local village groups to plan reprovisioning of power, water supply, telecommunications and irrigation systems;
- Relocate and reconnect utilities well ahead of commencement of construction works and coordinate with the relevant utility company at the district and sub-district levels for relocation and reconnection well before works commence and include for compensatory planting for trees;
- Inform affected communities well in advance;
- Arrange reconnection of utilities and irrigation channels in the shortest practicable time before construction commences; and
- If utilities are accidentally damaged during construction it shall be reported to the PMU / DRBFC and utility authority and repairs arranged immediately at the contractor's expense.

5.4 Construction Impacts on the Biological Environment

5.4.1 Impacts on Flora and Fauna

251 **Impacts on habitat and flora.** Minor impacts upon terrestrial habitats and flora of the Project area are expected as a result of the road reconstruction and rehabilitation. Habitat fragmentation occurs when a road cuts through an ecosystem; the core Project road has existed for some time and though its original construction would have caused habitat fragmentation, ecosystems have re-established albeit as altered and/or smaller units around the road.

252 There will be limited and minor, if any, impacts on habitat, flora or fauna. Rehabilitation work will directly cause minor degradation of local ecology through the clearance of small areas of vegetation at work sites and ancillary sites such as materials extraction sites, and material stockpiling areas. Construction activities will impact only a narrow band of vegetation within the existing road corridor.

253 Plant species present within the impact area are either introduced species or ubiquitous native species, which are highly tolerant of disturbances. There is no vegetation adjacent to the Project road that has any conservation significance nor is it representative of the original vegetative cover. There are some gardens, plantations and individual trees, including mango, jackfruit and teak close to the road that will require removal. They are non-endemic, common and have no special characteristics to merit protection.

254 Therefore, in light of the nature of the project and the types of works envisaged, there will be no significant loss of valuable flora or habitat. Rehabilitation activities will take place entirely within the existing ROW or within areas already subjected to clearing in the past.

255 **Impacts on fauna.** In terms of impacts on fauna, there is the potential for construction workers to poach edible animals and birds of the locality in spite of prohibitions and poaching. The contractor will be responsible for providing enough food and adequate information to workers regarding the protection of fauna and imposing sanctions on workers trapping, killing or wounding birds or other wildlife. Protected species are listed in Appendix 3.

256 Field observations, research, and consultations indicate that the streams and rivers have some, but limited, aquatic macro-fauna. Replacement of culverts will create minor, if any, impacts. Where possible, gravel extraction should be confined to the floodplain areas of larger rivers, rather than the river bed (especially through curves or bends in the river).

257 The PMU will supervise and monitor to check that the contractors carry forward the mitigation measures and environmental enhancements identified in the CEMP as well as routine matters such as avoiding unnecessary removing of trees and compensatory and enhancement planting.

258 Invasive species shall not be introduced. During replanting/revegetation works, new alien plant species (i.e., species not currently established in the region of the project) shall not be used unless carried out with the existing regulatory framework for such introduction. All replanting and compensatory tree planting will be planned in full agreement with the local forest authority.

259 Measures to be included in the project to ensure protection of flora and fauna within the Project area include:

- Contractor's site office, works yard, rock crushers, material storage, borrow pits, and quarries will all be located as approved by PMU in consultation with local authorities and will not be permitted in any ecologically important sites or areas valuable for conservation;
- Vegetation clearance during construction activities, especially of trees along the road-side, will be avoided minimized;
- Under no circumstances is the contractor or any of his sub-contractors or employees permitted enter the mangrove to fell or remove mangroves or collect wood;
- Vegetative cover cleared from the roadside during rehabilitation activities will be stockpliled and kept for bioengineering and mulching in the re-vegetation works. Contractors will be responsible for re-vegetation in cleared areas;
- The contractor will be responsible for providing adequate knowledge to construction workers in relation to existing laws and regulations regarding illegal logging. Contract documents and technical specifications will include clauses expressly prohibiting the felling of trees, not marked as requiring to be cleared by the project, by construction workers for the term of the project;
- The contractor will be responsible for providing adequate knowledge to construction workers in respect of fauna. Contract documents and technical specifications will include clauses expressly prohibiting the poaching of fauna by construction workers and making the contractor responsible for imposing sanctions on any workers who are caught trapping, killing, poaching, being in possession of or having poached fauna;
- The PMU will supervise and monitor a ban on use of forest and mangrove timber and workers shall be prohibited from cutting trees and mangrove for firewood or collecting wood from mangrove areas; and

- Construction workers will be informed about general environmental protection and the need to avoid un-necessary felling of trees unless justified on engineering grounds and marked for cutting as approved by PMU.

5.4.2 Impacts on Protected or Sensitive Areas

260 There are no currently designated protected areas or IBAs within the construction corridor and no protected areas likely to be affected by construction activities or works.

5.5 Construction Impacts on Social Environment

5.5.1 Impacts on Noise Levels

261 Construction noise is generally intermittent, attenuates quickly with distance, and depends on the type of operation, location and function of equipment. During construction, there will be temporary adverse impacts due to the noise of the construction equipment, especially heavy machinery, when construction activities are carried on in the vicinity of the sucos. The most sensitive receptors along the Project road include the suco residential areas, churches, health clinics and schools. Cooperation between the contractor and the residents is essential and it is the responsibility of the contractor to arrange meetings between these parties and arrange such matters as work schedules (hours of equipment operation etc.), locations of work camps and material storage areas, and the locations of rock crushers and asphalt plant >500m from settlements in the sucos.

262 Clearing vegetation, bulldozing, compaction equipment, excavation of existing pavement materials, and grading will produce noise. Aggregate processing is one of the noisiest activities required in construction processes, however, this will be undertaken at a designated site located at least 500m away from the nearest sensitive receivers.

263 Noise impacts may be short lived, although can be very intrusive if not controlled properly. Noise measurement shall be undertaken in response to noise complaints using hand help noise meter at the same sites sampled for TSP and shall follow the methodology specified by the manufacturer. Noise shall be measured in dB(A) over 24 hours covering the different periods (i.e., 6h to 18h, 18h to 22h and 2h to 6h). Measurement will also be taken to establish if the World Bank criterion of Leq55dB(A)1-hour is exceeded at the measurement points. If it is exceeded by the existing noise a criterion of background +3dB(A) will be applied in the impact monitoring. Works are not expected to be carried out at night but if this is unavoidable for unexpected reasons separate measurements will also be taken before construction commences to establish if the World Bank criterion of Leq45dB(A)1-hour is exceeded and the monitoring assessment criteria will be established accordingly.

264 Measures to be included in the project to mitigate the effects of noise include:

- Baseline data on noise levels shall be collected before commencement of civil works;
- The EMP and contract documents will require that all vehicle exhaust systems and noise generating equipment be acoustically insulated and maintained in good working order and that regular equipment maintenance will be undertaken to minimise noise emissions;
- The contractor will prepare a schedule of operations that will be approved by suco chiefs and PMU. The schedule will establish the days, including identifying days on which there should be no work, and hours of work for each construction activity and identify the types of equipment to be used;
- Workers will be provided with ear defenders as may be required; and

- Any complaints regarding noise will be dealt with by the contractor in the first instance through the communications plan and if unresolved they shall referred through the grievance redress mechanism.

5.5.2 Impacts on Access and Traffic Safety

265 The Project will cause temporary negative impacts through presence of vehicles and equipment, including inconvenience, minor disruptions to traffic using the road, and on local access to and from the villages along the Project road during the construction period. Mitigation of impacts on access and traffic will include:

- The contractor will prepare, and submit to PMU, a traffic management plan detailing diversions and management measures;
- Signs and other appropriate safety features will be used to indicate construction works are being undertaken;
- Contract clause specifying that care must be taken during the construction period to ensure that disruptions to access and traffic are minimized and that access to villages along the Project road is maintained at all times; Provincial Works and village officials will be consulted in the event that access to a village has to be disrupted for any time and temporary access arrangements made;
- Construction vehicles will use local access roads, or negotiate access with land owners, rather than drive across vegetation or agricultural land, to obtain access to material extraction sites. Where local roads are used, they will be reinstated to their original condition after the completion of work;
- The road will be kept free of debris, spoil, and any other material at all times;
- Disposal sites and haul routes will be identified and coordinated with local officials;
- Provision of adequate protection to the general public in the vicinity of the work site, including advance notice of commencement of works, installing safety barriers if required by villagers, and signage or marking of the work areas; and
- Provision of safe access across the works site to people whose villages and access are temporarily affected during road re-sheeting activities.

5.5.3 Impacts on Worker Health and Safety

266 The Project's construction phase can cause a range of health and safety impacts. The JGESC requires that health and safety impacts on workers and the community are identified and mitigation measures proposed. Air pollution and noise, which also have a health and safety aspect, have already been discussed. Traffic safety issues have been discussed above. The risk of spread of communicable disease is dealt with in the next section.

267 Worker occupational health and safety is generally governed by the new Labour Code of Timor-Leste and the UNTAET National Labour Code (1 May 2002). As of 2009 the then current National Labour Code has been in a reform process. The International Labour Organisation (ILO) has supported the drafting the new Labour Code to include the fundamental principles of rights at work. It is expected that the Labour Code will have been approved by the Council of Ministers and Parliament before implementation of the Project. The contractor's EMP will address worker health and safety and will establish routine safety measures as required by World Bank Group's EHS Guidelines, Labor Code of Timor-Leste and by good engineering practice.

268 Observing general health and safety requirements, including provision of safety and protective gear and equipment to workers, will reduce the risk of accidents at the work sites. The construction camp will be equipped with a health post which will include first-aid and basic medical

supplies. To reduce the risk of incidents at the camp, access to construction camps by other than those authorized will be prohibited.

269 Mitigation measures for reducing and avoiding impacts on worker health and safety include:

- At least one month before construction commences the contractors will demonstrate to the PMU they are properly resourced and a qualified/experienced environment and safety officer (ESO) will be identified by the contractors in the bid;
- Establishment of safety measures as required by law and by good engineering practice and provision of first aid facilities at work sites, in vehicles and establishment of an first aid/health post at the camp;
- The contractor will conduct training (assisted by PMU) for all workers on safety and environmental hygiene at no cost to the employees. The contractor will instruct workers in health and safety matters as required by law and by good engineering practice and provide first aid facilities;
- Instruction and induction of all workers shall be carried out for all operatives before they start work in health and safety matters, including road safety;
- The contractor will instruct and induct all workers in health and safety matters (induction course) including construction camp rules and site agents will follow up with toolbox talks on a weekly basis. Workforce training for all workers starting on site will include safety and environmental hygiene;
- Workers shall be provided with appropriate personnel protection equipment (PPE) such as safety boots, helmets, reflector vest, gloves, protective clothes, dust mask, goggles, and ear protection at no cost to the workers;
- Fencing will be installed on all areas of excavation greater than 1m deep and sides of temporary works;
- Reversing signals (visual and audible) shall be installed on all construction vehicles and plant.
- Provision of potable water supply shall be maintained at all tmes in all work locations;
- Fencing on all excavation, borrow pits and sides of temporary bridges;
- Scheduling of regular (e.g. weekly tool box talks) to orientate the workers on health and safety issues related to their activities as well as on proper use of PPE;
- Where worker exposure to traffic cannot be completely eliminated, protective barriers and warning signs shall be provided to shield workers from passing vehicles. Another acceptable measure is to install channelling devices (e.g., traffic cones and barrels) to delineate the work zone and trained flag men at each end of the current working zone ; and
- Construction camps shall be provided with toilets/sanitation facilities in accordance with local regulations to prevent any hazard to public health or contamination of land, surface or groundwater. These facilities shall be well maintained and cleaned regularly to encourage use and allow effective operation and emptied regularly so as never to overflow.

5.5.4 Impacts on Community Health and Safety

270 The works could create various impacts on the health and safety of communities. The presence of construction workers and work camps can induce or increase risk of spread of communicable diseases Transmission of sexually transmitted infections (STIs) and Human Immuno-Deficiency Virus (HIV) is a potential impact of the construction phase posed by construction workers engaging in either commercial sex or sexual relationships with local people.

271 Potential sanitation and impacts from disease will need to be controlled by maintaining hygienic conditions in the worker camps and implementing the social and health awareness programs for the Project.

272 Public safety, particularly of pedestrians and children can be threatened by the excavation of the trenches for side drain construction. Within 500m of settlements and towns fencing will be installed prior to excavation work commencing on all sides of temporary excavations. The plans will include provisions for site security and guards, trench barriers and covers to other holes and any other safety measures as necessary. The contractor will provide warning signs at the periphery of the site warning the public not to enter. The contractor will restrict the speed of Project vehicles and also control traffic by contra-flow and provide flag men and warning signs at either end of the works where the traveling lanes must be temporarily reduced.

273 The contractors will provide information boards near the work sites to inform and instruct the public on how to conduct themselves and to be aware of their surroundings if they must approach the works. Information boards will be refreshed as necessary and also show the name and telephone contacts in PMU and contractors offices for complaints about the works. Information boards will also state that the PMU and contractor have an open door policy as regards complaints. The contractors will implement the following safety measures for the public:

- The contractor will appoint an ESO to address health and safety concerns and liaise with the PMU and sucos within the Project area;
- Barriers (e.g., temporary fence), and signs shall be installed at construction areas to deter pedestrian access to the roadway except at designated crossing points;
- Adequate signage and security will be provided at the site office and works yard and prevention of unauthorized people (including children) entering work areas and camp. Warning signs will be provided at the periphery of the site warning the public not to enter;
- The general public/local residents shall not be allowed in high-risk areas, e.g., excavation sites and areas where heavy equipment is in operation and these sites will have a watchman at the entrance to keep public out;
- Speed restrictions shall be imposed on Project vehicles and equipment traveling within 50m of sucos and sensitive receptors (e.g. residential, schools, places of worship, etc.);
- Upon completion of construction works, borrow areas will be backfilled or temporarily fenced, awaiting backfilling;
- Provisions will be made for site security, safety barriers and signs will be erected outside trenches deeper that 1m and covers will be placed over other holes. Other safety measures will be installed as necessary;
- Drivers will be educated on safe driving practices to minimize accidents and to prevent spill of spoil, hazardous substances (fuel and oil) and other construction materials during transport;
- Contractors will ensure that no wastewater is discharged to local rivers, streams, lakes and irrigation channels and any other water bodies;
- Measures to prevent proliferation of mosquitoes shall be implemented (e.g., provision of insecticide treated mosquito nets to workers, installation of proper drainage to avoid

formation of stagnant water. Standing water will not be allowed to accumulate in the temporary drainage facilities or along the roadside);

- The contractor shall make provision to ensure the construction workforce attends STI and HIV/AIDS prevention workshops provided through an approved service provider. The workshops will be delivered to the contractor's workforce prior to commencement of any civil works; and
- Suco-based community awareness raising about transmission of STIs and HIV, reproductive health and safe sex. The program will be implemented after contractor mobilization when training staff are in post and prior to construction works commencing,

5.5.5 Impacts on Physical Cultural Resources

274 Consultations and research indicated that there are no PCR sites or cultural property in the works areas of the Project road. However the is a prayer shrine near Hera (Km7+400) a cemetery at Hera (Km9+750) the sacred meeting place Ainaro (Km39+600) and prayer shrine near Beheda bridge (Km47+650) which are all within 5m of the working areas and need careful consideration not to disturb them during construction and to preserve access for the devotees. Depending on the specific locations of gravel and material extraction site, consultation with suco chiefs as well as resource owners is also required to ensure that there are no PCR or sites in the locations proposed for materials extraction.

275 Any accidental discovery of PCR will be handled as per the provisions set out in 5.2.3.In the event this occurs, work shall cease immediately and the relevant authorities shall be informed. Activities shall not re-commence until the authorities have signed-off that the site/resources have been dealt with appropriately and that work may continue.

276 The Contractor shall be responsible for complying with the requirements of authorities, and the PMU shall monitor the same. The contractor will include a section on "chance finds" in the CEMPCEMP. Mitigation measures for potential impacts on PCR include:

- No spoil materials or other waste will be stockpiled near or disposed near the the cultural sites.
- Works will not obstruct access to cultural sites.
- Site agents will be instructed to keep a watching brief for relics in excavations.
- Should any potential items be located, the PMU will immediately be contacted and work will be temporarily stopped in that area.
- The PMU with the assistance of the PMU will determine if that item is of potential significance and contact MPW to pass the information to the relevant department in GOTL (i.e. Secretary of State for Culture) who will be invited to inspect the site and work will be stopped to allow time for inspection.

277 Until GOTL has responded to this invitation work will not re-commence in this location until agreement has been reached between GOTL, PMU and MPW as to any required mitigation measures, which may include structured excavation.

5.6 Operation Impacts on Physical Environment

5.6.1 Air Quality

278 **Gaseous emissions.** Vehicle emissions as indicated by concentration of oxides of nitrogen will be the main air pollution sources during operation. Following the rehabilitation of the road its use will create air pollution such as hydrocarbons, carbon monoxide, nitrous compounds, sulphur dioxide and particulate matter. The current volume of traffic and forecasted traffic growth are such that emissions will be low enough to not have a noticeable effect on ambient air quality.

The anticipated levels of traffic, excessive capacity of the road network, and subsequent lack of congestion and concentration of traffic, are unlikely to result in adverse impacts on air quality. There will be few other sources of emissions near the Project road other than from domestic fuel burning. Sensitive receivers are set far enough back from the Project road to allow adequate dispersion that there will be no significant impacts at the sensitive receivers.

279 **Particulate emissions.** Particulate contamination such as dust and fumes will also be air pollution sources during operation however toxic residues from vehicle emissions near the Project road are unlikely to accumulate or create significant impacts. Dust from the existing road will be reduced due to the better asphalt surface for the new road.

280 The conclusion in respect of air quality is that the Project road is likely to continue to operate at well under its design capacity and no significant air quality impacts warranting mitigating actions are anticipated.

5.6.2 Run-off and Soil Erosion

281 Soil erosion will be prevented by developing a comprehensive suite of engineering controls in the detailed designs to prevent and maintain erosion. A system will be devised and engineered to control erosion and flooding on either side of the embankments in case of heavy rains. Apart from affecting the community lands and resources, this would otherwise cause natural streams and irrigation channels to become silted.

282 Measures will also be taken during the operational phase to ensure that the frequency of maintenance is increased and that storm drains and highway drainage systems are periodically cleared to maintain clear drainage to allow rapid dispersal of storm water flow. An adequate system of monitoring, reporting and maintenance will be developed.

5.6.3 Water Quality

283 Potential impacts on water quality or availability of water for domestic or agricultural use are not expected to occur. During operation negative impacts on water quality could be caused by accidental spills.

284 There is a very minor risk of impacts on sedimentation and water quality through improving drainage from the road and areas landward of it in the few months when there is significant rainfall. At other times there will be virtually no runoff but the drains will need to be kept clear of dry matter constricting the drains. The Project will lead to longer term environmental benefits for water quality created by the Project through proper compacting of the road and surface and reducing mobilisation of surface dust during rain. The dust that are resuspended and mobilized will be captured where required in sediment traps to limit the amounts finding their way to rivers. The maintenance contractor will be responsible for regular clearing of drainage structures to keep them effective. Additional plantings around drains will be appropriate and will help to retain surface particles on land.

285 Water quality may show slight improvements after rehabilitation and maintenance due to reduced erosion from improved embankments on the slopes, stabilization by rip-rap or gabion baskets, and re-vegetation to prevent erosion. However any improvements are unlikely to be detectable in water samples due to the infrequency of rainfall. To cater for the times when there is heavy rain, the replacement of dilapidated or damaged culverts will facilitate passage of high flows and reduce scouring and remove overland flows, ensuring the integrity of the surface of the road pavement and removing a potential hazard from overflowing.

286 The area of impervious surface is not being significantly increased by Project and therefore increased runoff due to rehabilitation activities (if any) will be negligible in the Project area.

5.6.4 Routine and Ongoing Maintenance

287 There are unlikely to be any significant impacts on soil during the operation phase of the Project as long as the structures are properly maintained. Naturally occurring river bank erosion could in fact be reduced as a result of the Project if selective road sealing, gabion baskets and rip-rap are used to stabilize the river banks and protect the road where it passes close to the rivers. Rip-rap, gabion baskets or bio-engineering alternatives will also be used to reduce scour and erosion in identified sections. These impacts and values can be maintained through good design as follows:

- DRFBC will ensure that all culverts and drainage structures are adequately maintained so that debris does not build up causing waters to deviate around the structures stranding them and resulting in severe erosion and loss of land; and
- Scour protection is on-going and adaptive to changing river requirements.

288 Increasing awareness about the need to maintain vegetative cover of areas adjacent to the road in terms of both assisting in reducing silt laden run-off to waterways and the inter-tidal area and contributing to the stability of river banks and the foreshore area, can be included as a component of the project's communication plan and identified as part of the maintenance activities.

5.7 Operation Impacts on the Biological Environment

5.7.1 Effects on Flora and Fauna

289 The operation of the Project is not likely to induce people to the area to poach or hunt timber, flora or fauna as it does not comprise provision of additional access to previously inaccessible areas. The road already exists and does not provide access to the interior and still forested areas.

290 Deforestation is not an impact attributable to the Project because (i) single selective logging for traditional and/or cultural purposes is permitted; and (ii) logging companies purchase licenses to fell trees within prescribed areas and construct their own roads to provide access to these areas, and in any case logging has not been a major activity in the Project area. Therefore there will be no impacts on flora and fauna as a consequence of road rehabilitation during the operational phase.

291 There are no rare or endangered fauna that could be impacted by the operation of a rehabilitated road.

5.7.2 Protected Areas

292 There will be no impacts on existing or proposed conservation area as a result of the road rehabilitation.

5.8 Operation Impacts on the Social Environment

5.8.1 Noise Effects

293 Even under the most optimistic scenario of increased traffic, the ambient noise level after the completion of rehabilitation activities along the road (operational period) will not be of sufficient magnitude to require mitigation.

294 As noise is a function of traffic numbers, ambient noise levels will not increase above acceptable levels due to the low forecast traffic.

295 Maintenance of vehicles travelling on the road to maintain an acceptable level of, or to reduce, noise emissions in the operational phase, is beyond the scope of the project.

5.8.2 Risk of Spread of Communicable Disease

296 In terms of risk of transmission of communicable diseases during operation, roads have the potential to pose a risk as a pathway for disease transmission only if they carry a large volume of traffic, including high proportions of heavy traffic such as trucks, are routes that connect cities, towns or large numbers of villages, especially roads or highways with international borders where improved access to major markets can facilitate international trade, and there is a hospitality service industry established that is geared towards large numbers of truck drivers and mobile populations.

297 The road does not provide linkage to Indonesia. Therefore the conclusion, in terms of risk of transmission of communicable diseases during operation, is that the Project road has the potential to pose, a low risk as a pathway for disease transmission. This small risk is considered to be mitigated by implementation of the Project's STIs/HIV/AIDS awareness and prevention campaign.

5.8.3 Access, Traffic and Community Safety

298 Following rehabilitation of the road, local access as well as the performance of a key route in the transport network will be improved. This will facilitate the flow of traffic, goods, and passengers between the sub-districts and two towns within the Project area and facilitate transportation to and from the capital of Dili. Access to social services and key community facilities will be improved as a result of the Project. The implementation of the maintenance plan to be implemented by DRBFC will ensure the sustainability of the road rehabilitation.

299 In general traffic safety will be improved following rehabilitation and routine maintenance of the road, inclusion of the shoulder and minor widening of the road will allow for safe passing of vehicles. An increased traffic volume and possibility of higher vehicle speeds can create the potential for accidents involving pedestrians and children (who are used to playing on the road). The Project overall includes a road safety program which will help mitigate this.

300 It should be noted that overgrown vegetation poses a traffic hazard, especially when it reduces sight-lines around corners. Vehicles are known to cross to the other side of the road to avoid heavily vegetated areas, posing accident risks to oncoming vehicles. Clearance of road-side vegetation should be included as part of the road maintenance program.

301 The rehabilitation and widening of the Project road is likely to increase the vehicle speed on the road. Increases in traffic flow indicate additional future traffic should be moderate and unlikely to create many community safety issues. Overall the condition of the road facilities will be enhanced and driving conditions should improve. Routine safety measures, signage and road markings should be introduced to reduce driving risk further in sucos and accident prone areas and provide enhancements to driving conditions.

6. Consultation and Information Disclosure

6.1.1 Introduction and Stakeholder Identification

302 The objectives of the stakeholder consultation process were to disseminate information on the Project and its expected impact, long-term as well as short-term, among primary and secondary stakeholders and to gather information on relevant issues so that the feedback received could be used to address these issues at early stages of Project design. Another important objective was to determine the extent of the concerns amongst the community, to address these in the Project implementation and to suggest appropriate mitigation measures. The feedback received has been used to address these issues at early stages of Project design.

303 The stakeholders consulted for the Project included local affected persons, local village head persons, local authorities, suco leaders, national authorities, educational institutions, and other groups with an interest in the Project corridor where the improvements will be implemented. GOTL departments were also consulted. Individuals representing several hundred persons from numerous family groups in the sucos along the alignment were informed about the Project and invited to comment on their environmental concerns. These stakeholders were considered to be representative of the community living in the area, the road users, the business associated with the road and the locally elected representatives. Consultations have taken place in three phases.

304 The first phase of disclosure took place with a public consultation meeting held on October 13, 2010, coordinated by the JICA study Team with around 40 participants from various government departments, district officers, suco leaders, donors banks, international organizations, and NGOs participating. The meeting shared the basic concept and scope of the preparatory survey with the participants and gathered views, comments, and recommendations of the participants about issues on technical design, environmental issues, land acquisition and resettlement. These comments were taken into consideration in the design of the project.

305 The second phase of consultation took place between May 27 & 28, 2013 in Manatuto District and Dili District. The public consultation meeting incorporated the environmental and social economic baseline surveys. Participants included suco and aldeia leaders, government staff of several sectors, and NGOs. Approximately 35 persons attended in Manatuto District and 31 persons in Dili District. Attendance of participants is presented in Appendix 4.

6.1.2 Concerns Raised and Responses

306 The communities along the Project road generally indicated they would support the rehabilitation and improvement project. Some suggestions were made on the alignment and need for wider bridges. The main environmental concerns included slope stability, vegetation loss, flooding, erosion control, traffic accidents, protecting water supplies, preventing damage to local electricity cables and other infrastructure and utilities surrounding construction areas. Prompt completion of the works and minimization of land acquisition were also requested by some local stakeholders. No significant operational phase impacts were identified. Table 6.1 summarises the result of discussion from the first phase.

Table 6-1 Comments from participants at the first phase public consultation

Technical Aspect	
1.	The road alignment between Bercoli and Subao in Manatuto District has many twists and turns in the mountain side, which causes traffic accidents. Hence, we recommend to MPW (Ministry of Public Works) to construct a by-pass through mountain areas. (Participants from Manatuto district)
2.	We welcome the project because the national roads in Timor-Leste are still out of standards.
3.	Upgrading of national road with widening have more impacts.
4.	Realignment and construction of bridge, and installation of guard rails along the road shoulders are recommended.
5.	Due attention should be paid to risks of erosion on the slopes.

6.	Alternate road reaching to Baucau Airport is recommended.
7.	The government should fully support and contribute in the project implementation.
8.	The current highway passes very closely to Baucau Airport, which needs to find another route.
9.	Laleia Bridge needs to be widened because its width is not sufficient to allow the current traffic volume.
Environment	
1.	Rural water sources and mangroves in Bercoli might be affected by the project operations. Mitigating measures shall have to be prepared to minimize anticipated impacts to these natural resources.
2.	There are impacts on environment, water resources and mangroves in broccoli.
3.	If there are land acquisitions and cutting of trees, compensation for loss of land and trees must be paid.
4.	It is important to protect the water sources in the country.
Land Acquisition & Resettlement	
1.	The project is welcome because it brings economic development to the communities.
2.	MPW should work with more frequent coordination from the Ministry of State and the Ministry of Justice.
3.	Community people will not resist displacement and relocation of some kiosks, business assets, and other structures along the road side. Suco leaders will help resolve this problem.
4.	It is necessary to conduct socialization program & information dissemination campaign in the affected communities.
5.	Due attention should be paid by the government to resolve the affected natural environment in the protected area, if any.

307 Concerns with respect to road alignment and drainage design and the disturbance or destruction of crops and gardens, private property and community disturbance have been brought to the attention of the Project proponent in the second phase of consultation and the relevant parties are well aware of the potential for local disturbance that can result from poorly controlled contractors. The main issues raised are addressed in the environmental management plan, as far as is reasonably practicable at this stage; a resettlement plan has been prepared to compensate for affected persons that can reasonably be predicted at this stage. Unforeseen impacts will also be captured by the requirements to update the environmental management plan and inform JICA in response to any unpredicted impacts that arise periodically as necessary. The main environmental concerns raised and the responses are in Tale 6.2. Land acquisition and compensation issues dominated the second phase consultation.

Table 6.2 – Concerns Raised and Responses

Concern raised	Response
Generally, local residents are very happy with this improvement project. They feel this will contribute to the local development. It is beneficial and can drive up local economic growth	Participation and consultation will be continued into the implementation stages to preserve the goodwill and support of the public.
There are sacred places, religious sites, and cemeteries close to the roads. These places must be considered when road improvement project is implemented	Known religious sites and cultural heritage locations have been recognized and protected in the EMP As a fall back option a watching brief will be kept and included in EMP
Water supply is essential for the locals. Many are still lack of water even they have pipes or water well. Water is also collected from different sources and places (hillside and underground pump). Although supply is not generally sufficient for local requirements but this must be protected. Local people need clean water. Most of the pipes are rightly on the roadsides	Facilities will be identified before construction commences and re-provisioning planned to be completed before construction commences and agreed with local authority in Utilities & Infrastructure Management Plan.
Local traffic will be expected to be affected significantly. Local help will be available to manage this situation.	Precautions will be taken to keep traffic flowing by implementation of measures included in the EMP
Besides water, electricity is very essential. The distribution lines run on poles next to the road and need to be protected.	Power and other facilities will be identified before construction commences and re-provisioned before construction commences and agreed with local authority in the EMP
Traffic accidents would be unavoidable, but it should be controlled. There are some concerns and comments asking to build pavement for pedestrian as well. It would also be good to improve culverts and drainage at the same time	Road will be widened with sealed hard shoulders and road markings and signs to improve safety. Footpaths have been recommended in villages particularly near the schools.

Concern raised	Response
Local affected people do not expect too many major impacts but this is the first project of this scale for some time in the area. [Contractor should control the impacts]. Most people are also recommending a close coordination between government, companies and local communities and leaders to see the impacts	Participation and consultation will be continued into the implementation stages to preserve the goodwill and support of the public. The GRM will also respond to any complaints. The contractor(s) will commit to implementing the mitigation measures identified in the Project EMP and EMPs and will be monitored by PMU
Starting soon [and complete a soon as possible} is highly expected.	PMU will monitor progress of the works. This matter has been drawn to the attention of the proponents and is recognized as a public concern through this report
Negative impacts, such as on environment should be minimized through the cooperation with local leaders and community	The EMP requires presents mitigation measures for all impacts foreseeable at this stage.
Flooding is common as many places are situated lower that the roads. As suggestions, most of them recommend to have drainages on both sides of the roads and culverts. Good maintenance would be important	The EMP requires detailed designers to take account of heavy rainfall and potential flooding in the detailed designs. In construction phase erosion control plan will be implemented as per EMP to control runoff. Maintenance is proposed to increase.
Few are concerned about road widening project. If this will happen, a close coordination and cooperation with local leaders and affected community is necessary. Mostly recommend for a fair and reasonable compensation	If land acquisition or resettlement are needed the appropriate compensation will be included in the resettlement plan.
There are some buildings to be protected close to the main roads (mostly are local administration building and Police), which need to be considered as well.	The EMP requires presents mitigation measures for all impacts foreseeable at this stage.
The implementation of land acquisition should involve both local leaders, at least suco and aldeia and also government parties such as district land officers, agricultural land owners, public works departments etc., in order to achieve a smooth land acquisition process	The RAP is prepared to address all land acquisition and compensation issues.
If the resettlement is necessary, it is expected government should find out alternative locations according to culture and social condition of the displaced people and the way of life for those resettled people	The RAP is prepared to address the resettlement issues.
Agreement of compensation should refer to other locations that have conducted land acquisition process already, so the pricing difference will be not so obvious	The RAP is prepared to address all land acquisition and compensation issues.
The irrigation building structure (channels) and the other public facilities such as water pipe lines should not be disrupted during construction activity	The irrigation channels have been noted by te engineers and water pipe lines will be protected or reprovisioned before the works commence. As required in the EMP.
It is recommended to have close coordination between the project and other ongoing projects for construction along Dili-Manatuto road such as the bridge development in Hera and also the retaining wall project in Camea.	The PMU and PISC will coordinate closely with all other projects near the subject road especially in the design and preconstruction stages.
It would better for the national road upgrading project to start the road construction as soon as possible because there are some people that are starting to renovate their houses and also building new construction at right and left side of road. A prompt start will avoid land acquisition problems in the future.	The construction is planned to start as soon as possible soon in 2014.
The local people did not recommend moving of the Grotto of Santo Antonio near Beheda bridge for the widening of road. They suggested to seek another alternative alignment shift to left side away from the grotto or any on other alternative road alignment	The Grotto of Santo Antonio near Beheda bridge will be avoided.
The protection of the existing crocodile habitat close to Laclo River needs to be taken into account during construction activity and this national road operation	The EMP provided for special attention to be paid to the area near Km50 where crocodiles are seen..

Source: Nippon-Koei Consultants (June 2013).

308 Consultations will continue throughout preconstruction and construction phase as per the Project's communications plan. Records including reports on environmental and social complaints and grievances will be kept in a simple database in the PMU Project Office. There are no significant potential constraints of public or private groups for the Project.

6.2 Information Disclosure

309 Information disclosure will be undertaken as per the requirements of JGESC policy 2010. In disclosing the environmental documents to the public, the MPW through the PMU is responsible for (i) providing the SEIS to JICA for review and to NDE for clearance; (ii) ensuring that all

environmental assessment documentation, including the environmental due diligence and monitoring reports, are properly and systematically kept as part of the Project specific records; (iii) disclosing all environmental documents, and making documents available to public, on request; and (iv) providing information to the public and stakeholders as per the Project's communications plan.

310 Disclosure of relevant environment safeguards documents will be in an appropriate form, manner, and language and at an accessible location to be understandable to the affected people and local stakeholders.

311 Where indigenous people or a linguistic group requires translation assistance, the Project will ensure that translators and translation of information materials will be available. This will be done in a manner to ensure full consultation with and disclosure to affected people, stakeholders and communities regarding the requirements for environment mitigation and monitoring as well as for land acquisition.

312 The following safeguard documents to be prepared and submitted by the PMU shall be publically disclosed by GOTL including posting on JICA's website:

- Draft and final SEIS or other environmental assessments;
- New or updated environmental assessment reports if prepared to reflect significant changes in the project during design or implementation;
- Corrective action plan prepared during project implementation to address unanticipated environmental impacts and to rectify non-compliance to EMP provisions; and
- Quarterly safeguards monitoring reports and other reports submitted by the PMU during project implementation (PISC will report monthly to PMU).

7. Grievance Redress Mechanism

7.1 Need for Grievance Redress Mechanism

313 MPW assisted by PMU will establish a grievance redress mechanism (GRM) for the sector project to facilitate resolution of complaints by affected people and grievances about the project's environmental performance, in line with the requirement of JGESC. The GRM will be facilitated by the PMU and be applicable to all contractors who will be required to maintain a grievance registry or record. The PMU or designated officer in liaison with the Suco leaders and committees at the district level.

314 The public will be made aware of the relevant contact numbers and contact person in PMU and each contractor through media publicity, notice boards at the construction sites, and local authority offices. The public will be made aware that the contractors and the PMU have an open door policy and that the complainant can remain anonymous if requested. The GRM will address affected people's concerns and complaints promptly, using an understandable and transparent process based on traditional methods for resolving conflicts and complaints. The GRM shall provide a framework for resolving complaints at the project level as well as beyond the project (that is, involving relevant government offices such as District and Suco committees, NDE, etc.), using the existing judicial or administrative remedies. The GRM will be detailed in the SEISs and other safeguard reports as required (such as resettlement plans).

315 The GRM to be established to receive, evaluate and facilitate the resolution of affected people's concerns, complaints and grievances about the social and environmental performance at the level of the Project. The PMU will maintain an open door policy to accept complaints at all levels concerning the environmental performance of the project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project.

316 A project information brochure will include information on the GRM and shall be widely disseminated throughout the Project corridor by the safeguards officers in the PMU. Grievances can be filed in writing or by phone with any member of the PMU, construction sites and other key public offices all of which will accept complaints.

317 Existing arrangements for redress of grievances for affected persons are through complaints to the village and suco committees up to the district level and then through the PMU and back to the agency which implements a project. This indirect route will remain in place to preserve the usual administrative remedies. There will be a need to deal with complaints and grievances during construction for this Project.

7.2 Steps and Procedures for the GRM

318 **First tier of GRM.** The contractor and/or PMU are the first tier of GRM which offers the fastest and most accessible mechanism for resolution of grievances. One of the two safeguards officers or designated officer in the PMU shall be the key officers for grievance redress. Resolution of complaints will be done within fifteen working (15) days. The safeguards officers in PMU will provide the support and guidance in grievance redress matters. Investigation of grievances will involve site visits and consultations with relevant parties (e.g., affected persons, contractors, traffic police, etc.). Grievances will be documented and personal details (name, address, date of complaint, etc.) will be included unless anonymity is requested.

319 A tracking number shall be assigned for each grievance, and it will be recorded including the following elements: (i) initial grievance record (including the description of the grievance), with an acknowledgement of receipt handed back to the complainant when the complaint is registered;

(ii) grievance monitoring sheet, describing actions taken (investigation, corrective measures); and (iii) closure sheet, one copy of which will be handed to the complainant after he/she has agreed to the resolution and signed-off. The updated register of grievances and complaints will be available to the public at the PMU office, construction sites and other key public offices along the project corridor (offices of the suco and districts). Should the grievance remain unresolved it will be escalated to the second tier.

320 **Second Tier of GRM.** The PMU will activate the second tier of GRM by referring the unresolved issue (with written documentation) to the PMU who will pass unresolved complaints upward to the Grievance Redress Committee (GRC). The GRC shall be established by MPW before commencement of site works. The GRC will consist of the following persons: (i) Project Director; (ii) representative of District and Suco; (iii) representative of the affected person(s); (iv) representative of the local land office; and (v) representative of the National Directorate Environment (NDE) (for environmental related grievances). A hearing will be called with the GRC, if necessary, where the affected person can present his/her concern. The process will facilitate resolution through mediation.

321 The GRC will meet as necessary when there are grievances that cannot be solved at the first tier and within thirty (30) working days will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision and a timeframe that must be adhered to. The functions of the GRC are as follows: (i) resolve problems and provide support to affected persons arising from various environmental issues and including dust, noise, utilities, power and water supply, waste disposal, traffic interference and public safety as well as social issues land acquisition (temporary or permanent); asset acquisition; and eligibility for entitlements, compensation and assistance; (ii) reconfirm grievances of displaced persons, categorize and prioritize them and aim to provide solutions within a month; and (iii) report to the aggrieved parties about developments regarding their grievances and decisions of the GRC.

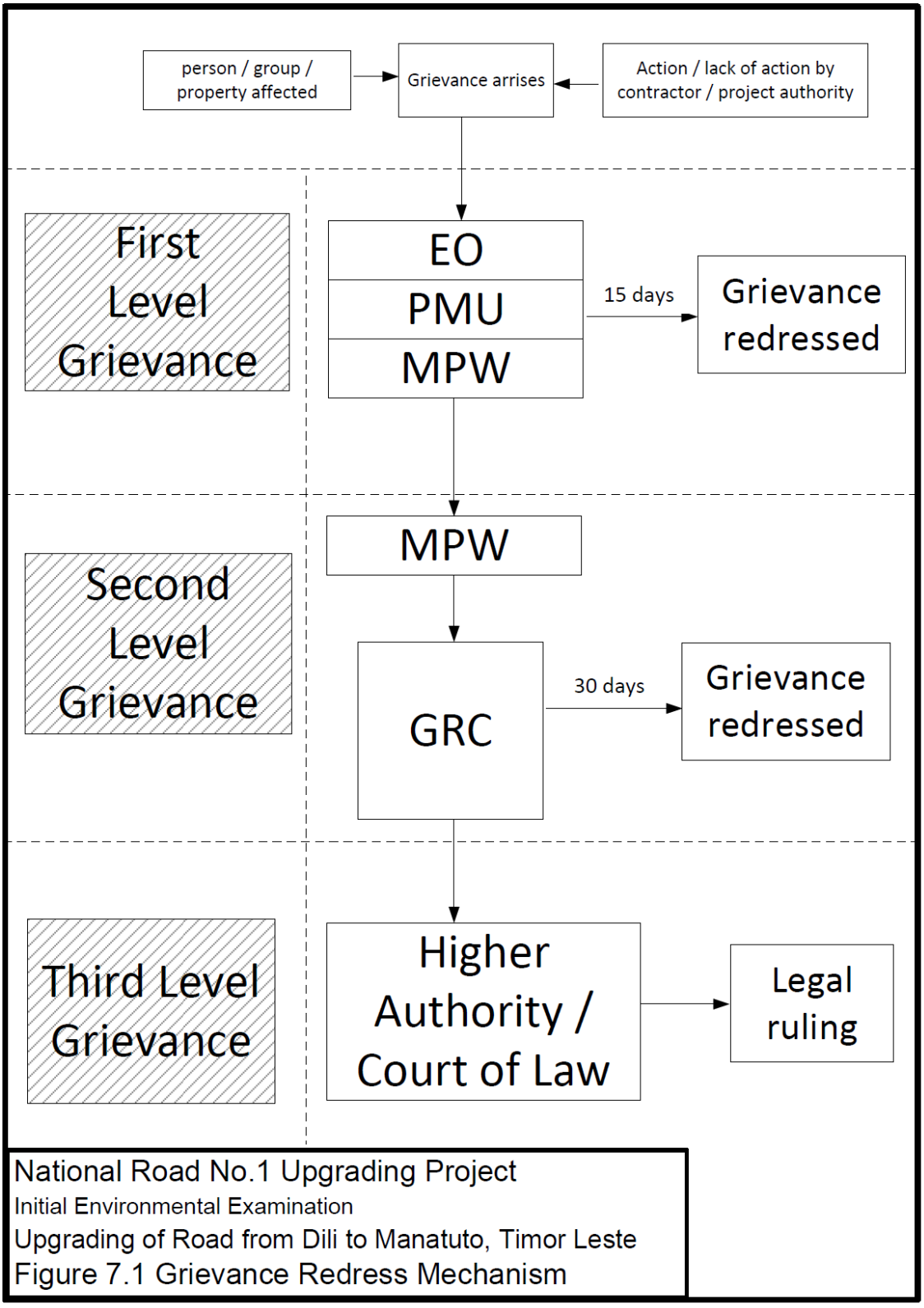
322 The PMU will be responsible for processing and placing all papers before the GRC, maintaining database of complaints, recording decisions, issuing minutes of the meetings and monitoring to see that formal orders are issued and the decisions carried out.The contractor will have observer status on the committee. If unsatisfied with the decision, the existence of the GRC shall not impede the complainant's access to the GOTL's judicial or administrative remedies.

323 **Third tier of GRM.** In the event that a grievance cannot be resolved directly by the contractor or PMU officers (first tier) or GRC (second tier), the affected person can seek alternative redress through the Suco or District committees under the existing arrangements for redress of grievances for affected persons. The PMU or GRC will be kept informed by the district, municipal or national authority.

324 Monitoring reports shall include information about the GRM including: (i) the cases registered, level of jurisdiction (first, second and third tiers), number of hearings held, decisions made, and the status of pending cases; and (ii) an appendix which lists cases in process and already decided upon may be prepared with details such as name, ID with unique case serial number, date of notice/registration of grievance, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance (i.e., open, closed, pending) and if it is a repeat of a previous grievance.

325 The grievance redress mechanism and procedure is depicted in Figure 7.1.

Figure 7.1 - Grievance Redress Mechanism

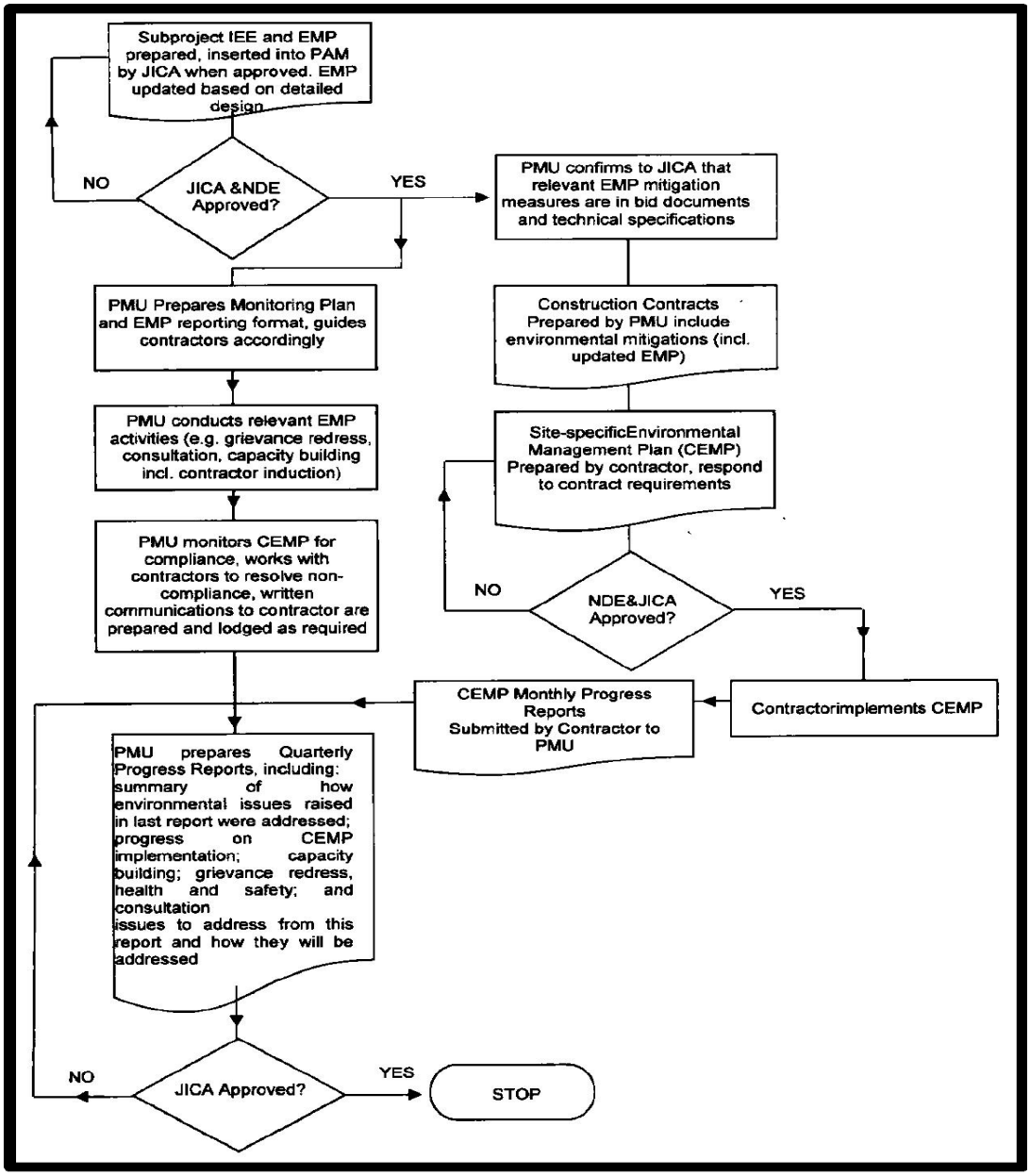


8. Environmental Management Plan

8.1 Overview of Environmental Management Plan

326 The environmental management plan (EMP) contains a number of components crucial to effective environmental management within the project. These include: (i) organizational responsibilities (for various aspects of EMP implementation); (ii) consultation and information disclosure; (iii) plan for mitigation of impacts (during pre-construction, construction and operation); and, (iv) monitoring. These are explained in detail in the sub-sections below. Figure 8.1 provides a flow diagram for the environmental management documents, showing the process for preparation, submission, and approval of various documents as well as the monitoring and reporting required for environmental management of the project.

Figure 8.1 – Flow Diagram pf Environmental Management Documents



8.2 Institutional Arrangements and Responsibilities

327 This sub-section of the EMP presents a discussion of the environmental management structure and activities that will be undertaken as part of overall NRA01 implementation. The roles and responsibilities of various agencies in undertaking these activities are then defined and the institutional strengthening activities that will be required to allow those organizations to fulfil their nominated roles and responsibilities are identified. An environmental monitoring program has been prepared and the cost associated with its implementation has been identified (refer to Section 8.6).

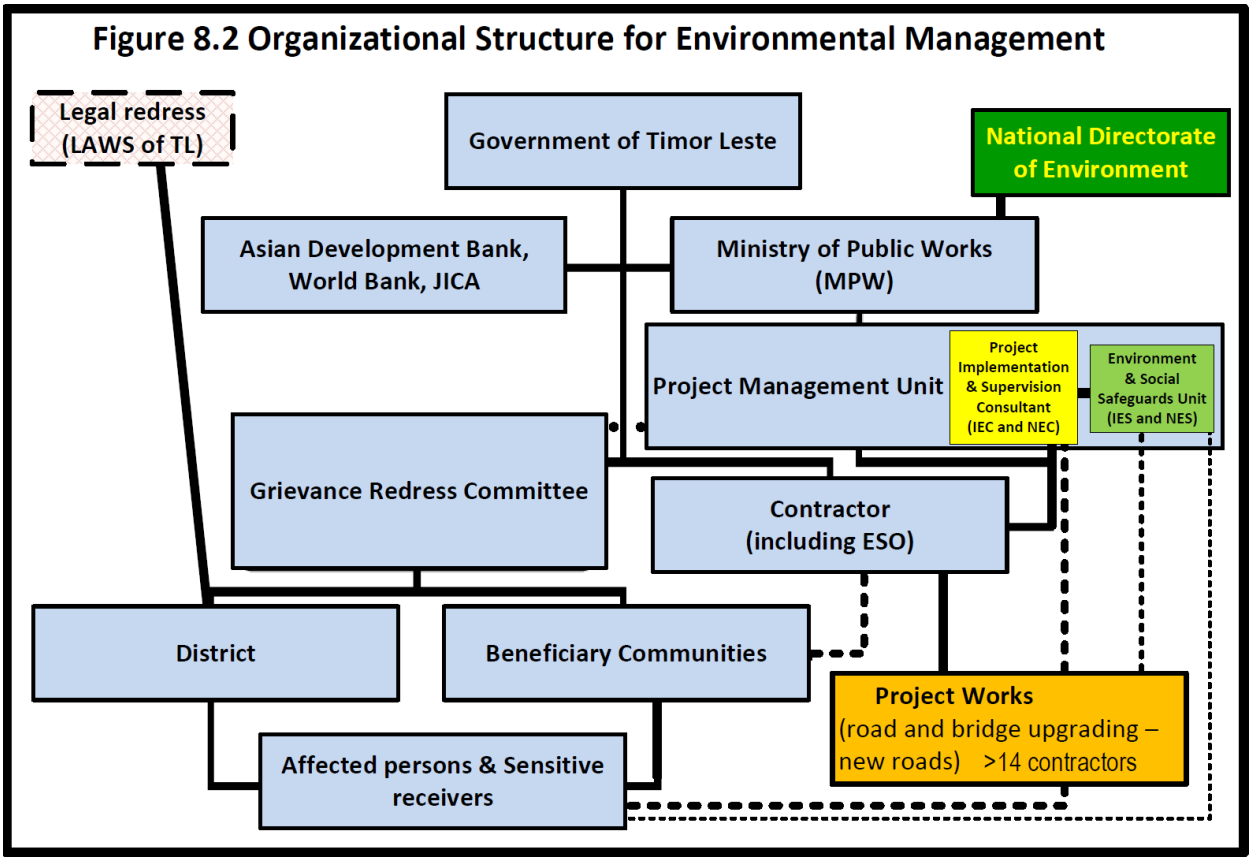
8.2.1 Overall Monitoring Responsibilities and Activities

328 The PMU will be responsible for monitoring of the project construction activities; assisted by the PISC environmental specialist consultants on a day to day basis. PISC will carry out regular daily and weekly inspections of construction activities and monitoring of mitigation measures. PMU will carry out spot checks to compliment the activities of PISC. Together this will provide an efficient use of the environmental monitoring resources available to the Project.

8.2.2 Organization Roles and Responsibilities

329 The overall organizational structure for environmental management for the project is shown in Figure 8.2.

Figure 8.2 - Organizational Structure for Environmental Management



8.2.3 Role of Ministry of Public Works

330 As implementing agency for NRA01 MPW has overall responsibility for preparation, implementation and financing of environmental management and monitoring tasks as they pertain to the Project and inter-agency coordination. MPW will exercise its functions through the PMU which will be responsible for general project execution, and which will be tasked with day-to-day project management activities, as well as monitoring.

331 A consulting firm (PISC) has been hired to provide services for detailed engineering design, construction supervision, and other assignments, as needed.

332 **Project Management Unit.** The PMU already established in MPW has been augmented in November 2013 to implement the Project and manage detailed design and supervision of construction. The PMU is headed by a full-time Project Manager and supported by a team consisting of staff and consultants engaged under different project arrangements. The PMU will be responsible for the following: (i) assisting the IA in implementing the Project; (ii) carrying out procurement and engaging design and supervision consultants (PISC) and contractors; (iii) as required liaising and coordinating with the DRBFC; and (iv) managing the contractors, and liaising with other stakeholders, on the day to day implementation of Project activities. The PMU, through the PISC, will retain experienced consultants to monitor and report on contractor compliance with the approved CEMP.

333 Road project implementation has evolved to the point that PMU needs to recruit safeguards staff who can receive training and capacity building under various projects financed by development partners. PMU has established an Environmental and Social Unit (ESU) that is co-financed from loans by JICA, WB and ADB. ESU staff – national environment specialist (ES) and national social safeguards specialist (NSS)- will receive capacity building and training from two international specialists financed under the Project (one environment (IES) and one (ISS) resettlement and social).

334 Wherever possible future projects - irrespective of financing - will provide support to PMU staff rather than national consultants brought on for specific projects. This will provide long term institutional support and develop the PMU.

335 In the implementation of environmental management and monitoring tasks specific technical assistance will be provided by environmental specialists that are part of the PMU. The specialists will assist in all aspects of implementation of environmental assessment and management, internal monitoring and evaluation (M&E), and training of MPW and MECM and other relevant government agencies.

336 PMU will prepare and submit to MPW and JICA Quarterly Progress Reports, these will incorporate the main items raised in contractor's monthly reports and the environmental monitoring reports prepared by PMU environmental specialists and NED, as well as all other items required by MPW and JICA.

337 **Design and Supervision Consultant.** The PMU will be supported by a PISC. The PISC will comprise international specialists as required to supplement existing PMU resources and deliver a capacity building program. In respect of safeguards the PISC will include an international environment consultant (IEC) and international resettlement and social development specialist for 6 months each intermittent. National environment consultant (NES) will also be required full time to monitor contractors mitigation measures on a daily basis.. The first inputs of each international specialist will be 2 months to maximize capacity building efforts across a number of activities required in first phases of implementation as well as for more general awareness raising and training needs. The NEC should be in place by the time the Contractor is mobilized.

338 A capacity building program in environmental assessment and management will be delivered by the IESC and NEC. Staff in the MPW, PMU, NEC and contractors will receive training

and capacity support from the IEC to ensure learning and development, as well as smooth and effective implementation of the CEMP.

8.2.4 Role of National Directorate of Environment

339 The NDE, the agency responsible for environmental management, was consulted at the outset of the SEIS process, will be consulted on the confirmation of the categorization of the project, and under the provisions of the ELL will review the SEIS and issue environmental clearance and grant of license.

340 Ongoing consultation with NDE will be required during the construction of the project and NDE will be asked to assist in the monitoring of implementation of the CEMP and ensure that environmental management and mitigation of the project is undertaken to an acceptable standard. Periodic inspections will take place with NDE, PMU, PISC and Contractors.

8.2.5 Role of the Contractor

341 The civil works contractor will be responsible for responding fully to all contract conditions including those covering environmental mitigation, social mobilisation and awareness and monitoring The contractor will then be responsible for implementing all environmental, health and safety actions included in the EMP and relevant clauses in the bidding documents and contract during the pre-construction and construction period.

342 The contractor will prepare the contractors EMP (CEMP) based on the site-specific construction methodologies they propose to use and the EMP in this SEIS. The CEMP will further develop the EMP contained in this SEIS and will detail measures for all impacts covered in the EMP including but not limited to traffic management, waste management, hazardous material and waste management and health and safety. The PMU will review and approve the CEMP before the commencement of construction.

343 The contractor will appoint an Environmental and Safety Officer (ESO) who will be responsible for site inspections on a daily and weekly basis to check compliance with the approved CEMP and ensuring implementation of all health and safety requirements, these will be documented and subject to monitoring by PMU and NDE. The responsibilities of the Contractor include:

- Participate in induction on EMP and mitigation measures to be delivered by PMU prior to preparation of the CEMP;
- Appointing an ESO and Deputy ESO, sending letter to PMU confirming that these positions have been filled and by whom before construction commences (the bidding documents and contract specify the roles and tasks of the ESO);
- Seeking training and support from PMU on any aspects of environmental management, as required;
- Coordinating with PMU for preparing and submitting the CEMP following detailed design, the ESO will be responsible for ensuring that the Contractor complies with the clauses in the contract and bidding documents in respect of environment, health and safety;
- As required, preparing, and submitting for approval, appropriate plans (tree cutting, aggregate extraction, traffic management etc.);
- Engaging an approved service provider to undertake STIs and HIV/AIDS briefings and awareness raising amongst the contractor’s employees and communities, and reporting on the same;

- Coordinating with PMU in respect of community consultation i.e. establishing GRM etc; and
- Undertaking daily and weekly site inspections (by the ESO) recording the same in a site diary, and participating in monitoring and coordinating with PMU to ensure that environmental management activities are reported in Monthly Progress Reports as required.

8.2.6 Assessment of Institutional Capacity

344 A capacity assessment of the MPW for application of environmental safeguards in donor assisted projects was carried out. Environmental management for earlier donor assisted projects has been with support of consultants. MPW has no direct experience in preparation of environmental assessment documents and the experience of the conformance to the NDE requirements has been very limited; largely as NDE is still developing as the regulatory agency under the ELL. MPW and DRBFC's current approach to tackling environmental issues is on a project level basis and varies with the requirements of the funding agency.

345 In Timor-Leste, the environmental assessment process is established but environmental awareness and capability for implementation of EMP in infrastructure projects of both the executing agency (MOF) and the implementation agency (MPW) are still developing. MPW's PMU has accumulated some experience with the ongoing Road Network Development (Sector) Project and WB and JICA investments in upgrading and improving the road network.

346 The Rural Roads Policy (2009), still awaiting endorsement, has a main objective to "develop rural road infrastructure in an environmentally sustainable way". The need to institutionalize environmental assessments in the design and implementation of rural roads has been identified and close cooperation with the NDE is anticipated. This policy is focused on rural roads but makes several significant commitments as follows:

- MPW is committed to mitigate negative environmental impacts at all stages of provision and production of the rural road infrastructure;
- MPW will develop comprehensive guidelines that will be followed by all involved in the planning and development of rural road infrastructure; and
- MPW will mainstream environmental safeguards into the planning and development of rural road infrastructure, followed up during the implementation.

347 If this policy is supported and applied to other road infrastructure there is a basis for environmental management infrastructure projects in the medium term. However, consultations with the various agencies indicate that there will not be a permanent structure or division to handle environmental concerns or issues in project planning and implementation during the term of this Project.

348 Therefore the most significant challenge for environmental management on this Project is the lack of human and financial resources and necessary infrastructure in MPW as the line agency for implementation. The institutional capacity in terms of environment, currently existing is largely that of the existing PMU created for implementation of ongoing development partner funded projects in the transport sector.

349 Training and orientation programs on environmental aspects have been largely through the capacity building initiatives taken up as part projects, and these have been mostly one at a time and have been limited to a awareness or sensitization workshops.

350 National minimum environmental standards have not yet been declared but guidelines already exist and need to be applied. The former practice in MPW was that engineering officers may occasionally be delegated to check environmental matters on an ad hoc basis but for day to

day environmental management of projects is undertaken by the PMU. However the current capacity of MPW to address the environmental issues at headquarters and regional offices are insufficient and need to be augmented. At present there are two staff in PMU with direct responsibility for addressing environmental issues on donor bank funded projects.

351 The in-house capacity in MPW to check the adequacy of the Project EMPs is limited, or that they are being implemented effectively by a contractor. In the long term it is recommended that a new unit responsible for environmental management be set up to improve capacity in the MPW.

352 The proposed capacity building includes (a) awareness training of the MPW and PMU (including management) and contractors on environmental management as per GOTL and JICA requirements; (b) capacity building programs to improve the capability of environment staff at all levels in carrying out monitoring and implementing environmental management measures; and (c) capacity building programs on environmental issues including pollution control and guidance on obtaining environmental licenses. The training programs will be conducted in Dili and district capitals as agreed with MPW and PMU.

353 Contractor training workshops should be conducted periodically as every new contractor is engaged during the first year and every six months for the second and third years, to share experience in the implementation of the works and the monitoring report on the implementation of the EMP, to share lessons learned in the implementation and to decide on remedial actions, if unexpected environmental impacts occur. In the medium to long term as the environmental responsibilities of MPW develop, dedicated staff officers will be trained and developed with the aim of taking over the role currently undertaken by consultants and specialists.

8.3 Mitigation of Impacts

354 The SEIS has been prepared to identify and assess environmental and social impacts and has also set out a range of measures to avoid and/or mitigate those impacts (Section 5). The mitigation of impacts during the pre-construction phase will be the responsibility of MPW and the contractor, the mitigation of impacts during the construction phase will be the responsibility of the contractor, and the mitigation of impacts during the operations phase will be the responsibility of MPW and DRBFC.

355 A CEMP will be prepared by the contractor and submitted to PMU and JICA for review for approval prior to commencement of works. Table 8.3 includes the overall EMP for the Project within a matrix of mitigation measures and responsibilities of implementation. Parts of the EMP such as the pre-construction and construction elements - will be used following completion of detailed design, as the basis for the contractor's CEMP. The overall process is shown previously in Figure 8.1). Costs have been included where these are known. A number of mitigation measures will be the responsibility of the contractor who will be required to identify the best means for mitigating an impact and include these in the CEMP, therefore these costs will be borne by the contractor as part of the construction cost (IIC).

8.4 Environmental Monitoring and Reporting

356 Environmental monitoring is a very important aspect of environmental management during construction and operation stages of the project to safeguard the environment. In response to the impacts identified during the feasibility study, an environmental monitoring plan has been developed and is presented in Table 8.4. The contract documents will contain a list of all required mitigation measures (Section 5) the EMP and a time-frame for the compliance monitoring of these activities as per table 8.3. The monitoring will comprise surveillance to check that the contractor is meeting the provisions of the approved CEMP and all other contractual obligations during construction.

357 The environmental specialists of PMU will supervise the monitoring of implementation of mitigation measures during the construction stage and compliance with the CEMP. The PMU during project implementation will be required to:

- Develop an environmental monitoring protocol for the construction period, and formulate a detailed plan;
- With assistance from the Engineer, conduct regular environmental monitoring, including review of daily and weekly site inspections undertaken by the contractor and items recorded in the ESO's site diary (the main parameters to be monitored are outlined in Table 8.3); and
- Prepare environmental monitoring reports covering the above and prepare and submit inputs for the Quarterly Progress Reports.

358 Responsibilities for the implementation of the monitoring requirements of this SEIS are shown in Tables 8.1 and the EMP table (8.3). Implementation of mitigation measures during the construction stage will be the responsibility of the contractor in compliance with the bid documents, contract clauses and technical specifications.

359 The monitoring plan is incorporated into the EMP (and is presented in Table 8.3).

Table8.1 - Responsibilities for Environmental Management & Monitoring

Agency	Responsibilities
Ministry of Public Works (MPW)	• Overall responsibility for project construction and operation • Ensure that sufficient funds are available to properly implement all agreed environmental safeguards measures • Ensure that the Project, regardless of financing source, complies with the provisions of JICA's Safeguard Policy Statement (JGESC) 2009 • Ensure that Project complies with GOTL environmental laws and regulations • Ensure that tender and contract documents for civil works include all relevant parts of the environmental assessment and project agreements • Submit at least quarterly safeguards monitoring reports to JICA
Project Management Unit (PMU)	• Ensure that EMP provisions are implemented to mitigate environmental impacts to acceptable levels • Ensure that Project complies with JICA's JGESC and government laws and regulations • Engage and retain two full time staff within PMU as environmental safeguards officer (ESO) and social safeguards officer (SSO) • Ensure that environmental protection and mitigation measures in the SEIS and EMP are incorporated into the detailed design including climate change adaptation measures. • Ensure that requisite measures from the SEIS and EMP are incorporated into the bid and contract documents • Undertake environmental management capacity building activities for MPW and orientation and awareness training for contractors • Ensure that MPW has obtained necessary environmental license(s) from NDE/DEIA prior to award of civil works contracts. • Ensure that contractors obtain necessary environmental license(s) from NDE/DEIA prior to commencement of civil works contracts. • During detailed design phase carry out baseline data collection on air quality and noise (as specified in the EMP). • Assist MPW to establish an environmental grievance redress mechanism, as described in the SEIS, to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the Project's environmental performance • Undertake monitoring of the implementation of the EMP (mitigation and monitoring measures). • Prepare quarterly or semi-annual environmental monitoring reports for submission to JICA and other cofinanciers as necessary • Based on the results of EMP monitoring, identify environmental corrective actions and prepare a corrective action plan, as necessary, for submission to JICA and other cofinanciers as necessary • Implement all mitigation and monitoring measures for various project phases specified as PMU's tasks in the EMP • Work with DRBFC to undertake any additional environmental assessment for Projects prior and submit to JICA and NDE for review and clearance

Agency	Responsibilities
Design & Supervision Consultant (PISC included in PMU)	• Provide training and capacity building to MPW and PMU staff (including management) and provide training to contractors prior to the submission of contractor's CEMP. • Engage and retain two full time staff within DSC as national environmental consultant officer (NEC) and social safeguards consultant (SSC) • Incorporate into the project design the environmental protection and mitigation measures identified in the EMP for the design stage including climate change adaptation measures included in the SEIS. • During detailed design phase provide all necessary information to the MPW to facilitate obtaining environmental licenses from NDE prior to award of civil works contracts • During detailed design notify PMU of any change in alignment or project design/components and provide all necessary information to the PMU to facilitate preparation of any additional environmental assessment prior to project construction as required in the EMP (e.g., preparation of new or supplementary environmental assessment in case of change in alignment that will result to adverse environmental impacts that are not within the scope of the SEIS prepared during loan processing, etc.) • Update, based on detailed design, the EMPs and other environmental protection and management measures to be incorporated in bid and contract documents • Assist PMU in the review and approval of the contractor's CEMP for each road section • Assist PMU to undertake monitoring of the implementation of the EMP (mitigation and monitoring measures) including incorporation of reports from the contractors • Assist PMU to prepare quarterly progress reports and semi-annual safeguards monitoring reports for submission to JICA and MPW as necessary including incorporation of reports from the contractors and corrective action requests to contractor • Based on the results of CEMP monitoring, identify environmental corrective actions and prepare a corrective action plan, as necessary, for submission to JICA and other cofinanciers as necessary
Contractors	• Participate in induction training on EMP provisions and requirements delivered by the PMU • Prepare the CEMP and submit to PMU for approval • Obtain necessary environmental license(s) from NDE/DEIA for associated facilities for Project works, quarries, hot-mix plant etc. prior to commencement of civil works contracts • Ensure that all workers, site agents, including site supervisors and management participate in training sessions delivered by PMU and PISC. Maintain a record of training and conduct of awareness sessions for staff to ensure compliance with environmental and safety statutory and contractual obligations including the approved CEMP • Ensure compliance with environmental statutory and contractual obligations and proper implementation of JICA requirements including approved CEMP • Based on the results of CEMP monitoring, cooperate with the PMU to implement environmental corrective actions and corrective action plans, as necessary. • Based on the results of EMP monitoring, cooperate with the PMU to implement environmental corrective actions and corrective action plans, as necessary. • Respond promptly and efficiently to requests and instructions from PMU for environmental corrective actions and corrective actions and implement additional environmental mitigation measures, as necessary. • Provide sufficient funding and human resources for proper and timely implementation of required mitigation measures in the EMP.
National Directorate of Environment (NDE)	• Review and approve environmental assessment reports required by the GOTL • Issue, and renew environmental licenses as required by the GOTL during the life of the project • Undertake monitoring of the project's environmental performance based on their mandate

8.5 Environmental Management Costs

360 The estimated costs for environmental management include costs for staffing, mitigation, monitoring during construction and permitting costs. Most mitigation measures to be implemented during the construction phase will be included in the construction contract and be covered by the contractor. Implementation of mitigation measures will be part of the construction costs, and will be included in the Bill of Quantities (BOQ) as a monthly line item for implementation of CEMP. The costs for training proposed include the costs incurred towards the site visits, travel to the training program by the participants, printing of training materials and other logistic arrangements.

The costs involved towards preparation of training material and imparting of training are covered in the PMU costs.

361 In respect of staffing the IES will be financed through the PISC fee paid for by the loan, the first three years salary of the EO will be also financed out of the loan, after which time the MPW-PMU will cover the cost of the salary as with other full-time staff.

362 The budget for the environmental management costs for the Project is presented in Table 8.2 below. The government counterpart funding required, covering the costs for environmental licensing, will be borne by Government. Tree planting (re-vegetation) is included as a separate line item and will require clarification at the detailed design stage.

Table 8.2 - Summary of Estimated Costs for EMP Implementation

Item	Estimated cost (US$)	Costs covered by
International Environmental Specialist in DSC ESC – 6 months intermittent	150,000	DSC
Environmental specialist in DSC ESC – 36 months full-time	36,000	DSC
Environmental impact monitoring[1]	50,000	Cotract
CEMP implementation (construction mitigation measures)[2]	90,000	BOQ/Contract
Environmental Permitting[3]	TBC	MPW/PMU
Tree planting subject to confirmation at detailed design	TBC	Contract

Notes:
1 Allows $25,000 for portable monitoring equipment and $5,000/year per Project for chemicals and calibration;
2 Assumes $5000 per month for 18 months;
3 Expenditure on environmental licensing procedure are the responsibility of the state according to Article 43 of DL5/2011 therefore cost of permits for environmental license as clearance certificate under DL5/2011 required from DEIA should be nil.

Table 8.3 – Environmental Management and Monitoring Plan

IMPACT MITIGATION					IMPACT MONITORING		
Project activities	**Environmental Impact**	**Mitigation measures to be included in EMP**	**Mitigation Responsibility**	**Mitigation Cost (US$)**	**Parameter to be monitored**	**Frequency and means of verification**	**Monitoring Responsibility**
PRE-CONSTRUCTION PHASE							
Climate change adaptation	Risk of increased erosion and damage to road infrastructure	• Ensure all measures incorporated in design are implemented	PMU/PISC - design Contractor	Project IIC	Designs and works implemented	Visual inspection	PMU
Contractor EMP prepared Awareness and orientation od Contractor	All foreseeable impacts captured in CEMP.	The following sections or method statements shall be included in the CEMP based on the EMP and the CEMP shall be prepared by the Contractor in the preconstruction stage for approval by PISC and endorsement by PMU and implementation by the Contractor: • Waste Disposal (covering spoil disposal, general waste and hazardous waste); • Quarries, borrow areas and construction materials management; • Blasting and vibration; • Asphalt, hot mix plant, rock crushers and bitumen supply; • Erosion control and runoff; • Bridge repairs and river protection; • Water contamination prevention; • Dust and noise minimization; • Tree cutting and replanting; • Enhancement planting; • Construction camp operations, sanitation and diseases; • Power and utilities protection; • Drainage system, irrigation and water resources; • Safety precautions - workers and public; • Temporary traffic management; and • Accidental discovery of archaeological assets, sites or resources. • Decommissioning, rehabilitation, revegetation and recontouring of quarries, borrow areas and construction materials processing areas.	PISC – and Contractor compile CEMP based on the EMP in the SEIS and the CEMP shall be prepared by the Contractor assisted by PISC as necessary.	Project IIC	CEMP prepared and endorsed	Review inspection of CEMP	PMU
PISC Check on legitimacy of material sources	Project complies with donor bank requirements, best practice and material suppliers are fit for purpose	PISC checks legitimacy of material supplies proposed by Contractor in the CEMP and re[ports to PMU.	PISC & Contractor	Project IIC	CEMP prepared and endorsed	Review inspection of CEMP	PMU
Surveying and demarcation of centre-line	Minor loss of vegetation during demarcation	• Vegetation clearance during surveying and demarcation activities, especially of trees along the river banks and road-side, will be minimized. Major trees (especially in suco areas) to be removed will	PMU Contractor	Project IIC	Area of vegetation; area of felled trees/vegetation removal	During survey and activities - visual inspection	Contractor; PMU

Notes: IIC=Included in Contract (and specific means for mitigation to be identified and costed by Contractor); TBA=To be advised

IMPACT MITIGATION					IMPACT MONITORING		
Project activities	**Environmental Impact**	**Mitigation measures to be included in EMP**	**Mitigation Responsibility**	**Mitigation Cost (US$)**	**Parameter to be monitored**	**Frequency and means of verification**	**Monitoring Responsibility**
		be clearly marked, only marked trees will be removed; • In order to minimize loss of trees the trees that are not within the paved area or hard-shoulder but are in the embankment will not be cut unless for justifiable engineering or safety reasons; • The contractor will be responsible for providing adequate knowledge to construction workers in relation to existing laws and regulations regarding illegal logging. Contract documents and technical specifications will include clauses expressly prohibiting the felling of trees, not requiring to be cleared by the project, by construction workers for the term of the project; and • Construction workers will be informed about general environmental protection and the need to avoid un-necessary felling of trees wherever possible.				before, during and after	
Site clearance, digging, excavations	Accidental discovery of PCR or cultural property sites	• Contractor's CEMP to include section on "chance finds" • Site agents will be instructed to keep a watching brief for relics in excavations. • Should any potential items be located, the PMU will immediately be contacted and work will be temporarily stopped in that area. • The PMU with the assistance of the PMU will determine if that item is of potential significance and contact MPW to pass the information to the relevant department in GOTL (i.e. Secretary of State for Culture) who will be invited to inspect the site and work will be stopped to allow time for inspection.	Contractor;	IIC	Sites and/or resources discovered and their protection	During activities - stop work order issued; Site/resources dealt with appropriately	Contractor; Sec. of State for Culture/, PMU
	Removal of trees	• Based on the schedule of trees that are unavoidably to be cut made by PMU make a plan to remove trees and include this in the CEMP. • Consultation with owner and compensation as per Resettlement Action Plan (RAP)	PMU	In RP	No residual effect of loss; owner satisfaction with compensation	Following provision of compensation	PMU
Mobilisation of contractor, presence of construction workers, establishment of camp, associations with local people	Social disruption	• Suco (village) protocols discussed with workers as part of awareness and mobilization training; • At all times workers should respect village and land owner's boundaries and recognize an follow village rules and terms of conduct (especially addressing women and elders), avoiding damage to productive trees and gardens, and access to the resources and springs;	Contractor		Complaints of incidents between workers and villagers; No. of children entering camp; Number and effectiveness of signs	During activities - checking records for complaints, consultation with workers about protocols;	PMU

Notes: IIC=Included in Contract (and specific means for mitigation to be identified and costed by Contractor); TBA=To be advised

IMPACT MITIGATION					IMPACT MONITORING		
Project activities	**Environmental Impact**	**Mitigation measures to be included in EMP**	**Mitigation Responsibility**	**Mitigation Cost (US$)**	**Parameter to be monitored**	**Frequency and means of verification**	**Monitoring Responsibility**
		• The contractor is to ensure that workers' actions outside work site are controlled and Suco codes and rules of conduct are observed at all times; • The contractor will identify one member of their staff to be the liaison between the Suco chiefs and elders and contractor, as well as between the contractor and PMU; • Worker camp location and facilities will be located at least 500m from settlements and agreed with local communities and facilities approved by PMU and managed to minimize impacts; • Adequate signage and security provided at the site office and works yard and prevention of unauthorized people (especially children) entering the area; • Hire and train as many local workers as possible by using labour from each suco as the work proceeds along the road from suco to suco.					
	Health & safety	• Provide adequate housing for all workers at the construction camps and establish clean canteen/eating and cooking areas; • Potable water, clean water for showers, hygienic sanitation facilities/toilets with sufficient water supply, worker canteen/rest area and first aid facilities will be provided. Separate toilets shall be provided for male and female workers; • Portable lavatories (or at least pit latrines in remote areas) shall be installed and open defecation shall be prohibited and use of lavatories encouraged by cleaning lavatories daily and by keeping lavatory facilities clean at all times; • Wastewater effluent from contractors' workshops and equipment washing-yards will be passed through gravel/sand beds and all oil/grease traps and contaminants will be removed before discharging it into natural streams. Oil and grease residues shall be stored in drums awaiting disposal in Tibar in line with the agreed waste management section of the EMP and the Environmental License; • Predictable wastewater effluent discharges from construction works shall have the necessary permits from NDE and local authorities before the works commence; • As much as possible, food shall be provided from farms nearby or imported to the area. Bush meat supplies from protected areas will be banned to	Contractor	IIC	Camp, yard, streams/rivers	Monthly - observation, consultation	Contractor PMU

Notes: IIC=Included in Contract (and specific means for mitigation to be identified and costed by Contractor); TBA=To be advised

IMPACT MITIGATION					IMPACT MONITORING		
Project activities	**Environmental Impact**	**Mitigation measures to be included in EMP**	**Mitigation Responsibility**	**Mitigation Cost (US$)**	**Parameter to be monitored**	**Frequency and means of verification**	**Monitoring Responsibility**
		discourage poaching. Solid and liquid wastes will be managed in line with the provisions of the waste management section of the EMP; • Use of guns and hunting equipment by workers will be banned and dismiss workers taking or using green timber or hunting or in possession of wildlife (see 5.4.1); • Entry to the protected areas, IBAs and/or sensitive areas (beaches and mangrove areas) by workers will be banned; • Provision of adequate protection to the general public in the vicinity of the work site, including advance notice of commencement of works, installing safety barriers if required by villagers, and signage or marking of the work areas; • Provision of safe access across the works site to people whose suco and access are temporarily affected or disconnected during construction works (especially across drainage works in sucos);					
	Spread of communicable diseases	• Construction camp(s) will be established in areas with adequate drainage in order to prevent water logging at the camp and formation of breeding sites for mosquitoes in order to facilitate flow of the treated effluents; • Implementation of HIV/AIDS awareness and prevention program – community (villages)	Contractor & Approved service provider	TBA	STI/HIV/AIDS prevalence Increased awareness about transmission and prevention	Prior to construction - check contractor records, consultation with employees, discussions with NGO	PMU
CONSTRUCTION PHASE							
Operation of construction plant and vehicles generating emissions	Emission of exhaust from vehicles and machinery; Dust from aggregate crushing plant; generated by heavy vehicles transporting materials on roads; Uncovered loads on trucks; Dust from exposed stockpiles	• Construction equipment will be maintained to a good standard. The equipment will be checked at regular intervals to ensure they are maintained in working order and the checks will be recorded by the contractor as part of environmental monitoring; • Prohibition of the use of equipment and machinery that causes excessive pollution (i.e. visible smoke) at the Project site; • Material stockpiles being located in sheltered areas and be covered with tarpaulins or other such suitable covering to prevent dusty material becoming airborne; • Ensuring that all vehicles transporting potentially dust-producing material are not overloaded, are provided with adequate tail-boards and side-boards, and are adequately covered with a tarpaulin (covering the entire load and secured at	Contractor	IIC	Air quality, emissions, dust, particulate matter; Use of tarpaulins and loading of vehicles; Stockpiles	Monthly or after complaint - periodic visual inspection; Any particulate matter and smoke managed as per EMMP	Contractor; PMU

Notes: IIC=Included in Contract (and specific means for mitigation to be identified and costed by Contractor); TBA=To be advised

IMPACT MITIGATION					IMPACT MONITORING		
Project activities	**Environmental Impact**	**Mitigation measures to be included in EMP**	**Mitigation Responsibility**	**Mitigation Cost (US$)**	**Parameter to be monitored**	**Frequency and means of verification**	**Monitoring Responsibility**
		the front, sides and tail of the vehicle) during transportation. This is especially important as there are a number of suco along the road; • Damping down of the road, especially within 100m the sucos along the road and any roads being used for haulage of materials, during the dry season shall take place four times per day; and • Periodic qualitative air quality monitoring.					
Works in, or adjacent to, rivers and streams and in the vicinity of the coast	Erosion of riverbanks,; Effects on river structure including (i) changes to river water flows, including levels and velocity; (ii) changes to channel depth, structure & location resulting from excavations; and (iii) changes to riverbanks; Increased turbidity of river waters due to gravel extraction; Increased siltation at culverts; Construction materials are washed out into rivers and other areas	• Material stock-piles will not be located within riverbeds or the islands in the centre of rivers. Similarly, they will not be located within the current area of floodplain in areas subject to regular flooding (i.e. once per year or more). All land will be for temporary uses will be rehabilitated to original condition or better condition upon completion of the works to the satisfaction of the PMU; • Scour protection will be used as temporary measures, as needed, to ensure temporary structures do not damage river configuration; • Movements of vehicles and machinery, and hence disturbance, within the riverine habitats will be minimized at all times; • No vehicles or machinery shall be washed in the river; • In the event that the contractor causes damage to the river bank or other structural parts of a river, the contractor is solely responsible for repairing the damage and/or paying compensation; • Embankments and in-stream/river activities will be monitored during construction for signs of erosion; • Re-vegetation with local fast growing species, or other plants in consultation with the land owners and suco chiefs, will be carried out incrementally and as quickly as possible after work within any river habitat has been completed; and • Spoils, rubbish or any material will not be disposed of within any river system including riverbed, banks or floodplain areas. Suitable disposal sites will be designated in consultation with land owners and suco chiefs and approved by PMU.	Contractor	IIC	Temporary structures removed; River training/scour protection; No stockpiling in riverbeds, river islands or floodplains; Flooding frequency; Localised erosion	Monthly or as required after event; Check designs; Visual observation of culverts, bridges and in-stream/river work areas; Consultation with users	Contractor; PMU
Sourcing of materials (river gravels, aggregates etc)	Extraction of river gravels from the beds or active channels of rivers changes hydrology altering channel & erosion;	• Contractor to prepare materials extraction plan as part of CEMP; • Stockpile topsoil for later use and fence and re-contour borrow pits after use. Properly remove topsoil, overburden, and low-quality materials and	MPW, Contractor, PMU	IIC	Materials only obtained from designated sites (locations and method) as per extraction plan;	Monthly - visual inspection; Review of extraction plan;	Contractor; PMU

Notes: IIC=Included in Contract (and specific means for mitigation to be identified and costed by Contractor); TBA=To be advised

IMPACT MITIGATION					IMPACT MONITORING		
Project activities	**Environmental Impact**	**Mitigation measures to be included in EMP**	**Mitigation Responsibility**	**Mitigation Cost (US$)**	**Parameter to be monitored**	**Frequency and means of verification**	**Monitoring Responsibility**
	Extraction from quarries or borrow pits leaves unusable land, exposed water table, attracts rubbish dumping, reduces visual values	stockpile near the site to be covered and preserved for rehabilitation; • Gravel and alluvial material shall not be removed within 10m of the river bank or within 200m upstream or downstream from a bridge; • Gravel and alluvial material shall not be removed to a depth of greater than 2m and holes in river bed shall be re-contoured when extraction is complete; • Alluvial terraces or alluvial deposits which lie on the river beds but not covered by water in normal hydrological conditions; shall be preferred; • Use quarry with highest ratio between extractive capacity (both in terms of quality) and loss of natural state; • Use quarry sites lying close to the alignment, with a high level of accessibility not on slopes and with a low hill gradient; • Reinstate upon completion of construction works at each section damaged access roads, agricultural land and other properties due to transport of quarry/borrow materials, other construction materials and any other project-related activities n; • Provide adequate drainage to avoid accumulation of stagnant water during quarry/borrow site operation; • Avoid use of quarry sites located on river bed. If it is not possible to locate quarries out of river beds use only quarry sites lying on large rivers as approved by PMU. Quarry sites lying on small rivers and streams shall be avoided; • Cut berms and terraces during and after extraction in quarries in the mountainous or hilly areas to stabilize slopes, or wherever slopes are important, and implement a drainage system and vegetation cover for rehabilitation; • Dewatered and fence quarries and borrow pits as appropriate, upon completion of extraction activities to minimize health and safety risks; • Ensure borrow pits are left in a tidy state with stable side slopes and proper drainage in order to avoid creation of water bodies favorable for mosquito breeding; • Prevent accidental access and avoid drowning when pits become water-filled by implementing measures such as fencing, providing flotation			Rehabilitation is conducted as per extraction plan	Re-vegetation and rehabilitation	

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		devices such as a buoy tied to a rope, and backfill as soon as practicable; and • Additional extraction sites and/or borrow pits will not be opened without the restoration of those areas no longer in use; • Refill borrow pits as required by NDE using inert surplus spoil material and • Mark refilled borrow pits and cover with soil and plant vegetation as required by NDE. • The excavation and restoration of sites and borrow areas, as well as their immediate surroundings, will be undertaken in an environmentally sound manner to the satisfaction of the PMU. Sign-off to this effect by PMU will be required before final acceptance and payment under the terms of the contract. • Decommissioning of all accommodation, plant and construction materials processing areas wil include removal of all residual contamination, waste, machinery and constructed facilities. • Decommissioning plan will be included in the CEMP covering rehabilitation, revegetation and recontouring of quarries, borrow areas and construction materials processing areas.					
Spoil disposal. The mitigation measures also apply equally to discarded asphalt of macadam pavement surfaces.	Improper disposal impacts habitats and water courses	• Contractor's CEMP to include section on spoil disposal • Spoil will be reused as far as possible for bulk filling; • Spoil shall not be stockpiled at the side of the road or dumped over the road edge or the crash barriers; • Spoil will not be disposed of in rivers and streams or other natural drainage path; • Under no circumstances will spoil be dumped into any other watercourses (the sea, cliffs near the sea, rivers, streams, drainage, irrigation canals, etc.); • Under no circumstances will spoil be temporarily dumped into any other watercourses (rivers, streams, drainage, irrigation canals, etc.); • Spoil disposal shall not cause sedimentation and obstruction of flow of watercourses, damage to agricultural land and densely vegetated areas; • Spoil will not be disposed of on fragile slopes, flood ways, wetland, farmland, forest, mangrove and associated salt flats, beaches, religious or other					

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		culturally sensitive areas or areas where a livelihood is derived; • Surplus spoil will be used where practicable for local repair works to fill eroded gullies and depression areas and degraded land in consultation with local community; • Spoils shall only be disposed to areas approved by land owner, local authority, PISC and PMU; • Spoils shall only be disposed to areas that have acceptable ecological and engineering safety as approved by PISC and PMU; • Spoil will be to disposed of to disused quarries and abandoned borrow pits where practicable; • Disposed spoil will be spread in 15 cm layers and compacted to optimum moisture content, covered with topsoil, landscaped and provided with drainage and vegetation to prevent erosion in line with best practice; • The spoil disposal site shall be located at least 20m from surface water courses and shall be protected from erosion by avoiding formation of steep slopes and by grassing and other planting.					
Clearing, grubbing, cut and fill activities, construction of embankments; Gravel extraction from rivers leads to erosion; Stockpile and staging areas lead to loss of land use	Soil erosion & silt generation; Increased runoff / erosion; Sediment contamination of rivers; Turbidity	• All required materials will be sourced in strict accordance with GOTL guidelines and the EMP; • Material stock-piles, borrow pits and construction camps will only be located on unused land or non-agricultural land following consultation with PMU, land owners and suco chiefs. All land will be rehabilitated to its original condition or better condition upon completion of the project works; • Excavated material will be reused and surplus will be used to refill borrow pits; • In the event that the contractor causes damage to agricultural land, productive land or gardens, the contractor is solely responsible for repairing the damage and/or paying compensation based on the rates in the approved resettlement plan; • Embankments and in-stream/river activities will be monitored during construction for signs of erosion. A standby pile of stones and rocks should be kept on hand to be used in the event that there is bank or channel erosion for work in location of stream and river; • Gabion baskets, rip-rap or bio-engineering methods will be used to both strengthen the road and to	Contractor	IIC	Reduced erosion; Damaged culverts replaced; Reduce flooding and overtopping Vegetation clearance minimized; No garden or agricultural land used; No dump sites near waterways or coast	Monthly - visual inspection	Contractor; PMU

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		prevent erosion upstream and downstream of bridge abutments; • Re-vegetation of riverbanks will be carried out with fast growing species, or other plants in consultation with the land owners and suco chiefs, as quickly as possible after work has been completed; • Random and uncontrolled fly-tipping of spoil, or any material, will not be permitted. Suitable dump sites will be designated in consultation with land owners and suco chiefs. Dump sites will not be permitted within 50mof rivers or streams or on garden land or in areas used for livelihood production by suco residents; and • Obtaining all necessary permits or approvals for location of construction camps, material extraction sites and sources of construction materials from NDE and other government agencies prior to works commencing.					
Run-off, discharges, generation of liquid wastes	Impacts on water quality; Increased siltation at culverts and bridges; Construction materials washed out into rivers	• Lubricants will be stored in containers / dedicated enclosures with a sealed floor >50m from water bodies; • Fuel tanks 5000 litres or less will be stored in dedicated areas with a sealed floor >50m from water bodies; • Fuel tanks greater than 5000 litres will be stored in a walled enclosure with a sealed floor and bunds >50m from water bodies including rivers and beach; • Work in rivers will be scheduled during dry season and work duration shall be as short as possible. Bare slopes shall be stabilized immediately after works are completed; • Stockpile areas and storage areas for hazardous substances shall be located away from water bodies; • Washing of machinery and vehicles in surface waters shall be prohibited; • Sediment controls such as silt fences or other sediment reducing devices (rock dams or silt barriers), to prevent both siltation and silt migration during works being undertaken in the vicinity of streams and rivers; • Sediment control devices will be cleaned and dewatered, discharges will not be to the rivers or streams. Consultation with land owners and suco chiefs will identify suitable land-based areas for settling ponds or discharge areas;	Contractor	IIC	Discharge of waste as per waste management plan; Occurrence of erosion	Monthly - vsual inspection of culverts, and in-stream/river work areas	Contractor; PMU

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		• Diversion ditches will be dug around material stockpiles to catch runoff; • Minimizing interference with natural water flow in rivers, water courses or streams within or adjacent to work sites. Pollution of water resources will not be permitted; • Abstraction from water resources may be permitted after prior approval from PMU in consultation with local suco leaders and local authorities. • Solid wastes, debris, spent oil or fuel from construction machinery or plant, construction material, or waste vegetation removed from work sites will not be dumped in or near streams, rivers or waterways • Discharge of sediment laden construction water or material (including dredged spoil) directly into the rivers, sea, inter-tidal area or surface waters will not be permitted. All such construction water will be discharged to settling ponds or tanks prior to final discharge; • Discharge zones from culverts and drainage structures will be carefully identified, and structures will be lined with rip-rap. Down-drains and chutes will be lined with rip-rap, masonry or concrete; • Spoil and material stock piles will not be located near the coast, on the coastal side of the Project road, or within 15 m of waterways, streams or rivers, or on the edge of slopes or hills above rivers or stream; • Hydro-carbons, fuel, and other chemicals as required for the works, will be stored in secure containers or tanks located >50m away from surface waters, or streams. Any spills will be contained and immediately cleaned up as per the requirements of the emergency response plan prepared by the contractor (and approved by PMU); and • All water, waste-water and other liquids shall be disposed of after treatment in line with the Environmental License - see below					
General activities - solid and liquid waste generation	Uncontrolled and un-managed waste disposal	• Contractor's CEMP to include section on waste disposal, recycling and re-use of materials from the project; • Areas for disposal to be agreed with local authorities and checked and recorded and monitored by the PMU;					

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		• Segregation of wastes shall be observed. Cleared foliage, shrubs and grasses may be given to local farmers for fodder and fuel. Organic (biodegradables) shall be collected and disposed of on-site by composting; • NO Burning. Waste associated with the project or the supporting activities is NOT allowed to be burned anywhere ; • Burning of construction and domestic wastes shall be prohibited; • Recyclables shall be recovered and sold to recyclers; • Residual general wastes shall be disposed of in disposal sites approved by local authorities; • Construction/workers' camps shall be provided with garbage bins; • Disposal of solid wastes into flood ways, wetland, rivers, other watercourses, farmland, forest, mangrove and associated salt flats, beaches, places of worship or other culturally sensitive areas or areas where a livelihood is derived canals, agricultural fields and public areas shall be strictly prohibited; • There will be no site-specific landfills established by the contractors. All solid waste will be collected and removed from the work camps and disposed in the local authority designated waste disposal sites at Tibar; and • Waste disposal areas approved by local authorities shall be rehabilitated, monitored, catalogued, and marked if required.					
Use of hazardous materials	Oil and other hazardous chemicals are spilled into the environment resulting in pollution; Hydrocarbon leakage or spills from construction camps and workshops; Accidents placing people at risk	• Emergency Response Plan (as part of EMP) shall be prepared as part of the CEMP by Contractor to cover hazardous materials/oil storage, spills and accidents; • Ensure that safe storage of fuel, other hazardous substances and bulk materials are agreed by PMU and have necessary approval/permit from NDE and local authorities. • Hydrocarbon, toxic material and explosives (if required) will be stored in adequately protected sites consistent with national and local regulations to prevent soil and water contamination. • Equipment/vehicle maintenance and re-fuelling areas will be confined to areas in construction sites designed to contain spilled lubricants and fuels. Such areas shall be provided with drainage leading	Contractor, PMU (to approve plan)	IIC	EMP and emergency response plan; Ensure storage sites are using existing concrete base; Spills cleaned and area rehabilitated	Monthly or after event or as required - review and approval of emergency response plan; Visual Inspection of storage facilities;	Contractor; PMU

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		to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency; • Fuel and other hazardous substances shall be stored in areas provided with roof, impervious flooring and bund/containment wall to protect these from the elements and to readily contain spilled fuel/lubricant; • Segregate hazardous wastes (oily wastes, used batteries, fuel drums) and ensure that storage, transport and disposal shall not cause pollution and shall be undertaken consistent with national and local regulations; • Ensure all storage containers are in good condition with proper labeling at least in English and Tetun; • Regularly check containers for leakage and undertake necessary repair or replacement; • Store hazardous materials above flood level; • Discharge of oil contaminated water shall be prohibited and all oily waste shall be taken to Tibar oil disposal facility as required by NDE; • Used oil and other residual toxic and hazardous materials shall not be poured on the ground; • Used oil and other residual toxic and hazardous materials shall be disposed of in an authorized facility off-site but shall be taken in sealed drums to Tibar oil disposal facility as required by NDE; • Adequate precautions will be taken to prevent oil/lubricant/ hydrocarbon contamination of river channel beds; • Ensure availability of spill clean-up materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored; • Spillage, if any, will not be washed away but will be immediately cleaned up using absorbant cleaning materials with utmost caution to leave no traces; • Spillage waste to disposal sites approved by local authorities and approved by PMU; • All areas intended for storage of hazardous materials will be quarantined and provided with adequate facilities to combat emergency situations complying with all the applicable statutory stipulation; • The contractors shall identify named personnel in their EMP in-charge of storage sites for hazardous materials and ensure they are properly trained to					

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		control access to these areas and entry will be allowed only under authorization.					
Construction activities causing accidental damage to existing services	Interference with existing infrastructure; Water supply contaminated, and power and telecommunications supplies disrupted through knocking over poles or breaking of pipelines or exposing water table during works.	• Consult with inservice providers to minimize physical impacts on public infrastructure and disruption to services; • Reconfirm power, water supply, telecommunications and irrigation systems likely to be interrupted by the works and any additional trees to be cut near utilities; • Contact all relevant local authorities for utilities and local village groups to plan re-provisioning of power, water supply, telecommunications and irrigation systems; • Relocate and reconnect utilities well ahead of commencement of construction works and coordinate with the relevant utility company at the district and district levels for relocation and reconnection well before works commence and include for compensatory planting for trees; • Inform affected communities well in advance; • Arrange reconnection of utilities and irrigation channels in the shortest practicable time before construction commences; and • If utilities are accidentally damaged during construction it shall be reported to the PMU, DRBFC and utility authority and repairs arranged immediately at the contractor's expense.	Contractor	IIC	Services damaged and rehabilitated/reinstated; Services re-routed; Service disruptions	As required - visual inspection, consultation with service providers	Contractor; PCMBU
Encroachment into precious ecology, disturbance of marine and terrestrial habitats, effects on flora and fauna	Impacts on terrestrial habitats; Workers poach animals for food or feathers etc; Protected or sensitive areas affected	• Invasive species shall not be introduced. • Contractor's site office, works yard, rock crushers, material storage, borrow pits, and quarries will all be approved by PMU and will not be permitted in any ecologically important sites or areas valuable for conservation; • Vegetation clearance during construction activities, especially of trees along the river banks and road-side, will be minimized and no greater than the absolute minimum in line with the detailed designs; Under no circumstances is the contractor permitted to fell or remove mangroves; • Contractors will not cut any trees within or outside the project at the request of the local land owners or suco leaders without prior approval from PMU; • Vegetative cover cleared from the roadside during rehabilitation activities will be kept for land protection and re-vegetation. Contractors will be responsible for re-vegetation in cleared areas; • The contractor will be responsible for providing adequate knowledge to construction workers in	Contractor	IIC	Check for poaching and unnecessary vegetation clearance; Progress of re-vegetation of work areas; Adequate fuel supplies in camp; Training of workers in information	Spot inspections; monthly - visual inspection of camp and work sites; Re-vegetation activities as per EMP; Consultations with villagers and workers	Contractor; PMU

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		relation to existing laws and regulations regarding illegal logging. Contract documents and technical specifications will include clauses expressly prohibiting the felling of trees, not requiring to be cleared by the project, by construction workers for the term of the project; • The contractor will be responsible for providing adequate knowledge to construction workers in respect of fauna. Contract documents and technical specifications will include clauses expressly prohibiting the poaching of fauna by construction workers and making the contractor responsible for imposing sanctions on any workers who are caught trapping, killing, poaching, or being in possession of or having poached fauna; • The PMU will supervise and monitor a ban on use of forest and mangrove timber and workers shall be prohibited from cutting trees and mangroves for firewood; and • Construction workers will be informed about general environmental protection and the need to avoid un-necessary felling of trees unless justified on engineering grounds and approved by PMU..					
Accidental encroachment into historical / cultural sites	Impacts on PCR or cultural property sites	• Contractor's CEMP to include section on "chance finds" • Site agents will be instructed to keep a watching brief for relics in excavations. • Should any potential items be located, the PMU will immediately be contacted and work will be temporarily stopped in that area. • The PMU with the assistance of the PMU will determine if that item is of potential significance and contact MPW to pass the information to the relevant department in GOTL (i.e. Secretary of State for Culture) who will be invited to inspect the site and work will be stopped to allow time for inspection.	Contractor;	IIC	Sites and/or resources discovered and their protection	During activities - stop work order issued; Site/resources dealt with appropriately	Contractor; Sec. of State for Culture/, PMU

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Operation of construction plant and equipment creating noise	Noise in community; Impacts on construction workers	• Baseline data on noise levels shall be collected before commencement of civil works. • Rock crushers and asphalt plant to be located at least 500m from sensitive receivers. • Requirements in the EMP and contract documents that all vehicle exhaust systems and noise generating equipment be acoustically insulated and maintained in good working order and that regular equipment maintenance will be undertaken; • The contractor will prepare a schedule of operations that will be approved by suco chiefs and PMU. The schedule will establish the days, including identifying days on which there should be no work, and hours of work for each construction activity and identify the types of equipment to be used; • Workers will be provided with ear defenders and noise abatement equipment as may be required; and • Temporary noise barriers will be used if necessary as approved by the PMU • Any complaints regarding noise will be dealt with by the contractor in the first instance through the GRM.	Contractor	IIC	Adherence to agreed schedule; Complaints (no. logged with resolution); Workers safety equipment	Monthly or after complaint - review schedule Consultation (ensure schedule being adhered to) GRM register	Contractor; PMU
Presence of vehicles and equipment in villages, use of people's land for access to construction site, traffic and safety issues	Traffic and access disrupted during construction; Traffic safety affected	• The contractor will prepare, and submit to PMU, a traffic management plan detailing diversions and management measures; • Signs and other appropriate safety features will be used to indicate construction works are being undertaken; • Contract clause specifying that care must be taken during the construction period to ensure that disruptions to access and traffic are minimized and that access to villages along the Project road is maintained at all times; Provincial Works and village officials will be consulted in the event that access to a village has to be disrupted for any time and temporary access arrangements made; • Construction vehicles will use local access roads, or negotiate access with land owners, rather than drive across vegetation or agricultural land, to obtain access to material extraction sites. Where local roads are used, they will be reinstated to their original condition after the completion of work; • The road will kept free of debris, spoil, and any other material at all times;	Contractor, Sucos	IIC	No. of accidents or events; Maintenance of access; Signage; Road free of materials and debris; Haulage routes rehabilitated	During activities - Visual inspection; Consultations; Review of traffic management plan	Contractor; PMU

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		• Disposal sites and haul routes will be identified and coordinated with local officials; • Provision of adequate protection to the general public in the vicinity of the work site, including advance notice of commencement of works, installing safety barriers if required by villagers, and signage or marking of the work areas; and • Provision of safe access across the works site to people whose villages and access are temporarily affected during road re-sheeting activities.					
General activities, handling equipment and plant; construction vehicles	Worker health and safety risks	• At least one month before construction commences the contractors will demonstrate to the PMU they are properly resourced and a qualified/experienced environment and safety officer (ESO) will be identified by the contractors in the bid; • Establishment of safety measures as required by law and by good engineering practice and provision of first aid facilities at work sites, in vehicles and establishment of an first aid/health post at the camp; • The contractor will conduct of training (assisted by PMU) for all workers on safety and environmental hygiene at no cost to the employees. The contractor will instruct workers in health and safety matters as required by law and by good engineering practice and provide first aid facilities; • Instruction and induction of all workers by the contractor in health and safety matters, including road safety is required for all operatives before they start work; • The contractor will instruct and induct all workers in health and safety matters (induction course) including construction camp rules and site agents will follow up with toolbox talks on a weekly basis. Workforce training for all workers starting on site will include safety and environmental hygiene; • Workers shall be provided with appropriate personnel protection equipment (PPE) such as safety boots, helmets, reflector vest, gloves, protective clothes, dust mask, goggles, and ear protection at no cost to the workers; • Fencing will be installed on all areas of excavation greater than 1m deep and sides of temporary works; • Fencing will be installed on all excavation, borrow pits and sides of temporary bridges;					

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		• Reversing signals (visual and audible) shall be installed on all construction vehicles and plant. • Provision of potable water supply in all work locations; • Scheduling of regular (e.g. weekly tool box talks) to orientate the workers on health and safety issues related to their activities as well as on proper use of PPE; • Where worker exposure to traffic cannot be completely eliminated, protective barriers shall be provided to shield workers from passing vehicles. Another measure is to install channelling devices (e.g., traffic cones and barrels) to delineate the work zone; and • Construction camps shall be provided with toilets/sanitation facilities in accordance with local regulations to prevent any hazard to public health or contamination of land, surface or groundwater. To ensure hese facilities never overflow they shall be well maintained and cleaned regularly to encourage use and allow effective operation and emptied regularly at disposal site approved by PMU.					
Presence of construction workers	Various social impacts including: (i) social disruption; (ii) possibility of conflicts or antagonism between residents and workers; (iii) spread of communicable diseases including STIs and HIV/AIDS; (iv) children are potentially exposed to exploitation; (v) impacts on community health and safety	• The contractor will appoint an EO to address health and safety concerns and liaise with the PMU and sucos within the Project area; • Barriers (e.g., temporary fence), and signs shall be installed at construction areas to deter pedestrian access to the roadway except at designated crossing points; • Adequate signage and security will be provided at the site office and works yard and prevention of unauthorized people (including children) entering work areas and camp. Warning signs will be provided at the periphery of the site warning the public not to enter; • The general public/local residents shall not be allowed in high-risk areas, e.g., excavation sites and areas where heavy equipment is in operation and these sites will have a watchman at the entrance to keep public out; • Speed restrictions shall be imposed on Project vehicles and equipment traveling within 50m of sucos and sensitive receptors (e.g. residential, schools, places of worship, etc.);	Contractor, SucoChiefs, PMU; approved service provider	IIC + costs for program (already identified)	HIV/STIs awareness campaign implemented; ESO recruited; Training implemented; Provision of safety equipment; Signage and security to prevent unauthorized people entering camp; Signage installed as required;	As required; Monthly or after complaint - ESO recruited; Training records; Staff records; Visual inspection; Consultations with villagers; Checking of complaints; Consultations with workers re training	Contractor; PMU;

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		• Upon completion of construction works, borrow areas will be backfilled or temporarily fenced, awaiting backfilling; • Provisions will be made for site security, trench barriers and covers to other holes and any other safety measures will be installed as necessary; • Drivers will be educated on safe driving practices to minimize accidents and to prevent spill of spoil and hazardous substances (fuel and oil) and other construction materials during transport; • Contractors will ensure that no wastewater is discharged to local water bodies, mangroves, rivers, streams or lakes; • Measures to prevent proliferation of mosquitoes shall be implemented (e.g., provision of insecticide treated mosquito nets to workers, installation of proper drainage to avoid formation of stagnant water, standing water will not be allowed to accumulate in the temporary drainage facilities or along the roadside); • The contractor will make prior provision to ensure the construction workforce attends STI and HIV/AIDS prevention workshops provided through an approved service provider. The workshops will be delivered to the contractor's workforce prior to commencement of any civil works; and • Suco-based community awareness raising about transmission of STIs and HIV, reproductive health and safe sex. The program will be implemented after to contractor mobilization and staff are in post but prior to the commencement of civil works.. • No child labour will be used					
Site office and works yard and use of water and electricity supplies	Stress on resources and existing infrastructure	• Site office and works yard located, if possible, in areas better supplied with infrastructure and services.; • Contractor to supply temporary facilities i.e. health post, accommodation, water and electricity, telecommunications, and sanitation	Contractor	IIC	No. concerns raised and resolution; Service supply to camp and office	Ongoing - consult with villages along Project road to monitor environmental concerns	
OPERATION PHASE							
Operation of vehicles creating emissions	Hydrocarbons, Carbon Monoxide, Nitrous compounds, Sulphur Dioxide and particulate	• Forecasts of traffic growth indicate that emissions will be low and not have a noticeable effect on air quality; • Landscaping along roadside to reduce dust impacts	DRBFC; routine maintenance contractor	IIC	Air quality; Particulates and smoke;	Monthly or as required - consultation and visual	Main. Contractor; PMU

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	matter increase through increased traffic				No. complaints; incidents logged with resolution	observations; Complaints;	
Routine and ongoing maintenance	Constriction of water flows through structures blocking water flow; The need for gravel for on-going road maintenance leads to acquisition of new source areas affecting properties; Standing water degrades road and surrounding environment	• Maintenance of structures to ensure river debris does not collect and result in damage to culverts and drainage structures, riverbanks, or land through altered flow patterns (see below); • MPW will negotiate with resource owners and prepare an MOU acceptable to all parties; • Drain and fill areas where water can pool as part of ongoing maintenance activities	DRBFC; routine maintenance contractor	IIC	Satisfaction with MOUs; Condition of road	As required or as per PSA - MOUs; Routine maintenance records; Visual inspection; As per monitoring framework included in PSA	MPW/DRBFC; JICA
Placement of culverts	Alterations to river flow; Restriction of natural meandering of streams; Restriction of natural flood cycles by temporary storage of floodwaters and restricted flood plain movements	• Proper maintenance of structures to ensure river debris does not collect and result in damage to banks and land; • Scour protection; • Good design to ensure normal flood behaviour maintained as closely as possible through use of transparent structures and relief culverts	MPW/DRBFC; routine maintenance contractor	IIC	Erosion; Flooding patterns; Culverts and drainage structures cleared of debris	2 x year for 3 year, mid-term and post-eval. monitoring - check designs; Visual assessment; Review of flooding patterns/records	MPW/DRBFC; JICA
Run-off from road	Use of the road results in problems with runoff, loss of soils and other forms of erosion; Water quality in rivers and near-shore areas is affected by use of the new roads (debris laden run-off and silts etc)	• Maintenance of erosion control structures, preventing debris build-up and ensuring good vegetation cover; • Roads will be better compacted, covered and provided with culverts and drains; • Awareness of the value of maintaining vegetation cover will be undertaken	DRBFC; routine maintenance contractor	IIC	Water quality in streams and rivers; Suspended solids from road or areas of erosion, if identified	2 x year for 3 year, mid-term and post-eval. monitoring - visual assessment; Consultations or complaints	MPW/DRBFC; JICA
Climate change issues	Unexpected and costly failure of road; Impacts on rainfall, groundwater depletion, or carbon emissions not expected	Note: The Project will not induce climate change; Coastal protection works implemented to accommodate climate change (extreme weather events and predicted sea level rise)	DRBFC; routine maintenance contractor	IIC	Tidal, stream/river heights and velocities; Flooding frequency; Localised erosion	Visual; Review rainfall and flooding records	Contractor; PMU
Improved access to previously inaccessible, or difficult to reach, areas	Hunting and poaching increases	• Lack of through-route access and low traffic volumes means it is unlikely there will be any impacts on flora and fauna; • There are no rare or endangered species that could be affected by operation;	DRBFC; routine maintenance contractor	IIC	Increases in hunting activity; Reduced sightings of fauna	2 x year for 3 year, mid-term and post-eval. monitoring - visual assessment;	MPW/DRBFC; JICA

Notes: IIC=Included in Contract (and specific means for mitigation to be identified and costed by Contractor); TBA=To be advised

IMPACT MITIGATION					IMPACT MONITORING		
Project activities	**Environmental Impact**	**Mitigation measures to be included in EMP**	**Mitigation Responsibility**	**Mitigation Cost (US$)**	**Parameter to be monitored**	**Frequency and means of verification**	**Monitoring Responsibility**
		• There are no protected areas in or near the Project area				Consultations	
Increased traffic	Increases in noise nuisance for residents; Increased traffic volumes and higher speeds leads to accidents	• Low traffic forecasts and the low population density means that ambient noise levels will not significantly increase • General safety will be improved through providing a shoulder and widening within ROW • Installation of road safety signage • Work with police to carry out enforcement of traffic regulations once road is upgraded • Awareness raising through village meetings will be needed to create road safety programs • Ongoing community awareness ascertain village concerns regarding traffic calming &management	MPW/DRBFC; Local police	IIC	Accidents and collisions; Safety issues discussed in schools; Effectiveness of traffic calming measures	2 x year for 3 year, mid-term and post-eval. monitoring - consultation and visual observations; Complaints; Collect road accident data	MPW/DRBFC; JICA
Spread of communicable diseases	Roads act as pathway for spread of communicable diseases such as HIV and STIs	• At expected traffic volumes risk of spread of such diseases are not expected	DRBFC; routine maintenance contractor	IIC	Health status of people; No. of cases of STIs etc	2 x year for 3 year, mid-term and post-eval. Consultations with villagers; Review health records (STI data)	MPW/DRBFC; JICA
Any other	Unintended or unanticipated impacts	• As required to avoid or reduce effects or impacts	DRBFC	TBA	TBA	As above, as required	MPW/DRBFC; JICA

Notes: IIC=Included in Contract (and specific means for mitigation to be identified and costed by Contractor); TBA=To be advised

9. Conclusion and Recommendations

9.1 Difficulties Encountered

363 No particular difficulties were encountered by the consultants in compiling the SEIS. Limitations. Lack of environmental laboratory services is one of the limitations to completing environmental assessment in Timor-Leste. The Rural Water Sanitation Service (SAS) under the Ministry of Public Works, can perform water quality analysis but its laboratory capability is limited. Another limitation in conducting environmental studies in Timor-Leste is the absence of baseline ambient environmental data. However the regulatory framework, including that for environmental protection is now in place.

9.2 Findings and Conclusions

364 The improvement of Road A01 – Dili - Manatuto offers a robust option for the enhancement of the existing road network. The works are largely restricted to the existing road corridor and there will be some small areas of land required where there road geometry is improved but these will be small and there is not likely to be any significant additional land required to complete the construction. A resettlement plan has been prepared to establish policies and procedures for payment of compensation to affected people for lost assets.

365 The road is an existing piece of infrastructure and does not traverse any protected areas or areas of conservation value, including primary forests, terrestrial reserves or community managed marine protected areas. The Project will not create any impacts on cultural or heritage sites and neither does it pass through densely populated areas or an area subject to heavy development. The proposed Project will not create conflicts with natural resource allocation.

366 The construction impacts should be very predictable and manageable and with appropriate mitigation few residual impacts are likely. Additional human and financial resources will be required to improve environmental capability and to progress and achieve necessary statutory compliance and environmental clearance and the associated activities that also require environmental permits under the environmental laws of Timor-Leste. The EMP is based on the type, extent and duration of the identified environmental impacts.

367 Implementation of appropriate measures during the design, construction, and operation phases will minimize negative impacts to acceptable levels. To ensure that these mitigation measures are implemented and negative impacts avoided, the measures will be included in the contract specification. Contractors' conformity with contract procedures and specifications and implementation of the approved CEMP during construction will be carefully monitored. The contractor will be required to follow standard construction practices and comply with a series of contractual requirements which will be monitored and supervised by PMU. Environmental monitoring of the project will be undertaken regularly through the first three years of its operation to ensure that the measures are being implemented properly.

368 The Project will have an overall beneficial impact, improving access, reducing coastal erosion, reducing dust, reducing travel time and travel costs, while improving socio-economic conditions. It will have insignificant negative impacts that will nevertheless be carefully monitored and adequately mitigated. A major benefit of the Project is the accessibility to the social services being provided.

369 The overall conclusion is that the Project complies with environmental categorization B, and therefore, the completion of this SEIS fully meets GOTL and JICA's requirements and no further environmental study is required for the core Project road.

9.3 Recommendations

370 The recommendations of this SEIS are: (i) the SEIS be accepted by JICA and NDE as the statement of Project's environmental effects and how they will be mitigated; (ii) Contractor to prepare a CEMP based on the pre-construction and construction parts of the EMP included in this SEIS detailing their specific construction methodologies and submit to PMU for review and approval; and, (iii) the Project impacts and mitigation thereof, be monitored as per the monitoring plan.

9.4 Non-Technical Summary

Non-Technical Summary		
	English	Tetum
1	**Introduction:** The Government of Timor-Leste (GOTL) will be supported by the Japan International Cooperation Agency (JICA) to finance the upgrading of National Road No.1 as part of a comprehensive program of road rehabilitation for priority roads in Timor-Leste that links major cities and towns; implemented by Ministry of Public Works (MPW). This SEIS report covers the first stage of the A01 from Dili to Manatuto (A01-01). The Manatuto to Baucau Road (A02-02) is also a priority for follow up study and will be a subject of another SEIS. The Project Management Unit (PMU) within MPW will manage and implement the project as it is financed by one of GOTL's development partners including implementation of environmental safeguards, mitigation measures and other requirements.	**Introdusaun.** Governu Timor-Leste (GoTL) ne'ebe suporta husi Cooperasaun Agencia Internasional Japaun (JICA) ne'ebe financia hodi melhora Estrada No. 01 hanesan parte ida husi programa komprensivu prioridade liu ba rehabilitasaun Estrada iha Timor-Leste ne'ebe halo ligasaun principal entre cidades no capital; implementa husi Ministério Obras Públicas (MOP). Relatoriu SEIS ida ne'e inklui faze primeiru husi Dili ba Manatuto (A01-01). Estrada Manatuto ba Baucau (A02-02) mos sei sai prioridade no sei kontinua halo estudu SEIS seluk. Unite Jestaun Projetu (PMU) iha MOP sei jere no implementa projetu ne'ebe hetan financia husi GoTL hanesan parceiru dezenvolvimentu inklui implementasaun husi salvaguarda ambientais, medidas de mitigasaun no rekezitus seluk.
2	**Legal framework:** The implementation of the Project is governed by laws, regulations, and standards for environmental protection and management of GOTL including the Basic Law of Environment (April 2012) and the Decree Law 5/11 on environmental licensing. In addition to GOTL's requirements the NRA01 must comply with JICA's Guidelines for Environmental and Social Considerations. According to both Timorese law and the JICA's Guidelines, the Project is classified as Category B because the potential adverse environmental impacts are site-specific and mitigation measures can be designed readily.	**Kuadru Legal:** Implementasaun Projetu sei baseia tuir Lei, Regulasaun no padraun ba avaliasaun protesaun ambiental no jere husi GoTL inklui Lei Basiku do Ambiental (Abril 2012) no Dekreto Lei 05/11 konaba licenciamentu ambiental. Alende ne'e ho rekezitus GoTL nia ba NRA01 mak tenki kumpri Matadalan JICA konaba Ambiental no Orientasaun Social. Bazeia ba Lei Timor-Leste no matadalan JICA Projetu refere klasifika ona hanesan kategoria B tamba potensia adversaun impaktu ambiental espesifiku liu ona no medidas de mitigasaun bele facilita ona.
3	**Project description:** The Project will improve and rehabilitate 56.4km long of the Dili - Manatuto stretch of (A01-01) by widening and resurfacing to bring it back up to standard following international best practices and quality standards and providing one wider traffic lane per direction, with sealed hard shoulders and / or sidewalks in villages and improved bridges. Drainage will also be cleaned and improved, curves will be widened and new road markings and signs will improve road safety.	**Deskrisaun Projetu.** Projetu ne'ebe mak sei melhora no rehabilita mak nia naruk km 56.4 husi Estrada Dili-Manatuto (A01-01) hodi melhora nia rekapementu atu nune'e bele atinji pratika padraun Internasional no kualidade estandarte no bele prepara liña trafiku ne'ebe luan kada dirasaun, no fui hametin Estrada nia ninin / trotoar iha aldeias no halo menlhorasaun ba ponte. Drainaze mos sei hamos no haluan, nune'e mos kurvas no sei marka fali Estrada foun no mos sei monta sinais hodi aumenta seguransa trafiku iha Estrada.
	Description of Environment: The environmental setting for the Project in terms of the surrounding physical and biological features is described including social and economic conditions, livelihoods and quality of life.	**Deskrisaun Ambiental:** Jestaun ambiental konaba Projetu iha termus karakterizasaun fiziku no biolojia deskrebe ona inklui kondisaun social ekonomia, kualidade da vida no rendimentu lor-loron.
	Consultations: Public consultations were undertaken during the preparation of this SEIS to give information on the scale and scope of the Project to interested parties including the general public and authorities covering the expected impacts and the proposed mitigation measures. Information was gathered on concerns of the local community to be included in the project implementation stages. Project	**Konsultasaun**: Konsultasaun publiku hala'o ona durante preparasaun SEIS ida ne'e atu nune'e hodi fo informasaun sobre eskala no eskopu projetu ba parte hotu ne'ebe interresadas inklui publiku jeral no governu sobre espektasaun impaktu no proposta medidas de mitigasaun. Informasaun ne'ebe hetan inklui komunidade

	documentation will be disclosed in a place and language accessible to stakeholders.	lokal iha faze implementasaun projetu. Dokumentu projetu sei publika ou divulga iha fatin ho linguajen ne'ebe acessivel ba parte interessando.
	Concerns and complaints: A grievance redress mechanism (GRM) will be established to help resolve issues associated with the Project. The GRM will receive concerns and facilitate resolution of affected people's complaints and grievances about the environmental and social performance of the Project. The GRM will provide a mechanism for affected persons to voice and resolve social and environmental concerns linked to the Project.	**Preukupasaun No Reklamasaun.** Liu husi prosessu mekanizmu reklama kompensasaun (GRM) sei estabelese procedimentu hodi ajuda rezolve problema ne'ebe relevante ho projetu. GRM sei simu kestaun no facilita rezolusaun preukupasaun pessoas sira ne'ebe afetada no reklamasaun ou keixa sobre desenpenho ambiental no social husi projetu. Rezolusaun husi kestaun konaba ambiente no performance social husi projetu. GRM sei prepara mekanizmu ida konaba hodi rona no resolve kestaun social no ambiental konaba pessoal sira ne'ebe hetan afeita husi liña projetu refere.
	Environmental Management Plan. The environmental impacts from the Project will be controlled by making the contractor provide mitigation measures to minimize environmental impacts to acceptable levels. Controls on construction impacts such as dust and noise, waste disposal, water quality impacts, health and safety concerns, tree felling, traffic interruption, preservation of water and electricity supplies will be monitored on a regular basis by the PMU. Training will be provided as necessary to ensure these impacts are mitigated to the greatest extent feasible.	**Planu Jestaun Ambiental.** Impaktu ambiental husi projetu sei halo kontrolasaun husi kontraktor hodi prepara medidas de mitigasaun atu nune'e bele minimiza impaktu ambiental ho nivel ne'ebe aceitavel. Kontrolasaun konaba impaktu konstrusaun hanesan rai rahun, baruilhu, eliminasaun de residus, impaktu kualidade be'e, kestaun saude no seguransa, tesi ai, interupsaun trafiku, prezervasaun be'e no suplai eletricidade mos sei halo kontrolasaun ne'ebe regular husi PMU. Prepara treinamentu ne'ebe necessariu atu garantia impaktu hirak ne'e liu husi medidas de mitigasaun.
	Conclusion and Recommendations. The operation of the Project road should have beneficial effects on the surrounding environment overall with faster more efficient travel and improved traffic flow. The smoother asphalt surface will reduce noise and the accumulation of road side dust and therefore air pollution from noise and disturbed dust should also be reduced and improved road side gutters will improve drainage. The Project construction is restricted to areas within the road corridor and the land required for minor alignment improvements for curve widening. The impacts from construction and operation will be manageable and no insurmountable impacts are predicted, provided that the mitigation measures are implemented thoroughly. The overall recommendation of this SEIS are that (i) this report be accepted by JICA and NDE as the statement of Project's environmental effects and how they will be mitigated (ii) that the Contractor to prepares to mitigate environmental impacts by including the required mitigation measures in their specific construction methodologies that will be subject to PMU approval; and, (iii) that the Project impacts and mitigation measures are monitored regularly as required.	**Konklusaun no Rekomendasaun**. Operasaun projetu Estrada tenki iha efeitu atu nune'e bele fo beneficiu ba ambiente global ho rapidu viajen ne'ebe eficiente liu tan no iha melhoramentu trafiku. Superfici aspal ne'ebe diak sei redus baruilhu perturbasaun rai rahun no Estrada ninin ho drainaze mos sei hetan melhoramentu. Kontrusaun Estrada sei limita iha area koridor Estrada no rekezitu melhoramentu rai no aliñamentu kurva minor. Impaktu husi konstrusaun no operasaun sei maneja no la iha limitasaun sobre prediksaun impaktu, prepara medidas de mitigasaun ne'ebe bele utiliza hotu. Rekomendasaun SEIS sira ne'e hotu mak hanesan (i) relatoriu ne'ebe hetan aceita husi JICA no Dirasaun Nasional Ambiental (NDE) sai hanesan deklarasaun projetu nian hanesan impaktu ambiental husi projetu no oinsa atu bele redus impaktu sira ne'e hotu (ii) Kontraktor prepara mitigasaun impaktu ambiental inklui metodolojia konstrusaun no medidas mitigasaun liu-liu ba sira ne'ebe mak hetan aprovasaun husi PMU; no (iii) impaktu projetu nee hodi monitora medidas de mitigasaun tuir necessidade ne'ebe preciza.

Appendix 1 –Protected Areas

Protected Areas	District	Sub District	Village	Status
National Park of Koni Santana	Lautem	Tutuala	Tutuala	Definitive
			Mehara	
		Lospalos	Muapitino	
			Lore I	
			Bauro	
		Lautem/Moro	Com	
Matebian Mountain	Baucau	Quelecai	Laissorulai	Definitive
			Vaitame	
			Afaca	
			NamaOli	
			Sosa	
			Curuca	
		Laga	Sagadati	
			Atelari	
		Baguia	AlawaLeten	
			Lavateri	
			AlawaKraik	
			DefaUassi	
	Viqueque	Uatolari	Babulo	
			Vessoro	
			Afalocai	
		Uatocarbau	Afalocai	
MundoPerdido Mountain	Viqueque	Osso	Osso de Cima	Definitive
			Loihuno	
			Liaruca	
	Baucau	Venilale	Bualale	
Reserve Florest of Tilomar	Covalima	Tilomar	Maudemo	Definitive
			Lalawa	
Ribeira de Clere	Manufahi	Fatuberliu	Uma Berloik	Definitive
			Dotik	
			Caicasa	
Fatumasin Mountain	Liquiça	Bazartete	Megatou	Definitive
			Loerema	
			Fatumasin	
Cablaque Mountain	Manufahi	Same	Holarua	Definitive
			Letefoho	
			Rotutu	
	Ainaro	Ainaro	Mauciga	
Tatamailau Mountain	Ainaro	Hatobuilico	Nunumogue	Definitive
		Ainaro	Manutasi	

	Ermera	LeteFoho	Boeboeleten	
			KatraiKraik	
Saboria Mountain	Ainaro	Hatobuilico	Mulo	Definitive
		Maubisse	HaraiKik	
			Liurai	
	Ermera	LeteFoho	KatraiKraik	
Manu Coco Mountain	Dili	Atauro	Makili	Definitive
			Makadiki	
			Beloi	
Cristo Rei	Dili	Cristo Rei	Hera	Definitive
			Camea	
			Metiaut	
Talabu/Laumeta	Ainaro	Ainaro	-	Definitive
Diatuto Mountain	Manatuto	Soibada	FatuMakerek	Definitive
		Laclubar	Funar	
		Turiscai	Materek	
Cutete Mountain	Oecusse	PanteMakasar	Costa	Definitive Candidate
			Nipane	
			Bobometo	
Monoleu Mountain	Oecussi	Nitibe	Usitaco	Definitive Candidate
			BeneUfe	
Mangal Area of Citrana	Oecussi	Nitibe	BeneUfe	Still in process of detailed identification
TapoMountain	Bobonaro	Lolotoe	Lebos	Still in process of detailed identification
			Lontas	
			Gildapil	
			Saburai	
Taroman Mountain	Covalima	Fatululik	Taroman	Definitive Candidate
			Fatululik/Bedasi	
		Fohorem	DatoRua	
			DatoTolu	
			Laktos	
Kuri Mountain	Manatuto	Laclo	Uma Kaduak	Definitive Candidate
Legumau Mountain	Lauten	Luro	Vairok	Still in process of detailed identification
			Afabobo	
			Barikafa	
	Baucau	Laga	Atelari	
		Baguia	Uacala	
Laretame Mountain	Viqueque	Osso	Osso de Cima	Still in process of detailed identification

	Baucau	Venilale	Bualale	

Builo Mountain	Viqueque	Osso	Loihuno	Still in process of detailed identification
Guguleur Mountain	Liquiça	Maubara	Lisadila	Still in process of preliminary survey
			Guiso	
			Baubarlisa	
Loelako Mountain	Bobonaro	Cailaco	?	Still in process of preliminary survey
Burabo Mountain	Viqueque	Uatocarbau	Afalocai	Still in process of preliminary survey
			Bahatata	
			Loiulo	
MaureiLagon	Lautem	Ilomar	Irabere	Still in process of preliminary survey
	Viqueque	Uatocarbau	IrabiLetarea	
Aitana Mountain	Viqueque			In Planning
	Manatuto			
Bibileo Mountain	Viqueque			
ModomahutLagon	Manufahi	Fatuberliu		In Planning
WelenasLagon	Manufahi	Fatuberliu		In Planning

Appendix 2 – Existing and Proposed Important Bird Areas (IBA)

IBA code	IBA Name
TL 01	Tilomar
TL 02	Tata Mailau
TL 03	Fatumasin
TL 04	Atauro Island-Manucoco
TL 05	Clere river
TL 06	Lore
TL 07	Mount Paitchau and Lake Iralalaro
TL 08	Jaco Island
TL 09	Mount Diatuto
TL 10	Be Malae-Atabae
TL 11	Maubara
TL 12	Mount MakFahik and Mount Sarim
TL 13	Tasitolu
TL 14	AreiaBranca (”Cristo Rei”) Beach and hinterland
TL 15	Mount Curi
TL 16	Irabere Estuary and Ilomar Forest
Candidate IBA	Saboria Mountain (above 2,000 m)
Candidate IBA	Talobu/Laumeta Mountain (above 2,000 m)
Candidate IBA	Mount MudoPeridido
Candidate IBA	Mount Matebian (above 2,000 m)
Candidate IBA	Mount Cablaque

Appendix 3 – Threatened and Endangered Bird Species

English Name	Scientific Name	IUCN[1]	EBA[2]	Altitude (m)[3]	Habitat
Christmas Island Frigatebird	Fregataandrewsi	CR			Marine
Beach Thick-knee	Esacusgiganteus	NT		Lowlands	Beaches
Malaysian Plover	Charadriusperonii	NT		Lowlands	Beaches
Asian Dowitcher	Limnodromussemipalmatus	NT		Lowlands	Wetlands
Black-tailed Godwit	Limosalimosa	NT		Lowlands	Wetlands
Dusky Cuckoo Dove	Macropygia magna		RR	0–800	Evergreen forest, Tropical dry forest
Slaty Cuckoo Dove	Turacoenamodesta	NT	RR	0–1,300	Evergreen forest, Tropical dry forest
Wetar Ground Dove	Gallicolumbahoedtii	EN	RR	0–800	Evergreen forest, Tropical dry forest
Timor Green Pigeon	Treronpsittaceus	EN	RR	0–600	Evergreen forest, Tropical dry forest
Pink-headed Imperial Pigeon	Ducula rosacea	NT	RR	0–1,000	Forest coastal scrub
Timor Imperial Pigeon	Duculacineracea	EN	RR	400–2,200	Tropical montane forest plantation
Yellow-crested Cockatoo	Cacatuasulphurea	CR		0–1,000	Tropical dry forest woodland plantations
Olive-headed Lorikeet	Trichoglossuseuteles		RR	0–2,300	Forest, woodland, agricultural land
Iris Lorikeet	Psitteuteles iris	NT	RR	0–1,500	Closed forest, woodland, plantations
Olive-shouldered Parrot	Aprosmictusjonquillaceus	NT	RR	0–2,600	Tropical dry forest, savanna
Timor Coucal	Centropusmui	ne	RR	0–500	Tropical forests (edges), woodland
Cinnamon-banded Kingfisher	Todiramphusaustralasia	NT	RR	0–1,500	Evergreen forest, tropical dry forest
Streaky-breasted Honeyeater	Meliphagareticulata		RR	0–1,200	Tropical dry forest, villages
Plain Friarbird	Philemon inornatus		RR	0–2,200	Tropical dry forest ,Eucalyptus woodland
Red-rumpedMyzomela	Myzomelavulnerata		RR	0–1,200	Tropical dry forest; village
Plain Gerygone	Gerygoneinornata		RR	0–1,500	Tropical dry forest, scrub
Fawn-breasted Whistler	Pachycephalaorpheus		RR	0–1,500	Tropical dry forest
Timor Figbird	Sphecotheresviridis		RR	0–1,000	Tropical dry forest, scrub
Olive-brown Oriole	Oriolusmelanotis		RR	0–1,600	Tropical dry forest
Buff-banded Grassbird	Buettikoferellabivittata		RR	0–700 forest	Tropical dry forest
Timor Stubtail	Urosphenasubulata		RR	0–1,900	Tropical dry forest, scrub
Timor Bush Warbler	Bradypterus Timorensis	NT	RR	c.1800	Montane forest; montane scrub
Timor Leaf Warbler	Phylloscopuspresbyte		RR	0–2,300	All forest types
Spot-breasted White-eye	Heleiamuelleri	NT	RR	0–1,460	Evergreen forest; Tropical dry forest
Chestnut-backed Thrush	Zootheradohertyi	NT	RR	600–2,300	Hill and montane forest
Orange-banded Thrush	Zootheraperonii	NT	RR	0–1,600	Closed canopy forest, plantations
White-bellied Bushchat	Saxicolagutturalis	NT	RR	0–1,200	Tropical dry forest, woodland
Black-banded Flycatcher	Ficedulatimorensis	NT	RR	0–1,200	Ev.green forest, dry frest
English Name	**Scientific Name**	**IUCN[1]**	**EBA[2]**	**Altitude (m)[3]**	**Habitat**
Timor Blue Flycatcher	Cyornishyacinthinus		RR	0–2,000	Tropical dry forest, plantations
Red-chested Flowerpecker	Dicaeummaugei		RR	0–1,200	Open forest; villages
Flame-breasted Sunbird	Nectariniasolaris		RR	0–1,000	Tropical dry forest, scrub; villages
Tricoloured Parrotfinch	Erythruratricolor		RR	0–1,200	Trop. dry forest, thickets
Timor Sparrow	Paddafuscata	NT	RR	0–1,250	Woodland, grassland, agricultural land
Source:Birding ASIA 9 (2008)					

Appendix 4 – Selected Photographs

Photograph 1
Hera to Manatuto – Km 9.3 Police Station

Photograph 4
Dili to Manatuto – Km 44.0 Landslide

Photograph 2
Dili to Manatuto – Km 23.0 open road

Photograph 5
Dili to Manatuto – Km 48.0 Beheda Bridge

Photograph 3
Dili to Manatuto – Km 40.5 Lainlidum Bridge

Photograph 6 Dili to Manatuto – Km 52.7
West of Manatuto

Appendix 5 – Attendance at Public Consultation

KONSULTA PUBLIKA KONABA RAP/PUBLIC CONSULTATION ON RAP (28/05/2013)

Distrito Dili

Lista Prezensa/List of Presence

No.	Distrito Dili/District of Dili	Naran/Name	Intituisaun/Institution	No. Kontaktu	Assinatura/ Signature
1	*Admnistardor Distrito Dili*				
2	*Administrador S-Dist. Metinaro*	Adão Araujo	Distrito Dili	77304186	
3	Chefe Suco Sabuli				
4.	Chefe Aldeia Acadiru-Laran	Manuel S. Saldanha		77530042	
5.	Chefe Aldeia Behauc				
6.	Chefe Aldeia Sabuli				
7.	Chefe Aldeia Behocir				
8.	Chefe Suco Duyung	Cornelio dos Santos		78029007	
9.	Chefe Aldeia Benunuc	Manuel Garcia	Distrito Dili		
10.	Chefe Aldeia Manuleu	Antonio M.C. Fernandes		78146829	
11.	Chefe Aldeia Ri-Mean	Manuel Freitas	D 77	77347440	
12.	Chefe Aldeia Sahan	Pantaleão dos Santos		77017927	
13.	*Administrador S-Dist. Cristo Rei*				
14.	Chefe suco Camea				
15.	Chefe Aldeia Aidac Bihare				
16.	Chefe Aldeia Fatu Francisco	Roberto Castro		77509045	
17.	Chefe Aldeia Terminal	Manuel C. Freitas		77429304	
18.	Chfe Suco Hera	Simão Pedro Ribeiro		77440699	
19.	Chefe Aldeia Acanunu				
20.	Chefe Aldeia Aioc Laran				
21.	Chefe Aldeia Hali Dolar				
22.	Chefe Aldeia Moris Foun				
23.	Chefe Aldeia Mota Quic				

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24.	Chefe Aldeia Sucaer Laran				
21.	chefe suco [illegible]	Alexandrino Chaves	Suco	77259255	
22.	Chefi Suco Becora	Antonio da S. Soares		77299652	
23.	[illegible] A. Lopes	chefe Suco – Metiaut		7715216	
24.	[illegible]	[illegible]			
25.	Fernando da Cruz	Chefe do suco Lahane Oriental		77276122	
26.	[illegible] C. S. Conceição	Chefe Suco Bidau Lecidere	[illegible] Lecidere	77285010	
27.	Afonso da Cruz	Chefe Suco [illegible]	Bemori	77310989	
28.	José [illegible] P. [illegible]	chefe suco Culu-Hun	Culu-Hun	77249569	
29.	João da Costa F.	Chefe Aldeia	Birahu-matan	77481162	
30.	[illegible] A. Silva	chefe suco Colmera	chefe suco	77588226	
31.	Eustolio M. [illegible]	Chefe Dep. Dist. [illegible]		77262166	
32.	Luis M. S. [illegible]	Ad. D. Aleixo	Sd D. Aleixo	7730 4191	
33.	Maria Jose dos Santes	OSE Dist. Dili	Adm. DD	77334571	
34.	Marcelino Soares	chefe de suco [illegible]		77296976	
35.	[illegible]	[illegible]		77250078	
36.	Manuel Correia	Xefe Suco Santa Cruz	St. Cruz	77657881	
37.	Mário M. [illegible]	Chefe Mascarin	Vera-Cruz	[illegible]	
38.	[illegible]	Chefe Suco Comoro	Comoro	77292896	
39.	[illegible]	Xefe Al. [illegible]	Duyung		
40.	João [illegible]	Chefe Suco [illegible]		7723751	
41.	Ana Fernandes G. J.	DFO	Ad. Dili	77286088	
42.					
43.					

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Lista prezensa/Presence list

No.	Distritc Manatuto/District of Manatuto	Naran/Name	Instituisaun/Institution	No. Kontaktu/ Contact number	Assinatura/ Signature
1.	Administrador Distrito Manatuto	Gaspar Hugo Guerrão	DNAL MAE	78141416	
2.	Administrador S-Dist. Manatuto	António da Silva Pereira		77314213	
3.	Chefe Suco Sau	António dos Reis da Costa		77524285	
4.	Chefe Aldeia Obrato	António Alves da Costa		77367258	
5.	Chefe Aldeia Sau/Ponte Rohan	António de Carvalho			
6.	Chefe Suco Ailili	Sebastião M. de Carvalho	MAE/DNAE	77253426	
7.	Chefe Aldeia Ailili	Sebastião de Jesus da Silva		77709762	
8.	Chefe Aldeia Be bato	Manuel da Costa		77484413	
9.	Administrador S-Dist. Laleia	Basilio Ximenes	MAE/DNAL	77304216	
10.	Chefe Suco Lifau	Cipriano da Costa		77438024	
11.	Chefe Aldeia Lenão	João Bair Ximenes	Sub. Dis Laleia	77418537	
12.	Chefe Suco Hatularan	Gaspar J. de F. da Costa	DNAAS	77720861	
13.	Chefe Aldeia Falan	Francisco V. de Sousa	Sub Dis Laleia		
14.	Chfe Aldeia Uma luc	João Soares	Sub Dis Laleia		
15.	Administrador S-Dist. Lacio	Isidro Correia	MAE/DNAL	77271606	
16.	Chefe Suco Umakaduak	Agostinho M. da Cunha	Sub Dis Laclo	70051460	
17.	Chefe Aldeia Ilimanu	Hepolito C. da Cunha	Sub Dis Laclo		
18.	Chefe Dept. DAS Manatuto	Gonçalo Doutel	MOP	77009014	
19.	Coordinador Meio Ambiente	Duarte da Costa	DNMA - MCIA	77328170	
20.	Filipe de Carvalho Oliveira				
21.	District Coordinator NGO Belun	Filipe de Carvalho Oliveira	NGO Nasional Belun	7733723	
22.	612 RDP IV	Nelson F. Rebelo	612	77290838	
23.	Coordenador Recursos Minerais	Mario Nicolau	Recursos Minerais	7744096	
24.	District Coordinator NGO Healthnet	Rosa Maria da Silva.	NGO Local HealthNet.	7739771.	

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25.	~~Mariano Soares~~	~~Daseb Mariano Soares~~	~~78071688~~	~~78071688~~	
26.	—		Anseb	—	
27.		Nicolau de C. Carvalho	HAITC	77525405	
28.	Ministério Obras / DIPSC	Miguel Soares	DIPSC	77301748	
29.	Secretaria Justiça / PNTL	Domingos da C. P. Gomes	Pol. Polícia	77305089	
30.	Plan & Des' Distrital	António Soares da C.	MAE	77291554	
31.	~~Ligia Teresinha da Costa~~	~~Ligia T. da Costa~~			
32.	OCA Noris Foun/Staff	Ligia Teresinha da Costa	NGO	77390017	
33.	Staff	Ana Norberta S. da Silva	NGO Noris Foun	77486786	
34.	João da Silva	Lúcio Ma. Abel	Chefe do Suco	78078555	
35.	Diretor Adjunto Saúde	Abel M. da Silva, SKM	Saúde Manatuto	77265910	
36.	~~José Manuel M. da Silva~~				
37.					
38.	Agrikultura Distrito Manatuto	José Manuel M. da Silva	MAP	77290422	
39.	Obras publica	Bonifacio F. Sam.	ONEE	7740240	
40.	Fernando Flores				
41.	Director NGO CAMI	Fernando Flores	CAMI	77363445	
42.					
43.					
44.					

Appendix 6 – Staff of Consultant Team-NRUP Dili – Manatuto A-01

JICA PREPARATORY SURVEY ON ROAD NETWORK DEVELOPMENT SECTOR PROJECT				
	NAME	POSITION	NATIONALITY	EDUCATION
1)	Mr. Hiroshi FUJISAWA	Team Leader/Highway Engineer	Japanese	Civil Engineering, Chuo University
2)	Mr. Shigeru KONDA	Deputy Team Leader/Highway Design Engineer 1	Japanese	Faculty of Law, Keio University
3)	Mr. Takashi CHUJO	Bridge Engineer	Japanese	Civil Engineering, Osaka Institute of Technology
4)	Ms. Michiko MATSUMOTO	Geotechnical Engineer/Highway Design Engineer 2	Japanese	School of Engineering, The University of Tokyo
5)	Mr. Takafumi YOGATA	Hydrological Engineer	Japanese	Civil Engineering, Kyushu University
6)	Mr. Hiroaki TAUCHI	Disaster Prevention Specialist	Japanese	Civil Engineering, Hokkaido University
7)	Mr. Motoki IWAMARU	Mapping and GIS Specialist	Japanese	Civil Engineering, Hokkaido University
8)	Mr. Wako NOTO	Procurement/ Construction Plan/ Cost Estimate	Japanese	Civil Engineering, Kansai University
9)	Mr. Max BLACKER	Labor Planning	Australian	Civil Engineering, University of Adelaide
10)	Mr. Masahito HOMMA	Traffic Demand Estimate/ Economic Evaluation	Japanese	Faculty of Economic, Chuo University
11)	Ms. Karen H. JACOB	Social Specialist	Filipino	Univ. Philippines, Dip Women & Development
12)	Mr. Hiromi YASU	Environmental Specialist	Japanese	Department of Agriculture, Kyoto University
13)	Mr. Naoki KAWAHARA	Disaster Prevention Specialist 2	Japanese	Department of Science, Shinshu University
1)	Andi Sambudi	Highway Engineer	Indonesian	Atmajaya Yogyakarta University
2)	Heri MULYANA	Bridge Engineer	Indonesian	Lembaga Pendidikan (LPAK) Bandung
3)	Muhammad SUTOPO	Social Specialist	Indonesian	Agriculture, Gadjah Mada University
4)	Nani SUSANTI, ST	Environmental Specialist	Indonesian	Environment Engineering, STTL - YLH
1	José Guilherme dos Reis	Highway Engineer Assistant	Timorese	
2	Candido de Carvalho	Highway Engineer Assistant	Timorese	
3	Lisino dos Santos	Highway Engineer Assistant	Timorese	
4	Amilcar da Costa Victor	Traffic Surveyor	Timorese	
5	Casmiro Pinto	Traffic Surveyor	Timorese	
6	Gil Mesquita	Traffic Surveyor	Timorese	
7	Diogo Agustinho Pereira	Traffic Survey Assistant	Timorese	
8	Arcanjo Sarmento	Traffic Survey Assistant	Timorese	
9	José Filipe Bernardino	Traffic Survey Assistant	Timorese	
10	Tito de Jesus	Traffic Survey Assistant	Timorese	
11	Domingos Godinho	Traffic Survey Assistant	Timorese	
12	Bernardino Lopes	Traffic Survey Assistant	Timorese	
13	Joao Raimundo	Traffic Survey Assistant	Timorese	
14	Domingos Marques	OD Survey Assistant	Timorese	
15	Basilio da Silva	OD Survey Assistant	Timorese	
16	Abilio Rolando Neto	OD Survey Assistant	Timorese	
17	Anibal Ximenes Correia	OD Survey Assistant	Timorese	
18	Ventura Da Costa	Geotechnical Engineer Assistant	Timorese	
19	Rui Da Costa	Geotechnical Engineer Assistant	Timorese	
20	Rene Realista	Traveling Time Survey Assistant	Timorese	
21	Daniel Soares	Road Inventory Survey Assistant	Timorese	
22	Arsenio Periera da Silva	Public Consultation Expert	Timorese	
23	Adolfo Paulo Hornay	Public Consultation Expert	Timorese	
24	Edwin T. Loren Zana	Cost Estimator Assistant	Timorese	