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TIMOR LESTE BRANCH ROADS PROJECT 2
(TLBRP2)

Updated Environmental and Social Impact Assessment (ESIA)/Simplified Environmental Impact Statement (SEIS) of Ugrading 12-km Aituto – Hatubuilico Junction Road

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Draft - October 27, 2026

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Abbreviations and Acronyms

ANLA	*Agência Nacional de Licenciamento Ambiental* (National Environmental Licensing Agency)
ANM	*Autoridade Nacional de Minerais* (National Mineral Authority)
AoI	Area of Influence
BMP	Biodiversity Management Plan
CEDAW	Convention Against All Forms of Discrimination Against Women
CESMP	Contractor Environmental and Social Management Plan
CHA	Critical Habitat Assessment
CMIP6	Coupled Model Intercomparison Project Phase 6
DED	Detailed Engineering Design
DL	Decree-Law
E&S	Environmental and Social
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
ELL	Environmental Licensing Law
EMP	Environmental Management Plan
ESCOP	Environmental and Social Codes of Practice
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESRS	Environmental and Social Review Summary
ESSs	Environmental and Social Standards
FPIC	Free, Prior and Informed Consent
FS	Feasibility Study
GBV	Gender-Based Violence
GFPP	Grant Facility for Project Preparation
GIIP	Good International Industry Practice
GoTL	Government of Democratic Republic of Timor Leste
GRM	Grievance Redress Mechanism
IBAT	Integrated Biodiversity Assessment Tool
IDA	International Development Association
ILO	International Labor Organization
IP	Indigenous People
IPCC	Intergovernmental Panel on Climate Change
IPP	Indigenous Peoples Plan
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
LMP	Labor Management Procedures
MPW	Ministry of Public Works
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
OHS	Occupational Health and Safety
PCR	Physical Cultural Resources
PMU	Project Management Unit
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
ROW	Right of Way
SEA	Sexual Exploitation and Abuse
SEIS	Simplified Environmental Impact Statement
SEP	Stakeholder Engagement Plan

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SH	Sexual Harassment
TA	Technical Assessment
TLBRP	Timor-Leste Branch Roads Project
TLBRP2	Second Timor-Leste Branch Roads Project
TLRCRP	Timor-Leste Road Climate Resilience Project
TOR	Terms of Reference
WBG	World Bank Group
WGM	Workers Grievance Mechanism
WHO	World Health Organization
WMP	Waste Management Plan

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Executive Summary

Project Development Objective. The development objective of the proposed Second Timor-Leste Branch Roads Project (TLBRP2) is to improve resilient transport connectivity and enhance market access for agricultural producers along selected sections of the Gleno–Maubisse corridor. By upgrading critical road links, the Project is expected to provide safer and more reliable year-round access for rural communities, agricultural production areas and tourism destinations, strengthen connectivity between Ainaro and Gleno, and support local economic development, including coffee production and trade.

Project Interventions. TLBRP2 is a proposed Investment Project Financing operation supported by an IDA credit of US$37.2 million and implemented by the Ministry of Public Works (MPW), comprising two components. Component 1 will finance climate-resilient upgrading of approximately 12 km of the Aituto–Hatubuilico Junction Road to national road standards and approximately 5.4 km of the Hatubuilico Junction–Ramelau Sanctuary Road to municipal road standards, together with construction supervision and road maintenance arrangements. The works will include pavement upgrading, selective widening, shoulders, drainage and culvert improvements, slope stabilisation, retaining and protection structures, bioengineering, bridge-related works, utility relocation where required, and road-safety measures such as guardrails, signs, pavement markings, pedestrian facilities and traffic controls. Component 2 will finance detailed engineering designs and environmental and social instruments for potential future road investments, including the Oeleu–Fatumea road. Temporary and ancillary facilities required for the project would include laydown and stockpile areas, batching and crushing plants, borrow or quarry areas, spoil-disposal sites, access routes and, if required, workers' accommodation; each will require site-specific screening, lawful land access and approvals required according to prevailing laws and regulations of Timor-Leste and ket requirements defined in the Contractor's Environmental and Social Management Plan (CESMP).

ESIA Objective and Scope. This ESIA [termed as Simplified Environmental Impact Statement (SEIS according to the Timor-Leste Regulation] identifies and assesses the Project's direct, indirect and cumulative environmental and social risks and impacts; examines the requirements of applicable national laws and regulations and those of the World Bank Environmental and Social Framework (ESF), including the related environmental and social standards (ESSs); and defines measures to avoid, minimise, mitigate, monitor and manage adverse effects while enhancing project benefits. This document provides an update of environmental and social impact assessment, particularly for the 12-km Aituto–Hatubuilico Junction Road, previously prepared under the ESIA of Branch Road Section of the Dili – Ainaro Road (Aituto – Hatubuilico – Letefoho – Gleno) in 2019.

The primary assessment area of the updated ESIA is the 12 km Aituto–Hatubuilico road corridor and its immediate area of influence, including locations affected by road, drainage, slope-protection and bridge improvement and replacement works. Its scope includes baseline environmental and social conditions; sensitive receptors; land access and livelihood effects; labor and working conditions; community health and safety; biodiversity; pollution prevention; cultural heritage; stakeholder engagement and grievance management; alternatives; cumulative impacts; and the institutional, monitoring and reporting arrangements and mitigation measures set out in the ESMP.

Potential Environmental and Social Impacts and Risks. The Project is expected to generate substantial long-term benefits by improving all-season access, road safety, climate resilience and connectivity between rural communities, agricultural production areas, population centers and tourism destinations. These benefits are likely to include shorter and more reliable travel, lower vehicle operating costs, improved access to markets and services, reduced disruption during heavy rainfall, and safer conditions for road users. The principal adverse impacts are expected during construction and are associated with extensive earthworks in steep terrain, vegetation and tree removal,

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generation and disposal of large quantities of surplus soil and rock, erosion and sediment transport, temporary disturbance of watercourses and drainage paths, dust, noise, vibration, traffic disruption, occupational and community safety risks, temporary utility interruptions, land access requirements, labor influx and worker–community interactions.

Most impacts are expected to be localized and temporary, but slope instability, poorly managed spoil, unsafe traffic, pollution incidents, uncompensated land or livelihood impacts, and damage to community water supplies could be significant if not avoided and actively managed. With DED incorporating climate-resilient drainage and slope protection, implementation of the ESMP and CESMP, effective supervision, and timely corrective action, most residual construction impacts are expected to be moderate; impacts involving physical or economic displacement, serious incidents, sensitive habitats or cultural heritage would require specific assessment and management before the civil works proceed.

The main environmental and social risks and impacts at the **pre-construction phase** of the Project are summarized below:

- ***Social Disruption from Land Acquisition/Resettlement and Contractor Mobilization of Non-Local Labor.*** Pre-construction activities, including corridor delineation, asset inventories, valuation negotiations, and the initial mobilization of contractors, supervisory staff, and non-local workers into Horai-Quic, Mulo, and Nunumoge Sucos, will represent many communities' first direct contact with the Project and may generate anxiety and social tension if not managed transparently. Household uncertainty regarding land rights, valuation criteria, and compensation eligibility is compounded by the customary and often undocumented land-tenure arrangements described in the baseline. The incoming workers, unfamiliar with local Tara Bandu norms and Lulik-based customs, may also create friction if established protocols for introduction and consultation are not followed. Without early, structured communication and a functioning grievance mechanism, these issues could lead to work delays, distrust, and reduced cooperation during subsequent land acquisition and construction.

- ***Land Acquisition and Impacts on Structures.*** Land acquisition for the confirmed right-of-way of the Aituto–Hatubuilico Junction Road (Section 1), and for ancillary sites such as borrow pits and spoil disposal areas, may cause physical displacement (loss of dwellings or structures) and economic displacement (loss of agricultural land, coffee trees, or roadside kiosks) across Horai-Quic, Mulo and Nunumoge Sucos.

  The 2019 Land Acquisition and Resettlement Action Plan (LARAP) identified 75 Project-Affected Households (PAHs), including four severely affected PAHs and two requiring in-situ residential relocation. A rapid assessment of 15 PAHs in September 2026 confirmed that all affected land is privately held and that no communal land is involved. It also identified three additional cases not captured in the 2019 LARAP: two households with temporary structures on a cliffside curve and one PAH whose stone fence may be affected near a sacred tree. One previously listed PAH has already relocated voluntarily. As the 2018 census cut-off date is now outdated, an updated census and asset inventory, with a new eligibility cut-off date consistent with ESS5, will begin in November 2026. The findings will inform the updated LARAP, which will further address impacts associated with land acquisition and structure removal.

  All affected residential and commercial structures—including houses, kiosks, workshops, and fences—will be compensated at full replacement cost. Where relocation is required, support will include in-situ relocation on clan-owned land, construction assistance equivalent to 30% of the structure value, and transitional assistance. Livelihood impacts arising from the removal or relocation of kiosks and mechanical workshops are expected to be temporary. Owners will receive a temporary allowance to help them rebuild their commercial structures and restore economic

activities. Public infrastructure, including four water tanks, water pipes, and electricity poles, will also require relocation or reconstruction in coordination with the agencies responsible for operating and maintaining these utilities and facilities.

- ***Physical Cultural Resources during Site Clearance.*** Initial site clearance and boundary demarcation along the right-of-way and ancillary work areas create risks of disturbing the cultural heritage receptors identified as environmental and social (E&S) sensitive receptors, including the Heluli sacred tree, the Sacred Entrance, Uma Lulik structures, sacred water sources, cemeteries, and the historically significant horizontal cave used as a customary passage between Horai-Quic/Mulo Sucos and Maubisse. Several of these sites sit within a few meters of, or directly within, the existing road reserve, meaning even routine clearance and grading works carry a meaningful risk of physical damage or of disturbing previously unrecorded ancestral or archaeological material.

  Given the significance of the Lulik-based belief system described in the baseline, any unmanaged disturbance could also generate significant community grievance independent of the physical damage itself. In addition, the horizontal cave presents a distinct and elevated risk profile beyond the standard chance-find pathway applicable to the other five receptors, as the baseline indicates it may connect to a regional karst system, combining a cultural-heritage sensitivity with a potential geotechnical hazard to the road itself in landslide-prone terrain.

- ***Disproportionate impacts on marginalized and vulnerable groups.*** Land acquisition and preliminary pre-construction disruptions do not affect all community members equally. The baseline above identifies vulnerable households at the suco level, including women-headed households, elderly residents, and persons with disabilities. These groups, together with landless or informal resource users, face a heightened risk of exclusion from compensation consultations conducted in standard formats, loss of non-formalized or communally-held assets that fall outside conventional entitlement frameworks, and disproportionate hardship during any temporary relocation or livelihood disruption. Women, who play a central role in household agriculture and small-scale trade along the corridor, may also be underrepresented in land negotiations traditionally led by male household heads or customary leaders.

- ***Baseline verification and design risk reduction***. Incomplete baseline information or insufficient design verification could lead to poorly informed siting and design decisions, resulting in unstable spoil disposal, impacts on community water sources, unacceptable noise or air-quality effects at sensitive receptors, avoidable biodiversity loss, poorly located temporary construction facilities, or damage to cultural heritage values.

- ***Ancillary Sites, Materials, and Supply-Chain Controls.*** The selection and use of ancillary sites, quarries, borrow areas, water sources, and disposal sites may create risks related to land access, slope stability, drainage, biodiversity, cultural heritage, community safety, water demand, and pollution. Inadequate capacity planning, unapproved material sourcing, or improper disposal could also increase haul-route risks, resource consumption, and rehabilitation liabilities.

- ***Damage to Existing Utilities and Infrastructure.*** Road widening, excavation, drainage works, slope cutting, vegetation clearance, and construction access may damage or require the relocation of existing electricity and water-supply infrastructure, resulting in service interruptions. Disruptions could affect households, community facilities, and other users, while accidental strikes on buried or roadside utilities could create safety hazards, delays, and additional repair costs.

- ***Contractor Mobilization.*** Early contractor mobilization may create traffic, worker–community interaction, labor, waste, water-use and safety risks before full construction begins.

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The main environmental and social risks during **construction phase** of the Project are summarized below:

- ***Vegetation Removal and Modified Habitat Disturbance.*** Clearing, grubbing, road widening, slope trimming, drainage installation and temporary access will remove or damage roadside vegetation and disturb fauna using modified habitat along the corridor. The bill of quantities indicates approximately 18.5 ha of clearing and grubbing and removal of 835 small- and 30 large-diameter trees. Direct effects would include loss of tree and ground cover, fragmentation of remaining vegetation, disturbance or displacement of fauna, accidental injury to fauna, loss of shade and productive trees, and reduced soil protection on steep slopes. Indirect effects may arise from improved access, fire risk, collection of timber, introduction of invasive plants, and transfer of weed seed in soil, machinery, or revegetation materials.

- ***Slope Instability, Landslide, and Erosion***. Excavation, over-steepened cuts, placement of fill, vibration, vegetation removal, concentrated runoff and inadequate temporary support may destabilize already steep or weathered slopes. Failure could occur as shallow erosion, rockfall, debris movement or larger landslides, with consequences including worker or public injury, burial or damage of property and farmland, road closure, blocked drainage, sediment discharge and isolation of communities. Risk is highest at known unstable sections, deep cuts, high fills, retaining structures, spoil areas and outlets, and increases during prolonged or intense rainfall.

- ***Surplus Material from Excavation and Spoil Disposal.*** The design quantities identify approximately 236,100 m^3 of surplus common excavation, 123,600 m^3 of surplus hard rock and 239,400 m^3 of surplus soft rock. Total rock needed for stone masonry, gabion, riprap and concrete as per estimated quantity in BOQ is 112,855 m^3. Surplus from common excavation and soft rock excavation with a total of 475,500 m^3 may require disposal after reuse. Uncontrolled placement of these materials may overload slopes, increase erosion and sedimentation, bury productive land or vegetation, and increase downstream landslide risk as well as possible encroachment to Mount Ramelau Protected Area.

- ***Surface-Water Quality, Hydrology and Community Water Supply.*** Earthworks, stream crossings, culvert replacement, bridge works, concrete handling, spoil placement and fuel use may increase turbidity, release pollutants, alter flow paths or interrupt access to springs, streams, pipes and collection points used by communities. Steep terrain and intense rainfall can rapidly transport sediment and contaminants downstream. Poorly located culvert outlets may also cause scour, erosion, or drying of an existing flow path.

- ***Dust, Combustion Emissions and Nuisance, and Community Health and Safety.*** Excavation, grading, exposed soil, vehicle movements, unloading, and diesel-powered plant as well as the operation of rock crushing and concrete batching plants will generate dust and combustion emissions. Nuisance may include reduced visibility, soiling of houses and crops, odor and smoke, while fine particulate matter and exhaust may aggravate respiratory conditions. Houses, schools, health clinics, markets, and outdoor workers are particularly sensitive, especially during dry and windy weather. Repeated heavy-vehicle movements and operation of stockpiles, crushers and batching plants may expose nearby communities to concentrated dust, noise, vibration, vehicle conflict, falling material, moving machinery, reduced visibility and unauthorized access. Risks are greater where facilities or haul routes are close to homes, schools, markets, health facilities, pedestrian routes or community water sources, and where unsealed roads are narrow or steep.

- ***Noise and Vibration.*** Excavators, breakers, compactors, crushers, batching equipment, generators, trucks, and other construction activities may increase noise and ground vibration. Potential effects include disruption to sleep, teaching, communication, and business activities, as well as stress to

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livestock. The indicative daytime baseline of 52–57 dB(A) is already close to or above relevant daytime values for some sensitive land uses, leaving limited capacity for additional noise.

- ***Waste, Hazardous Materials and Spills.*** Construction will generate concrete and demolition debris, scrap, packaging, vegetation, domestic waste, sewage, used oil, oily rags, filters, batteries, chemicals and concrete washout. Poor storage, handling or disposal may contaminate soil and water, attract pests, create fire or injury risks, block drainage and expose workers or the public to hazardous substances. A significant fuel, bitumen or chemical release could have severe consequences at water crossings or near community sources.

- ***Borrow Areas, Quarries and Temporary Facilities.*** Borrow pits, quarries, crushers, batching plants, camps, laydown areas, workshops, stockpiles and access tracks may extend the disturbance footprint beyond the road reserve and create land, biodiversity, erosion, drainage, pollution, traffic, and community-safety impacts. The identified potential aggregate source at KM 1+680 has an estimated available quantity of 22,500 m^3, below the approximately 33,950 m^3 combined sub-base and base-course demand, so supplementary sources may be required.

- ***Construction Traffic and Community Road Safety.*** Heavy haulage, slow plant, temporary diversions and active work zones on narrow, steep and winding roads will increase collision risk, delay emergency and public transport, damage local access routes and create conflict with pedestrians, schoolchildren, roadside vendors, livestock and motorcycles. Reversing vehicles, blind bends, reduced visibility from dust, unstable road edges and movement through settlements or markets present risks to collission.

- ***Occupational Health and Safety.*** Workers may be exposed to live traffic, mobile plant, unstable slopes, rockfall, excavations, lifting operations, work at height, hot work, bitumen and cement, silica-containing dust, noise, vibration, electricity, manual handling, heat, and severe weather. Contractors, subcontractors, visitors, and informal workers may have different levels of competence and vulnerability. Potential outcomes include serious injury, fatality, occupational illness, gender-based violence (GBV), and delayed emergency response in remote work areas.

- ***Labor Influx Impacts: Utilities, Conflict, Child Labor, and Community Health and Safety.*** An influx of non-local workers into the rural Sucos of Horai-Quic, Mulo, and Nunumoge could strain the limited potable-water and medical supplies documented in the baseline, increase local food and rental prices, create friction with host communities, and contribute to the transmission of communicable diseases. Given the corridor's small resident population and limited services, including a single health facility still under construction nearby—even a modest labor influx could be significant relative to existing capacity. The arrival of construction crews and associated informal market activity, such as roadside vending and petty errands, may also create opportunities that draw school-age children away from the two corridor schools, whether through informal hiring by subcontractors or household decisions to prioritize short-term income over school attendance.

- ***Gender Based Violence (GBV) - Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH).*** Influx of male-dominated, cash-earning non-local labor into low-income, rural communities of the kind documented in the corridor's baseline significantly elevates the risk of GBV and Sexual Exploitation and Abuse (SEA), Sexual Harassment (SH), and intimate partner violence. Women's comparatively limited economic independence and decision-making power in the corridor communities may increase vulnerability to exploitation and reduce willingness to report incidents through informal channels.

- ***Livelihoods and Access Restriction.*** Construction activity may temporarily restrict access to basic services, gardens, agricultural plots, and roadside trading locations beyond the land-acquisition footprint addressed above, particularly where works require full or partial road closure or

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diversion. Because the corridor is the primary access route for all affected Sucos, including to primary schools, the periodic market, and the health facility under construction in Nunumoge Suco, even short-duration closures can have an outsized effect on households and services with no practical alternative route. Coffee cultivation and horticulture activities, the corridor's dominant livelihood activity, is also highly seasonal, making the timing of disruptive works as important as their duration.

- ***Local Economic Development and Employment Opportunities.*** The construction of the project road will generate demand for unskilled and semi-skilled labor, local materials and services (accommodation, food, transportation), and opportunities to channel benefits to vulnerable and female-headed households identified in the baseline data. The remaining risk is that these benefits may not be distributed equitably, or will accrue disproportionately to better-connected households, larger landowners, or residents of settlements closer to the more accessible end of the Maubisse corridor, at the expense of remote villages and women, who have significantly lower participation rates in the formal wage economy than men.

- ***Impacts on Cultural Heritage/ Sacred Sites.*** Excavation and heavy machinery movements along the corridor can accidentally damage the cultural heritage receptors (sacred trees, Uma Lulik, sacred water, cemeteries and the horizontal cave), as well as community water distribution networks and drainage structures running parallel to the roadway. Because several of these assets sit within or immediately adjacent to the existing road reserve, standard construction activities carry an inherent risk of contact even where damage is unintended. Heavy machinery operation, vibration, or excavation near the horizontal cave carries additional risk beyond accidental contact. Given the cave's possible connectivity to a regional karst system in landslide-prone terrain, uncontrolled nearby construction activity could aggravate an unmapped geotechnical hazard and damage the cultural asset itself.

The main environmental and social risks during the **post-construction phase** of the Project are summarized below:

- ***Air Quality***. During operation, road traffic will emit nitrogen oxides (NOx), hydrocarbons, carbon monoxide, sulfur dioxide (SO_2) and particulate matter. Dust and fumes may also arise from vehicle movements and nearby domestic fuel burning. However, the improved asphalt surface is expected to reduce road dust compared with existing conditions.

- ***Water Quality***. During periods of significant rainfall, improved drainage may mobilize sediment from the road and adjacent land. Accidental spills during operation could also affect receiving waters. In dry periods, accumulated vegetation and other dry matter could obstruct drains and increase the likelihood of polluted runoff when rainfall resumes.

- ***Access, Flora and Fauna.*** Improved road conditions could increase movement through the project area and, in principle, facilitate access to timber, flora, or fauna. However, the project rehabilitates existing roads and does not create new access into previously inaccessible forest areas. Commercial logging access is separately licensed and supported by logging-company roads, while limited selective logging for traditional or cultural purposes is already permitted.

- ***Operational Road Safety.*** Although the upgraded road should improve access, pavement condition and resilience, smoother surfaces may increase vehicle speeds and traffic volumes. This can raise the severity of traffic incidents involving pedestrians, motorcycles, livestock and roadside activity, particularly in settlements and near schools, markets, junctions and public transport stopping points. Better access may also encourage informal stopping or parking, roadside trading, encroachment into drainage, and land conversion.

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- ***Improved Access and Connectivity for Vulnerable Groups.*** The upgrade road is expected to improve safe mobility for women and girls, support continued attendance at the two schools documented in the project corridor, and improve access to health services once the Nunumoge health facility becomes operational. The residual risk is that the design may not extend these benefits to the most vulnerable, for example, if pedestrian infrastructure near schools and the market is absent, lighting is inadequate, or accessibility features for persons with disabilities and older people are not provided.

- ***Employment, Business, and Tourism Opportunities.*** Once operational, the upgraded road is expected to deliver sustained benefits, including shorter travel times and lower vehicle operating costs, expanded produce trading, growth in community-based tourism along the route toward Maubisse and Hatubuilico Junction, and more reliable operations for small enterprises. The residual risk is that these benefits may become concentrated among better-connected households and roadside businesses rather than extending to more remote Aldeias along the corridor.

Mitigation measures for these and other E&S risks are detailed in Annex 2 of this ESIA.

Institutional Arrangements for E&S Instrument Implementation. TLBRP2 will maintain the implementing arrangements as the ongoing Timor-Leste Branch Roads Project (TLBRP). The Administrative Council of the Infrastructure Fund and the Ministry of Finance will provide overall oversight of project implementation, and MPW will be the Implementing Agency. The existing Road Sector Project Management Unit (PMU) within MPW will prepare and implement the Project and will be responsible for day-to-day management, including E&S risk management. The PMU is currently implementing TLBRP and two Asian Development Bank (ADB)-funded road projects and will be strengthened with additional staff through the Grant Facility for Project Preparation (GFPP) resources to manage the expanded portfolio.

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1. Project Proponent

MPW will be the Implementing Agency for TLBRP2, including the improvements to the Aituto–Hatubuilico Junction Road. The PMU within MPW has been established to manage national road projects financed by developmente partners, including the World Bank and the ADB, and will be responsible for day-to-day management of the Project, including the implementation of required E&S risk management measures. The PMU has been supported by a consultant in the preparation of this updated Simplified Environmental Impact Statement (SEIS) according to Timor-Leste regulations which also serves as the updated Environmental and Social Impact Assessment (ESIA) that meet the requirements of the World Bank's Environmental and Social Framework (ESF).

Table 1. Project Proponent Details

Address:	REPÚBLICA DEMOCRÁTICA DE TIMOR-LESTE MINISTÉRIO DAS OBRAS PUBLICAS Avenida da Patria, Mandarin, Dili, Timor Lest
Telephone:	+670 3310249
Name	Project Management Unit
Email:	environmentpmu2@gmail.com

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2. Project Description

2.1. Project Components

The Timor-Leste Road Climate Resilience Project (TLRCRP) improved the climate resilience of the 110 km of the Dili–Ainaro road from 2011–2022; while the ongoing TLBRP is financing the first phase of upgrading the Gleno–Maubisse corridor, specifically the 42 km of the Gleno–Letefoho–Hatubuilico Junction Roads.[1] TLBRP2, the second phase of upgrading this road corridor, is proposed to upgrade a missing road link providing access to the country's highest coffee producing areas and tourist destinations, including Mount Ramelau.

TLBRP comprises three components: Component 1 (US$72.8 million) upgrades 42 km of the Gleno–Letefoho and Letefoho–Hatubuilico Junction roads to national standards through climate-resilient pavement, widening, drainage, slope-stabilisation and urban road-safety improvements, while also funding minor safety works elsewhere on the network; Component 2 (US$4.0 million) will strengthen MPW and DRBFC capacity through road-asset data collection, performance-based maintenance pilots, road-safety and geotechnical advisory support, studies and designs for future road investments, project implementation support, training, GBV and SEA prevention measures, equipment, operating costs and audits; and Component 3 is a zero-cost contingent emergency response mechanism allowing the Government of Timor-Leste to reallocate project funds for eligible crisis response and reconstruction. The ESIA of TLBRP prepared in 2019 covers approximately 60-km long road across Ainaro and Ermera municipalities, including the 12-km road from Aituto to Hatubuilico Junction. However, TLBRP invesement covers only the Hatubuilico–Letefoho and Letefoho–Gleno road sections.

TLBRP2 is a proposed Investment Project Financing to be financed by an International Development Association (IDA) credit in the amount of US$37.2 million equivalent, and the Implementing Agency will be MPW. The proposed ***Project Development Objective is to improve resilient transport connectivity and enhance market access for agricultural producers along selected sections of the Gleno–Maubisse corridor***. The Project beneficiaries are expected to be around 211,000 people (16 percent of the country's total population) living in the two municipalities (Ainaro and Ermera) who are directly served by the 12 km Aitituto – Hatubuilico Junction and 5.4 km Hatubuilico Junction – Ramelau Sanctuary Roads. The road corridor serves rural communities, agricultural production areas, and tourism destinations in the western region of Timor-Leste.

The Project comprises the following components:

- **Component 1: Gleno–Maubisse Corridor Upgrading.** This component will finance road upgrading works to improve the climate resilience, safety, and functionality of the Gleno–Maubisse corridor. It will include pavement upgrading, selective road widening, drainage and culvert improvements, slope stabilization, bioengineering measures, road safety improvements, and maintenance of

[1] TLBRP was approved by the Board on November 26, 2019, with US$59 million equivalent IDA credit. The PDO is to 'improve road access, safety, and climate resilience on the Gleno–Maubisse Corridor and, in the event of an Eligible Crisis or Emergency, to provide an immediate response to the Eligible'. Of the two major civil works, the Letefoho–Hatubuilico roadworks is in a final stage, while the Gleno–Letefoho roadworks is to be completed by August 2028. The committed contracts reached 100 percent of TLBRP IDA financing, and TLBRP's IDA disbursement is US$19.2 million (33 percent).

upgraded road sections after the defect liability period. Works will be designed to respond to expected increases in rainfall intensity and runoff, reduce erosion and landslide risks, and improve year-round accessibility for communities and road users. Component 1 has the following project's subcomponents:

- ***Subcomponent 1.1 will upgrade the Aituto–Hatubuilico Junction Road, approximately 12 kilometers, to national road standards, including a 6-meter carriageway, 2-meter shoulders, and 1-meter drainage.*** The works will include pavement upgrading, selective widening, culvert and drainage improvements, slope stabilization structures, bioengineering measures, and road safety improvements. Existing feasibility study, DED, bidding documents, Environmental and Social Impact Assessment, Environmental and Social Management Plan, and Land Acquisition and Resettlement Action Plan prepared in 2019 has been reviewed and updated to align with the World Bank ESF and the applicable ESSs. The updated ESIA is presented in this document.

- ***Subcomponent 1.2 will upgrade the Hatubuilico Junction–Ramelau Sanctuary Road, approximately 5.4 kilometers, to municipal road standards, including a 5-meter carriageway, 2-meter shoulders, and 1-meter drainage.*** The works will include pavement upgrading, selective widening, ***culvert*** and drainage improvements, slope stabilization structures, bioengineering measures, and road safety improvements. DED for this section including preparation of required E&S documents is planned to be prepared using grants from the Grant Facility for Project Preparation (GFPP), and the subcomponent will also finance related construction supervision consultancy services.

- **Component 2: Institutional Strengthening (estimated cost US$2.0 million).** This component will finance assessment, detailed designs, bidding documents, and E&S instruments required for the preparation of potential future investments in the road sector, including those for the Oeleu–Fatumea road (54 km). The component would also finance activities to strengthen MPW's capacity in road asset management and maintenance.

- **Component 3: Project Management Support.** This component will support effective project coordination, procurement, financial management, E&S risk management, contract management, monitoring and evaluation, and stakeholder engagement. Although fully financed by the Government, the component is included to reflect the project's full scope and provide a complete account of the institutional resources required for effective implementation.

2.2. E&S Risk Category and Assessment of the Project

The Project involves reconstruction and resurfacing of the existing road sections which include slope stabilization, and improvement of crossing drains. The proposed road infrastructure needs to be improved because the standards and conditions of many of the roads in Timor-Leste are inadequate to meet the rapidly growing demand for an efficient and improved road traffic safety. Lack of access and mobility due to poor road infrastructure has adversely impacted local economic growth and broader national development.

While TLBRP was classified as a Category B project under the Bank's OP 4.01 Environmental Assessment, TLBRP2 is now subject to the World Bank's ESF. Under the ESF, the proposed Project has

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been classified as having ***Substantial*** environmental and social risk rating. This reflects the nature and scale of civil works in mountainous terrain, the potential need for land acquisition and temporary land use, and the importance of robust measures required for stakeholder engagement, labor and working conditions, community health and safety, and environmental protection during project implementation.

The overall objective of this report is to provide an Environmental and Social Impact Assessment for the works proposed under the climate resilient infrastructure solutions which encompass items described above and include all ancillary infrastructure for works. As part of that process, the ESIA (prepared in 2019) has been updated, particularly for the 12 km Aituto – Hatubuilico Junction Road, including screening of the project and scoping of the potential impacts, it provides a description of the baseline conditions, it details the predicted impacts from the project activities. It also provides recommended mitigation measures and monitoring plan which have been taken forward and incorporated into the stand-alone ESMP. Although many anticipated impacts are site-specific, generally reversible and capable of being mitigated through established measures, the Project's overall risk profile warrants this classification because of the scale and complexity of the works, the sensitivity of the receiving environment and communities, and the need for robust mitigation, monitoring and management throughout implementation.

2.3. Project Site and Study Area

As shown in Figures 1 and 2, the TLBRP2 works are proposed along the approximately 12 km road section from Aituto to Hatubuilico Junction, together with an additional approximately 5.4 km road section from the Hatubuilico Junction to the Ramelau Sanctuary Road. For the purposes of this updated ESIA, the primary study area focuses on the 12 km road corridor and its immediate area of influence, including locations where construction activities, drainage works, and associated environmental and social interactions may occur. The approach used to define the geographic scope of the ESIA, including the consideration of direct, indirect, and cumulative areas of influence, is described in Chapter 4, Methodology. (As described earlier, E&S assessment of the 5.4-km road will be prepared separately from this updated ESIA.) The administrative areas within the 12-km road section are presented below.

Table 2. Municipalities, Sucos, Aldeias within Project Corridor

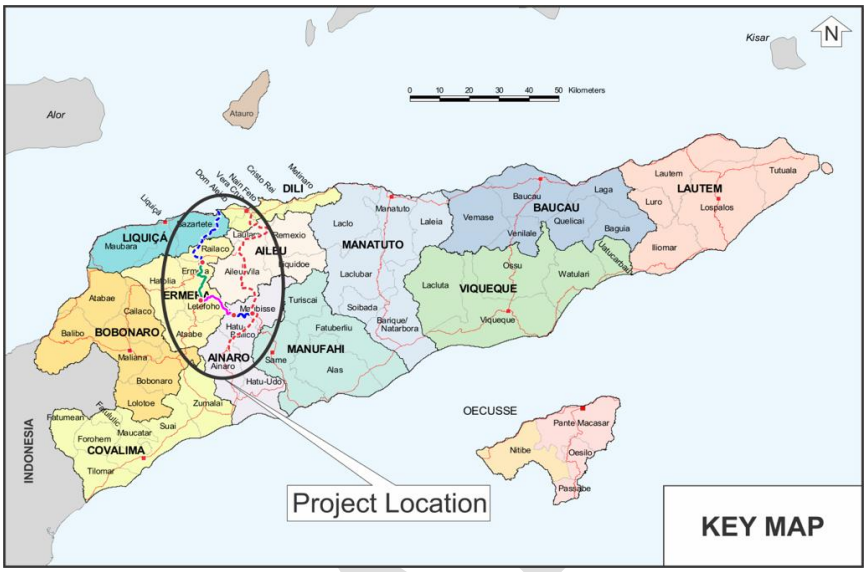
Municipalities	Ainaro and Ermera	
Administrative Post:	Maubisse	Hatubuilico
Sucos/ Village:	Horai-Quic	Mulo, Nunumoge
Hamlets/ Aldeias:	Lauheli, Hatusau, Cartolo, Gourema	Mulo: Manumera, Mau-Lahulo Nunumoge: Queorema, Laqueco, Mausoromata, Hato-builico

Implementation of the works will require temporary and ancillary facilities, including spoil disposal areas, laydown and stockpile areas, aggregate crushing plant sites, and workers' camp or accommodation areas. The precise locations, footprints, access arrangements, and duration of use for these facilities have not yet been confirmed and will be determined during the implementation stage. One potential borrow pit has been identified as an option; however, additional suitable sources and sites may be assessed before civil works commence. All proposed ancillary sites will be subject to

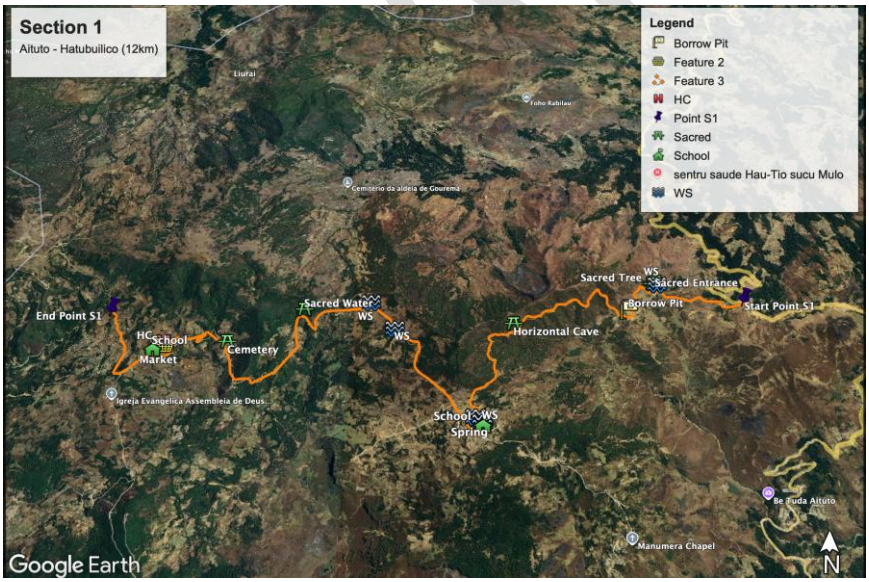
environmental and social screening, land access confirmation, community consultation where relevant, and approval according to prevailing laws and regulations of the Timor-Leste and key requirements defined in the CESMP.

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Map 1. Project Location



Map 2. Aituto – Hatubuilico Junction Road (12 km)



2.4. Current Condition

2.4.1. Road Condition

The road alignment traverses steep mountainous terrain, with sections that ascend, descend, and wind along slopes, reaching a maximum elevation of approximately 2,160 m between Aituto and Hatubuilico as described in the following table.

Table 3. Current Road Condition

Location	Description	Photos
STA.0+000 – STA.1+600	The road runs through the gentle slope (α= 25-30 degree) in where the thin layer (t= 0.5 to 1.0 m) of Talus is creeping. The area is underlain by phyllitic rock and sandstone belong to the Permian Maubisse Limestone. The rolling stone which is mainly composed of limestone in size of few meters is distributed sporadically on the slope.	
STA.1+600 – STA.5+000	In this section, the slope incline of the top and bottom direction of the road is hard with 45°from 35°. The area is underlain by the Maubisse Limestone, which is mainly composed of alternated layers with limestone, tuff breccia, sandstone and shale etc. that strike NS and dip 44W.	
STA.5+000 – STA.8+500	The road goes up from 1,500 meters above sea level to 1,700 meters above sea level and runs through the gentle slope of Mt. Maulabe (2,274m) facing the south-west.	
STA.8+500 + STA.12+000	From STA. 8+500, the road crosses mountainous slopes before reaching approximately 1,800 m above sea level after a gentler section. Numerous slope failures, including older failures, occur in this section.	

2.4.2. Existing Culvert/Drainage Structures

The inventory of existing drainage structures identified for the 12-km Aituto – Hatubuilico Junction Road, including box and pipe culverts, was prepared from site investigations undertaken by the DED team in 2018. The structures identified in the inventory are presented in the table below and provide

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a baseline for assessing drainage-related environmental and social risks, including flooding, erosion, sedimentation, and construction-related disturbance, as part of this updated ESIA.

Table 4. Current Culvert Structures to be Improved

NO.	STATION (KM)	NO. Of LINES SIZE	TYPE	REMARKS
1	0+620		RCP	Remove and Replace
2	1+220	1-900 mm ø	ARMCO pipe	Remove and Replace
3	1+360	1-1.00mø	ARMCO pipe	Remove and Replace
4	1+490	1-1.00mø	ARMCO pipe	Remove and Replace
5	1+760	1-800mmø	RCP	Remove and Replace
6	1+930	1-1.00mø	ARMCO pipe	Remove and Replace
7	2+100	1-610mmø		Remove and Replace
8	4+700	1-800mmø	RCP	Remove and Replace
9	6+570	1-800mmø	RCP	Remove and Replace
10	7+200	1-800mmø	RCP	Remove and Replace
11	8+080	1-800mmø	ARMCO pipe	Remove and Replace
12	8+690	1-1.00mø	ARMCO pipe	Remove and Replace
13	8+710	1-800mmø	RCP	Remove and Replace
14	9+120	1-800mmø	RCP	Remove and Replace
15	9+490	1-2.40 x 3.00	SM Box Culvert	Remove and Replace
16	10+260	1-800mmø	RCP	Remove and Replace
17	10+550	1-2.80 x 3.20	Flat slab	Remove and Replace
18	10+690	1-3.00 x2.20	Flat slab	Remove and Replace
19	10+980	1-900mmø	RCP	Remove and Replace
20	11+210	1-1.00mø	ARMCO pipe	Remove and Replace
21	11+350	1-800 mm ø	ARMCO pipe	Remove and Replace

The drainage structures comprise culverts and roadside ditches. Some culverts connect to natural waterways, including small tributaries that convey flow downstream. Several culverts are unstable or in poor condition because of previous landslides and cracking. The DED has assessed these structures and incorporated appropriate runoff culverts and lined drains into the design. Existing structures will be cleaned, repaired, or replaced as required. Improvements to the existing culverts will include cleaning and, where necessary, repairing concrete wing walls and headwalls to protect catch basins. Headwalls and wing walls may also be installed at the ends of culvert barrels for the following reasons:

- To improve hydraulic efficiency by streamlining flow towards the opening;
- To enhance structural stability by lengthening seepage paths;
- To retain filling material and reduce erosion of embankment slopes; and
- To counteract uplift forces.

Several sections of the project road are unstable, and the road has been damaged in some locations. Gabion walls have been installed to stabilize some sections, while others are supported only by timber logs. The damage may be attributable to several factors, including surface-water runoff, inadequate compaction, and the use of non-homogeneous fill-material during previous rehabilitation works. Road stability issues have been addressed through the DED incorporating a range of measures. To reduce water-related damage, the civil works will include constructing, rehabilitating, and repairing roadside drainage, as well as clearing and repairing culvert structures. Embankments will also be strengthened at selected locations, and drainage structures will be cleared to improve runoff during storms and heavy rainfall.

2.4.3. Existing Bridge/Flat Slab

An existing bridge/flat slab structure is located at STA. 10+335 (photo below), based on the existing road alignment. The structure has a clear span of approximately 3.9 m, a height of approximately 1.8 m, and a width of approximately 6 m. Field observations indicate scouring at both the upstream and downstream sides, including erosion of the waterway bed to an estimated depth of around 1 m, and the structure is also prone to debris accumulation.



2.4.4. Identified Sites Prone to Slope Failures and Landslides

As shown in the figure below, the geology of the road alignment based on exposed rocks along road cuts is mostly metamorphic rocks belonging to the Aileu metamorphics and recent colluvial deposits. The colluvium deposit is an accumulation in depressions/gullies of eroded materials from adjoining slopes. It consists of angular rock fragments ranging from gravel size to boulder size with soil and clay. This deposit is stable when dry but weakens with the presence of water as it is prone to debris flow and slippage. The stability of the rock formation along the cut slopes of the Project corridor can be a source of potential adverse impacts during the rehabilitation and construction work. Spoils from slope trimming that will be suitable for fill-materials will need to be disposed of. Threats of landslides will be present, and this is a safety concern for workers and people using the road.

Figure 1. Typical Slope Conditions



During the road operations stage, rock falls, slides and debris flow are going to be major concerns as these will affect roads and drainage. Road clearing of slide materials will continue during maintenance work, especially during the rainy season. Aside from obstruction, the other source of indirect impacts of road clearing is the disposal of the landslide materials which could be significant in the event of a major landslide event. The identified sites with potential landslides and slope failures are shown in table below.

Table 5. Sites Identified with Potential Landslides and Slope Failures

STA	Critical Items	α	Width (m)	Length (m)	Depth (m)	Remarks
0+620	Landslide					Landslide not yet improved
0+900	Slope Failure	40°	15	20	3	New landslide
1+760	Landslide	10^0	35	60	8	Landslide not yet improved
2+540	Slope Failure	40^0	5	15	1	Slope failure not yet improved
2+800	Slope Failure	45^0	7	10	0.5	Slope failure not yet improved
3+300	Slope Failure	45^0	5	8	1	Slope failure not yet improved
4+600	Landslide	20^0	36	20	4	The landslide informed by community
8+600	Landslide					Landslide not yet improved
9+300	Landslide	20^0	15	30	1.5	Landslide not yet improved
9+400	Slope Failure	50^0	40	50	5	Slope failure not yet improved
9+800	Slope Failure Talus	5^0	3	5	0.5	Slope failure talus not yet improved
10+600	Slope Failure	50^0	40	50	5	Slope failure not yet improved
11+300	Slope Failure	45^0	5	3	0.5	Slope failure not yet improved

Detailed technical design drawings are presented in **Annex 6**.

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2.5 Overview of Proposed Works

This section presents an overview of the proposed rehabilitation and improvement works for the TLBRP2 road upgrade, including the road, drainage, slope protection, and bridge-related activities anticipated under the project. The description is intended to support the ESIA by identifying the types, scale, and location of civil works that may give rise to environmental and social risks and impacts.

Table 6. Description of Proposed Works

DESCRIPTION	UNIT	SECTION 1			
		ROAD	DRAINAGE	BRIDGE	TOTAL
EARTHWORK:					
Clearing and Grubbing	ha.	18.5			18.5
Individual Removal of Trees, Small (150mm dia-900mm dia)	each	835			835
Individual Removal of Trees, Large (over 900mm dia)	each	30			30
Removal and Disposal of Existing Asphalt Pavement	sq.m.	4,800			4,800
Removal of Existing Stone Masonry Retaining Wall	l.m.	3,860			3,860
Removal of Existing Gabions	cu.m.	220			220
Surplus Common Excavation	cu.m.	236,100			236,100
Surplus Hard Rock Excavation	cu.m.	123,600			123,600
Surplus Soft Rock Excavation	cu.m.	239,400			239,400
Embankment from Roadway Excavation, Common Materials	cu.m.	47,200			47,200
Embankment from Selected Borrow (Granular Materials)		18,275			18,275
Subgrade Preparation (Common materials)	sq.m.	84,200			84,200
Subgrade Preparation (Existing Asphalt Pavement)	sq.m.	38,700			38,700
SUBBASE AND BASE COURSE:					
Aggregate Subbase Course	cu.m	17,150			17,150
Crushed Aggregate Base Course	cu.m.	16,800			16,800
SURFACE COURSE:					
Bituminous Prime Coat, (Cutback Asphalt, Grade MC-70)	tonne	180			180

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DESCRIPTION	UNIT	SECTION 1			
		ROAD	DRAINAGE	BRIDGE	TOTAL
Bituminous Tack Coat, Emulsified Asphalt SS-1	tonne	0.05			0.05
Bituminous Concrete Surface (Wearing) Course, Hot Laid (50mm thick)	tonne	13,275			13,275
BRIDGE CONSTRUCTION					
- HAUSPEHAN FLAT SLAB -					
Removal of Existing Bridge (L=5.50m)	l.s.			1	1
Bridge Excavation, Common Materials	cu.m.			779	779
Structural Backfill	cu.m.			213	213
Concrete Bridge Railing	lm.			16	16
Structural Anchor Bolt, 25mm dia. x 1000mm	each			10	10
Reinforcing Steel , Grade 40 (Bridges)	kg.			32,257	32,257
Structural Concrete Class A for bridge	cu.m.			271	271
Lean Concrete	cu.m.			11	11
Elastomeric Bearing Pad, Duro 60 (400 x 500 x 25mm)	each			12	12
Elastomeric Bearing Pad, Duro 60 (200 x 200 x 25mm)	each			10	10
Preformed Elastomeric Compression Joint Seals (50mm,thick)	lm.			20	20
Grouted Riprap, Class A	cu.m.			16	16
Stone Masonry	cu.m.			70	70
Detour Road	l.s.			1	1
Metal Drain Pipe (150mm dia. x 800mm G.I.Pipe)	each			3	3
DRAINAGE & SLOPE PROTECTION STRUCTURES:					
Structure Excavation, Common Materials	cu.m.		8,934		8,934
Structural Backfill	cu.m.		517		517
Reinforcing Steel , Grade 40 (for Drainage)	kg.	65,600	54,810		120,410
Structural Concrete Class A (for Drainage)	cu.m.		308		308
Lean Concrete	cu.m.		20		20

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DESCRIPTION	UNIT	SECTION 1			
		ROAD	DRAINAGE	BRIDGE	TOTAL
Reinforced Concrete Pipe Culvert (1 - 610mm dia.)	l.m.		109		109
Reinforced Concrete Pipe Culvert (1 - 910mm dia.)	l.m.		317		317
Reinforced Concrete Pipe Culvert (1 - 1070mm dia.)	l.m.		173		173
Reinforced Concrete Pipe Culvert (2 - 1070mm dia.)	l.m.		13		13
Reinforced Concrete Pipe Culvert (1 - 1220mm dia.)	l.m.		150		150
Reinforced Concrete Pipe Culvert (2 - 1220mm dia.)	l.m.		22		22
Reinforced Concrete Pipe Culvert (1 - 1520mm dia.)	l.m.		103		103
Reinforced Concrete Pipe Culvert (2 - 1520mm dia.)	l.m.		36		36
Underdrain, 200mm dia. PVC Pipe	l.m.		300		300
Catch Basins, 1-910mm dia. RCPC	each		16		16
Catch Basins, 1-1070mm dia. RCPC	each		2		2
Catch Basins, 1-1220mm dia. RCPC	each		1		1
Catch Basins, 2-1220mm dia. RCPC	each		1		1
Catch Basins, 1-1520mm dia. RCPC	each		1		1
Catch Pit	each		24		24
Grouted Riprap, Class A	cu.m.		5,239		5,239
Stone Masonry	cu.m.	78,875	2,280		81,155
Gabions	cu.m.	5,000	4,420		9,420
Reinforced Concrete Ditch with Monolythic Cover	l.m.		1,019		1,019
Concrete Lined Semi-Circular Ditch	l.m.		800		800
Underdrain on Side Ditch	l.m.		150		150
MISCELLANEOUS STRUCTURES:					
Concrete Sidewalk	sq.m.	100			100

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DESCRIPTION	UNIT	SECTION 1			
		ROAD	DRAINAGE	BRIDGE	TOTAL
Steel Railing (Side Walk)	l.m.	1,475			1,475
Maintenance Marker Posts	each		2,159		2,159
Kilometer Post	each	11			11
Metal Guardrail (Metal Beam) including Galvanized Steel Post	l.m.	323			323
Metal Beam End Piece (Rounded with anchor)	each	16			16
Warning Signs (Diamond Shape)	each	24			24
Regulatory Signs (R1-2 & R2-1)	each	7			7
Informatory Signs, (2000 x 1000mm)	each	2			2
Informatory Signs, (2300 x 1000mm)	each	2			2
Informatory Signs, (2450 x 1000mm)	each	3			3
Informatory Signs, (Assembly Type 1)	each	4			4
Informatory Signs, (Assembly Type 2)	each	8			8
Warning Signs, Chevron	each	142			142
Reflectorized Thermoplastic Pavement Markings (White)	sq.m.	2,800			2,800
Reflectorized Thermoplastic Pavement Markings (Yellow)	sq.m.	2,350			2,350
Reflectorized Thermoplastic Pavement Markings (Pedestrian Crossing)	sq.m.	150			150
Reflectorized Thermoplastic Pavement Markings (Rumble Strip)	sq.m.	110			110
BIO - ENGINEERING WORKS:					
Nursery Establishment Operation and Management	l.s.	1			1
Grass Slips Production	sq.m.	94,500			94,500
Slope Trimming and Preparation	sq.m.	94,500			94,500
Planting of Grass Slips (Vetiver Grass)	sq.m.	94,500			94,500
Coconet Bio-Engineering on Prepared Slopes	sq.m.	89,000			89,000

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The initial Project activity will involve clearing the existing carriageway of surplus materials and obstructions, including trees, stones, stumps, and unstable slopes. Suitable topsoil will be stockpiled for later reuse. Roots, logs, vegetation, waste, and other debris will be disposed of at designated and approved locations. Timber from affected trees will be returned to the owners for reuse, following payment of applicable compensation.

The Contractor will remove structures and obstructions, either wholly or in part, and will backfill associated trenches and pits as required. The Contractor will be required to prepare and implement a CESMP, in accordance with contractual obligations and to the satisfaction of the PMU and the World Bank. This will include the management and disposal of soil, debris, and other obstruction materials at designated and approved locations, and ensuring that such materials are not left at Project sites.

Utility relocation is likely to be required in certain sections of the Project corridor. The affected utilities are expected to include power lines, community water-supply lines, and water tanks. Relocation of power lines will generally be undertaken by the state-owned power company EDTL (*Electricidade de Timor Leste*), while relocation of community water-supply lines and reconstruction of water tanks will be supported by the Contractor. All relocation works will be approved by the PMU in consultation with affected communities and relevant utility owners. Where necessary, temporary or replacement utilities will be provided by the Contractor, subject to permission from the utility owners and affected communities.

Drainage structures within the Project area include culverts and roadside ditches. Some culverts connect to natural waterways, including small tributaries that flow downstream. Several culverts are currently in poor condition or structurally vulnerable due to previous landslides and cracking. The DED assessed these drainage structures and incorporated appropriate measures for runoff management, including culverts and lined drains. Where required, existing drainage structures will be cleaned, repaired, or replaced.

2.6. Sourcing of Aggregate Materials

Aggregate materials for the Project will be sourced locally, including aggregate for the road pavement sub-base (17,150 m^3) and base course (16,800 m^3). The DED has identified a potential source of aggregate materials (borrow pit) at KM 1+680, located approximately 32 m from the left-hand side of the road as shown in the figures below. The estimated available quantity at this location is 22,500 m^3. During implementation, the Project will identify and assess alternative sources of these materials as required to meet the necessary material quantities. Quarry site(s) will be selected in accordance with applicable national environmental licensing requirements and the ESMP's requirements.

An initial observation of the potential material source at KM 1+680 indicates that the site is suitable from an E&S perspective. Its development is not expected to affect water sources or active farmland, require significant vegetation clearance, or involve steep terrain. The PMU, with support from the supervision consultant, will undertake further due diligence on land tenure and access to ensure that no unresolved land-access or compensation issues arise. Before the site is finalised, the PMU and supervision consultant will also consult the local community and screen the surrounding area for cultural heritage resources.

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Map 3. Location of Potential Borrow Pit at KM 1+680



2.7. Construction Laydown Site

Laydown sites—also referred to as construction camps or temporary works areas—are expected to include project offices, storage and stockpile areas, concrete batching facilities, crushing plant facilities, and other associated temporary infrastructure required to support construction activities. The number, footprint, and final locations of laydown sites and crushing plant facilities have not yet been confirmed and will be determined during implementation.

Potential laydown site locations will be identified by the Contractor and assessed through the preparation of CESMP, which is then subject to approval by PMU. Each proposed site will be subject to E&S screening by the Contractor, with verification by the PMU, prior to approval. The PMU will approve only those sites that comply with the requirements of the ESMP, avoid or minimize associated risks and impacts on the environment and sensitive receptors, and meet all applicable land access, community health and safety, and environmental management requirements. Further, planning,

establishment, operation, and demobilization of laydown sites, batching plants, and crushing plants will comply with the ESMP and relevant World Bank ESF including ESSs.

Concrete batching plants and crushing plants will be located at least 150 m from the nearest residential settlement and at least 100 m from any water body, unless a more stringent requirement is identified through site-specific screening or national permitting conditions. The final location, layout, operating arrangements, and footprint of these facilities will be described in the CESMP and approved before establishment.

The size of laydown sites will be limited to the minimum area required for safe and efficient construction operations. Sites will be fenced, access will be controlled, and materials, equipment, fuels, chemicals, and wastes will be stored securely to prevent unauthorized access, accidental release, theft, or unsafe use by non-authorized persons.

Before any crushing plant is established, the Contractor will assess potential nuisance and community health and safety risks, including noise, dust, traffic, vibration, runoff, and occupational health and safety hazards. Where feasible, crushing plants will be located away from residential areas and sensitive receptors to avoid or minimize adverse E&S impacts. The proposed location and site-specific mitigation measures for this plant will be identified in the CESMP and will be subject to PMU review and approval.

2.8. Worker Accommodation

The requirement for a residential workers' camp for the project has not yet been confirmed and will be determined during construction planning and/or bidding process. Should a workers' camp be required, it will be planned, established, operated, and decommissioned in accordance with the requirements of the ESMP, including provisions relating to labor and working conditions, community health and safety, waste management, sanitation, water supply, security arrangements, and grievance management. The location, scale, layout, design, management arrangements, and decommissioning measures for any workers' accommodation will be detailed in the CESMP and subject to review and approval by the PMU prior to establishment.

Potential sites for workers' accommodation will be identified by the Contractor and assessed as part of the CESMP preparation process. Each proposed site will be screened for E&S risks and impacts, including proximity to communities, sensitive receptors, watercourses, land ownership and access arrangements, potential land acquisition or livelihood impacts. Potential risks to occupational health and safety, community health and safety, labor influx and worker–community interactions will also be considered. The Contractor's screening findings will be verified by the PMU, with support from the Supervision Consultant. Only sites that are technically suitable, lawfully accessed, and assessed as having acceptable and manageable E&S risks and impacts will be approved for use.

2.9. Haulage of Construction Materials

Movement of rock aggregates, construction materials, and equipment will primarily take place along the 12-km Aituto – Hatubuilico Junction Road corridor as this is in relatively in proximity to Dili compared to other road corridors. Although this road may be adequate for short-distance haulage, existing road conditions, together with the mountainous terrain, narrow carriageway sections, steep gradients, sharp curves, and limited passing opportunities, are expected to constrain longer-distance

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transport. Extended haulage movements may therefore be time-consuming, increase safety risks for other road users and roadside communities, contribute to traffic delays, and potentially affect the construction schedule. These risks will need to be managed through the CESMP, including a traffic and haulage management plan that defines approved haul routes, vehicle load limits, speed controls, delivery schedules, driver requirements, community safety measures, dust and noise controls, and procedures for maintaining safe access throughout construction.

2.10. Spoil Disposal Site

Spoil disposal sites will be required for surplus excavated soil, rock, and other construction materials generated from slope cutting, road widening, drainage works, and other civil works. The anticipated volume of surplus material is estimated at approximately 475,500 m^3. These dipsoal sites, which have not been determined at this stage, shall be identified, assessed, approved, and managed in accordance with national regulatory requirements and the ESMP. Site selection shall be informed by prior E&S screening, engineering assessment, land access due diligence, and meaningful consultation with affected communities and relevant authorities.

Preference for disposal sites is to be given to sites that are technically stable, already disturbed where feasible, accessible without creating additional significant impacts, and located away from sensitive environmental and social receptors. Prior to use, each proposed spoil disposal site shall be included in the CESMP, supported by site-specific management measures for access, slope stability, erosion and sediment control, drainage, traffic and community health and safety, dust and noise control, progressive stabilization, reinstatement, and closure. No disposal site shall be used until the required screening, consultations, land access arrangements, permits or approvals, have been completed.

2.11. Workers Recruitment

Recruitment and mobilization of the construction workforce will include site engineers, technicians, surveyors, heavy equipment operators and assistants, mechanics, general laborers, and other workers required for implementation of the civil works associated with road upgrading. Consistent with the Government of Timor-Leste's commitment to inclusive employment and the World Bank's ESF, the Contractor will prioritize local recruitment where feasible, particularly for semi-skilled and unskilled positions, subject to the required qualifications, experience, and occupational health and safety requirements.

The Contractor shall promote women's participation in the project workforce, with a target that women comprise at least 30 percent of the overall workforce and not less than 20 percent of technical and management positions. To support achievement of these targets, the Contractor shall develop and implement gender-responsive recruitment, workplace, and grievance procedures, including measures to provide equal opportunity, prevent discrimination and harassment, and address practical barriers to women's participation, including social norms that may place disproportionate caregiving responsibilities on women.

Commented [NK2]: Are the targets based on similar works experience in Timor-Leste or the region?

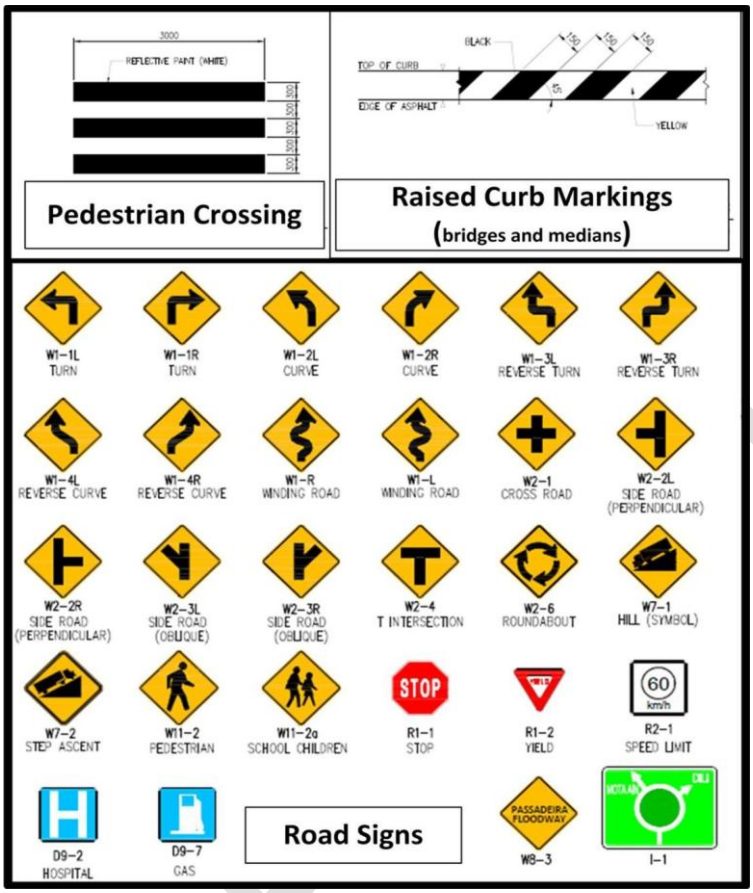
2.12. Traffic Safety and Road Furnishings

Road safety measures for this project involves provision of adequate and reflective pavement markings that will delineate the boundary between opposing and parallel traffic and pedestrians; covered drains adjacent to the road asphalt paved shoulders where pedestrians especially school

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children can walk safely; adequate road signs that will serve as warnings and information signs. Road safety features are shown in Figure 2. In addition, road safety features shall be provided such as metal guardrails, road signs, and guideposts.

Figure 2. Typical of Road Safety Features



Bioengineering works will involve preparation of excavated backfilling and embankment slopes and combination of an engineering structure (e.g. retaining wall and gabion) and slope planting with selected vegetation such as vetiver grass (*Chrysopogon zizanioides*), setaria grass (*Setaria sphacelata*), elephant grass (*Pennisetum purpureum*), and other local vines that grow locally 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 that have been considered for use in the project area as follows:

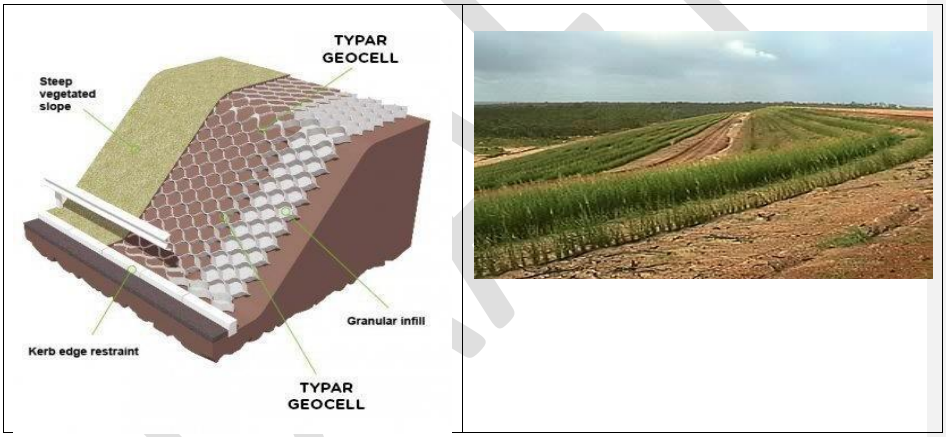
- Turfing on embankment slope to armor the surface;

- Grass slips (rhizome plantation) on the embankment to armor the embankment slope;
- Brush layer of hardwood cuttings in embankment slope to reinforce the slope to avoid encroachment of the embankment by local people.

As shown in the figure below, bioengineering works are targeted to be applied in several locations, especially on an unstable slope or fragile soil to support artificial slope stabilization. The locations will be furher confirmed during public consultations and the refinement of detailed design during project implementation; in response to local conditions and factors.

The Project will transition to the operations and maintenance stage, following the completion of construction and the defects notification period. The regular maintenance work will involve patching of the pavements, trimming of vegetation along the roadside, maintenance of road safety features, e.g. pavement markings, drainage etc. Given the projected volume of vehicular traffic is moderate, thus noise and air pollution are not expected to be a concern during the road's operational stage. Therefore, only a few significant indirect environmental and social impacts are predicted during this stage, particularly related to the safety issue of the passengers.

Figure 3. Steep Vegetated Slope with Vetiver Grass



2.13. Analysis of Alternative

At the DED stage, an analysis of project's alternatives was conducted. Three alternatives were considered for rehabilitating and upgrading the branch road, however, the proposed civil works are limited to upgrading of the existing carriageway through road improvement and rehabilitation, supported by appropriate climate-resilience drainage and slope-stabilization using bioengeening measures described earlier. The alternatives include the 'without Project' option and alternative road-improvement approaches.

2.13.1. 'Without Project' Option

The 'without Project' alternative would **not support** the Government's vision for rehabilitating national roads and is therefore not recommended. Retaining the existing condition would continue to constrain safe and reliable access. Travel times and vehicle operating costs would remain high and

could increase as the road deteriorates; access to tourism destinations and agricultural markets would remain disrupted; traffic-accident risks would persist; and communities would continue to face health and safety risks from dust, particularly during the dry season.

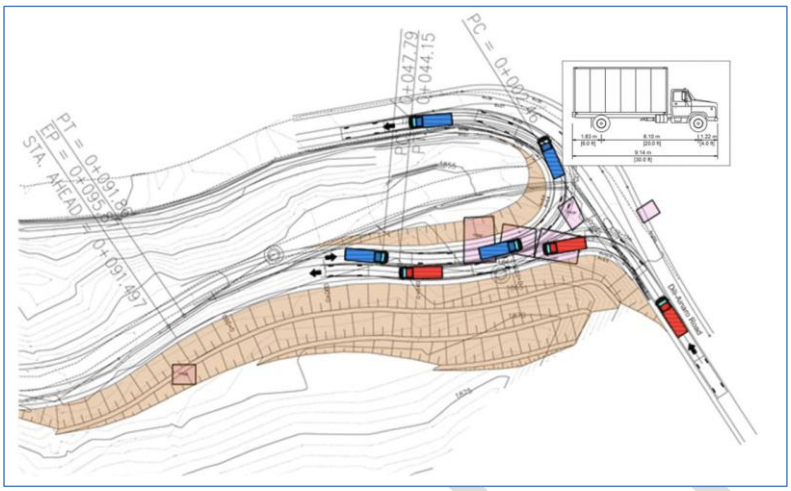
2.13.2. Alternative Alignment of Aituto Junction

The existing condition of Aituto Junction forms a sharp connection with the Dili–Ainaro Road, as shown below. If the junction is retained in its current location and layout, adequate sight distance along the Dili–Ainaro Road may not be achieved, presenting a road safety risk for vehicles entering, exiting, or travelling through the junction.



Therefore, three design options are proposed below for this road junction:

1. **Current position plan**. The plan is reinstalled at the existing intersection. This plan was rejected for the following reasons:
   - When a light truck turns, it is forced to travel abnormally into the opposite lane.
   - Additional land acquisition is necessary because of irregular widening.
   - For traffic safety, installation of traffic lights is necessary.
2. **Smooth alignment and big cutting plan.** This is a plan that emphasizes traveling performance and intersection safety without considering terrain. However, this proposal was also rejected for the following reasons.
   - A huge quantity of cutting soil occurs, and the maintenance of cut slope is very difficult.
   - All four (4) adjacent houses will be demolished.
3. **Compromise plan (1) and (2).** All four adjacent houses will be demolished, but the cutting volume is not so big. The form of junction is effective for traffic safety and functional in the future. For these reasons, this plan was selected as shown in the figure below.



2.14. Proponent's Endorsement of the Project

The Project Management Unit (PMU) of MPW endorses the findings and recommendations of the updated ESIA (SEIS). Hence, the project will be implemented in accordance with the recommendations of this updated E&S assessment and the accompanying Environmental and Social Management Plan (ESMP) to guide the management of environmental and social aspects of the Project.

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3. Policy, Legal and Regulatory Framework

TLBRP2 will comply with applicable laws and regulations of Timor-Leste, as well as relevant World Bank requirements. The Project will also take into account applicable World Health Organization (WHO) guidance and other relevant environmental directives that complement Government of Timor-Leste legislation, consistent with Decree-Law No. 26/2012, the Basic Law for the Environment.

This section summarizes the national regulatory framework and good international industry practices, such as the World Bank Group General EHS Guidelines applicable to the Project, with particular emphasis on environmental and social aspects. It outlines the requirements for environmental assessment and the preparation of E&S instruments to support Project compliance with applicable obligations, including laws, regulations, guidelines, and standards relating to environmental quality, occupational and community health and safety, protection of protected and sensitive areas, conservation of vulnerable and endangered species, and land use.

With respect to regulatory compliance, where national environmental quality standards have not yet been established, the Project will apply the relevant international standards identified in this chapter, in accordance with the Basic Law for the Environment (Decree-Law No. 26/2012).

3.1. National Regulatory Framework

The national legal and regulatory framework relevant to road-sector investments in Timor-Leste is summarized below, with emphasis on the requirements that guide environmental licensing, environmental assessment, land access and acquisition, labour and occupational health and safety, biodiversity protection, cultural heritage, public consultation, and grievance management. These national requirements provide the domestic compliance baseline for TLBRP2 and will be applied together with the World Bank ESF, including the applicable ESSs. Where gaps arise between national legislation and World Bank requirements, the Project will apply the ***more stringent standard*** or additional measures necessary to achieve outcomes consistent with the ESF throughout the project cycle.

Table 7. National Regulatory Framework for E&S Risk Management

Legal Instrument	Formal Citation	Relevance to TLBRP2
Constitutional environmental duties and rights	Constitution of the Democratic Republic of Timor-Leste (20th May 2002), including constitutional provisions on environmental protection, natural resources, property rights, and cultural rights.	Provides the constitutional basis for environmental protection, sustainable use of natural resources, protection of property rights, compensation for expropriation, and preservation of cultural heritage.
Environmental framework law	Decree-Law No. 26/2012 of 4 July 2012, Environmental Basic Law / Basic Environmental Legislation.	Establishes the core principles for environmental policy, conservation, sustainable use of natural resources, pollution control, waste management, environmental education, liability, and integration of environmental considerations into sectoral policies including transport.

Legal Instrument	Formal Citation	Relevance to TLBRP2
Environmental Licensing Law (ELL)	Decree-Law No. 5/2011 of 9 February 2011 on Environmental Licensing, as amended and republished by Decree-Law No. 39/2022 of 8 June 2022.	Creates the environmental licensing system for public and private projects that may negatively affect the environment. It establishes project categories, environmental assessment requirements, environmental licence procedures, public consultation, environmental management plans, monitoring, and compliance obligations.
Screening, scoping, terms of reference, EIA, and EMP requirements	Ministerial Decision No. 46/2017 on Detailed Requirements for Screening, Definition of Scope and Terms of Reference of Environmental Impact Assessment and Environmental Management Plans.	Provides detailed procedural requirements for environmental screening, scoping, preparation of terms of reference, environmental impact assessment, and environmental management plans for road projects requiring environmental evaluation.
Public consultation in environmental assessment	Ministerial Decision No. 47/2017 on Procedures for Public Consultation and Requirements during the Process of Environmental Assessment.	Requires consultation and disclosure during environmental assessment. It is relevant to engagement with affected communities, road users, landowners, *suco* and *aldeia* authorities, women, vulnerable groups, and other stakeholders.
Land expropriation for public utility	Law No. 8/2017 of 26 April 2017 on Land Expropriation for Public Utility.	Defines the legal regime for expropriation of immovable property for public utility, including public roads, highways, tunnels, railways, public transport systems, drainage, sanitation, protective structures, and other public infrastructure. It establishes procedures, guarantees for affected parties, and requirements for fair compensation.
Land and property regime	Law No. 1/2003 on Land and Property	Foundational land law that sets out the four categories of potential land claimants (customary occupiers, Portuguese-era title holders, Indonesian-era title holders, current possessors) and distinguishes public- and private-domain state land. It governs how customary land rights along the area of impact are recognized.
	Law No. 6/2017 on Basic Law of Land Use Planning	Land use planning is subject to the following general principles: Coordination of the various public interventions with a territorial impact and a fair balance between public and private interests; Sustainability of the solutions contained in the instruments of territorial planning, the economic, social, cultural and environmental dimensions; subsidiarity and coordinating the processes.
	Law No. 8/2017 on Land Expropriation for Public Utility	This Law establishes the legal regime governing the expropriation of immovable property and related private property rights or interests where the State, in pursuit of a public purpose, must acquire property in the absence of viable alternative solutions. It

Legal Instrument	Formal Citation	Relevance to TLBRP2
		defines expropriation as any legally admissible restriction on private property or related rights or interests, regardless of the persons or entities to which they belong, and provides that community immovable property may also be subject to expropriation. Expropriation is permitted only where the use of the property serves a recognized public interest. The Law specifies the circumstances and procedures under which expropriation may take place, including applicable compensation principles. Accordingly, it governs the compulsory acquisition of private-domain land required for public infrastructure, such as road upgrading, and establishes the domestic procedures and compensation requirements that the Project's land acquisition process must follow.
	Law No. 13/2017 on the Special Regime for the Definition of Ownership of Immovable Property, together with related land administration legislation.	Relevant for identifying land ownership and claims, including private, state, community, and customary interests that may be affected by road widening, realignment, ancillary facilities, temporary works, quarries, borrow areas, and access roads.
Protected areas	Decree-Law No. 5/2016 of 16 March 2016 creating the National System of Protected Areas.	Applies where road works are located in or near protected terrestrial or marine areas, critical habitats, ecosystem service areas, or designated conservation areas. It supports avoidance, minimization, and management of impacts on protected areas.
Biodiversity conservation	Decree-Law No. 6/2020 of 6 February 2020 establishing the Legal Framework for the Protection and Conservation of Biodiversity.	It establishes rules for biodiversity protection and conservation, including species, habitats, ecosystems, access to biological and genetic resources, monitoring, and sanctions. It is relevant for vegetation clearance, habitat fragmentation, erosion, river crossings, borrow pits, quarries, and restoration measures.
Cultural heritage	Decree-Law No. 33/2017 of 6 September 2017 on the Legal Regime of Cultural Heritage.	Protects movable, immovable, material, and intangible cultural heritage, including archaeological, historical, architectural, ethnographic, linguistic, documentary, artistic, scientific, social, and technical heritage. It is relevant to chance-find procedures and avoidance of sacred, burial, archaeological, and culturally important sites.
Labor relations	Law No. 4/2012 of 21 February 2012, Labour Code of Timor-Leste.	Sets minimum labor standards (minimum age, working hours, occupational safety, non-discrimination) applicable to individual and

Legal Instrument	Formal Citation	Relevance to TLBRP2
		collective labor relations. It is relevant to contractor workforce management, employment conditions, non-discrimination, worker rights, and labor compliance on road construction sites.
Occupational safety, health, and hygiene	Law No. 11/2023 of 19 April 2023 on Safety, Health and Hygiene at Work.	Establishes general safety, health, and hygiene requirements for workplaces in Timor-Leste. It applies to public, private, cooperative, and social sectors and is directly relevant to occupational health and safety plans, worker accommodation, PPE, incident reporting, emergency response, and management of construction risks.
Community land, customary interests, and local dispute resolution	Law No. 13/2017 of 5 June 2017 establishing the Special Regime for the Definition of Ownership of Immovable Property, including provisions on recognition of previous rights, informal property rights, community immovable property, community protection areas, equal property rights for men and women, the National Property Registry, and the Land and Property Commission.	Relevant to land due diligence, identification of formal and informal land claims, community and customary interests, overlapping rights, land disputes, gender-equal access to property rights, and documentation of land agreements for road widening, realignment, drainage, contractor facilities, quarries, borrow pits, spoil areas, and temporary access.
Suco governance, community representation, and customary practice	Law No. 9/2016 of 8 July 2016 establishing rules for the organization, competence, and functioning of Sucos.	Relevant to social assessment, stakeholder engagement, grievance resolution, community-level consultation, participation of suco and aldeia structures, promotion of social harmony, dispute resolution, protection of traditional practices and customs, gender equality in community development, and management of community assets affected by road projects.
Gender equality and gender mainstreaming	Decree-Law No. 74/2023 of 14 September 2023 on the Structure of the Secretary of State for Equality, together with Timor-Leste's constitutional commitments to equality and non-discrimination and international commitments including the Convention on the Elimination of All Forms of Discrimination against Women.	Relevant to gender-responsive social assessment, gender action planning, inclusion of women in consultation and decision-making, gender-sensitive employment opportunities, gender-disaggregated monitoring, prevention of discrimination, and integration of gender equality into road project design, implementation, budgets, and grievance mechanisms.
Gender-based violence and domestic violence prevention	Law No. 7/2010 of 7 July 2010, Law Against Domestic Violence, together with national gender-based violence action plans and relevant criminal law provisions on violence, sexual offences, coercion, harassment, and protection of vulnerable persons.	Classifies domestic violence as a public crime (not a private/family matter resolvable only through customary mediation), mandates police investigation and victim access to health, shelter, psychosocial and legal support, the legal basis for routing sexual exploitation and abuse (SEA) and sexual harassment (SH) cases arising from the Project to the formal system.

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Legal Instrument	Formal Citation	Relevance to TLBRP2
	Penal Code (2009) and Civil Code (2011)	Provide the general criminal and civil law framework, including offenses relevant to SEA/SH, including SEA cases.
Social assessment, vulnerable groups, and inclusive consultation	Environmental Licensing Decree-Law No. 5/2011 as amended by Decree-Law No. 39/2022, Ministerial Decision No. 47/2017 on public consultation during environmental assessment, Law No. 9/2016 on Sucos, and constitutional protections for equality, participation, property, culture, and protection of vulnerable persons.	Relevant to preparation of social baseline studies, socioeconomic surveys, stakeholder engagement plans, identification of vulnerable households, consultation with women, persons with disabilities, poorer households, elderly persons, youth, road-side businesses, land users, and communities affected by temporary or permanent impacts.
Indigenous Peoples (IPs), ethnic groups, customary communities, and cultural identity	Constitution of the Democratic Republic of Timor-Leste, Law No. 9/2016 on Sucos, Law No. 13/2017 on the Special Regime for the Definition of Ownership of Immovable Property, and Decree-Law No. 33/2017 on the Legal Regime of Cultural Heritage.	Relevant to screening for culturally distinct communities, customary leadership and decision-making structures, customary land and natural resource use, community protection areas, sacred and cultural sites, language needs, culturally appropriate consultation, and preparation of Indigenous Peoples, ethnic group, or culturally appropriate community development measures where required by the World Bank.

For the purposes of national environmental permitting and regulatory compliance, the Government of Timor-Leste's environmental classification system provides the basis for determining the level of environmental assessment and management documentation required for TLBRP2 activities. Given the nature of the proposed works, which are expected to involve rehabilitation of existing branch roads and associated facilities rather than major new greenfield infrastructure, the Project is anticipated to fall within Category B under the government classification system. Category B projects require proportionate assessment, preparation of a Simplified Environmental Impact Statement (SEIS) and Environmental Management Plan (EMP), and implementation of mitigation, monitoring, consultation, and reporting measures commensurate with the scale and significance of potential impacts. The relevant classifications and associated permitting requirements applicable to the Project and its ancillary activities are summarized in the table below:

Table 8. Environmental Assessment Requirements for Projects and Activities

Component Description				
Sector		**Category B in accordance with DL5/2011***	**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				

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Quarries				
Mining Sector	I 1	Exploitation of minerals (sand and gravel)	<30,000 m3/year & >5,000 m3	SEIS and EMP
Mining Sector	I 2	Processing and refinement of minerals / quarrying (non-toxic)	<30,000 m3/year & >5,000 m3	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 >3000m2	SEIS and EMP

3.2. Customary Acknowledgment

Timor-Leste's legal system operates two overlapping normative orders relevant to project, including the formal state justice and administrative system, and customary institutions, Rai Nain land authority, Tara Bandu, and the broader lia-na'in (customary elder) dispute-resolution tradition.

Constitution 2002 Section 2 on Sovereignty and Constitutionality stipulates that the State shall recognize and value the norms and customs (or hereafter known as Tara Bandu) of East Timor that are not contrary to the Constitution and to any legislation dealing specifically with customary law. Tara Bandu generally refers a traditional Timorese custom that enforces peace and recognition through the power of public agreement to define social norms and practices to a given community. The process of forming Tara Bandu represents a process of coming to communal agreement or 'social contract' that outlines the behaviors and practices that members of the community deem to be appropriate and want to enforce. As such the legitimacy of the Tara Bandu is largerly dependent on the degree of local level consultation and engagement in the generation of the terms of such communal accord.

Basic Environment Law 2012 Article 8 contains relevant provisions on Tara Bandu, which stipulate that:

(a) The State shall recognize the importance of all types of Tara Bandu as integral part of the culture of Timor-Leste and accept traditional mechanisms regulating relationships between people and the environment around them;

(b) Tara Bandu can be carried out according to the rituals preserved through the local customary law aiming at the preservation and promotion of environment and conservation and sustainable use of natural resources, provided that such action is consistent with the objectives and principles established by the law; and

(c) The state must ensure effective protection of the Tara Bandu.

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3.3 World Bank Requirements

3.3.1. World Bank Environmental and Social Standards

For the World Bank Investment Project Financing prepared under the ESF, the TLBRP2 is required to assess, manage, and monitor environmental and social risks and impacts in accordance with the applicable ESS. Consistent with the ESF, this assessment should be risk-based, proportionate to the nature and scale of project activities, and adaptive over the project cycle. The table below summarizes the relevant ESS requirements and their applicability to TLBRP2.

Table 9. World Bank E&S Standards Relevance to TLBRP2

ES Standards	Objectives	Relevance to TLBRP2
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	Sets out the Borrower's responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project supported by the Bank through IPF to achieve environmental and social outcomes consistent with the ESS's.	ESS1 is relevant. The Project will finance rehabilitation and upgrading of existing road sections and associated activities e.g. slope stabilization, quarry material sourcing, spoil disposal, worker facilities, etc. These activities may generate site-specific E&S impacts and risks during design, construction and operation. The E&S risk screening will confim project risk classification, identify sensitive receptors and exclusion conditions, determine the required site-specific E&S assessment required and and ensure that mitigation measures are reflected in management plans.
ESS2: Labor and Working Conditions	- Promote safety and health at work; - Promote fair treatment, non-discrimination and equal opportunity of project workers; - Protect project workers, including vulnerable workers such as women, persons with disabilities, children (of working age, in accordance with this ESS) and migrant workers, contracted workers, community workers and primary supply workers, as appropriate; - Prevent the use of all forms of forced labor and child labor; - Support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national law; - Provide project workers with accessible means to raise workplace concerns.	ESS2 is relevant. TLBRP2 will involve direct workers, contracted workers, consultants, government staff assigned to the PMU, and possibly community workers for selected local activities. Key risks include occupational health and safety hazards from road works, traffic exposure, working at heights or near slopes, use of machinery, worker accommodation, unequal treatment, and workplace harrassment.

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ES Standards	Objectives	Relevance to TLBRP2
ESS3: Resource Efficiency and Pollution Prevention and Management	- Promote the sustainable use of resources, including energy, water and raw materials; - Avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; - Avoid or minimize project-related emissions of short and long-lived climate pollutants; - Avoid or minimize generation of hazardous and non-hazardous waste; - Minimize and manage the risks and impacts associated with pesticide use.	ESS3 is elevant. Road rehabilitation willr equire aggregates, bitumen/asphalt or concrete, water, fuel, lubricants and energy, and may generate dust, noise, vibration, wastewater, sediment runoff, spoil, construction waste, used oil, hazardous materials and emissions from vehicles, plants and equipment. Quarries, borrow areas, batching or asphalt plants, workshops and disposal areas may create additional pollution and resource-use risks.
ESS4: Community Health and Safety	- Anticipate and avoid adverse impacts on the health and safety of project-affected communities during the project life cycle from both routine and non-routine circumstances; - Promote quality and safety, and considerations relating to climate change, in the design and construction of infrastructure, including dams; - Avoid or minimize community exposure to project-related traffic and road safety risks, diseases and hazardous materials; - Have in place effective measures to address emergency events; - Ensure that the safeguarding of personnel and property is carried out to avoid or minimize risks to the project-affected communities.	ESS4 is relevant. TLBRP2 may expose nearby communiteis, pedestrians, road users, markets and roadside businesses to construction activities (traffic, temporary diversions, open excavation, slope works, etc.) dust, noise, vibration, machinery movement, influx related health risks, worker-community interactions and emergency events.
ESS 5: Land Acquisition, Restrictions on Land use and Involuntary Resettlement	Sets out the responsibilities of the borrowers to address project-related land acquisition and restrictions on land use. Project-related land acquisition or restrictions on land use may cause a physical displacement (relocation, loss of residential land or loss of shelter), economic displacement (loss of land, assets or access to assets, leading to loss of income sources or other means of livelihood), or both	ESS5 is relevant. Although TLBRP2 is expected to focus mainly on existing road corridors, road widening, drainage improvements, temporary access, and construction facilities (quarries, spoil disposal, etc.) may require permanent or temporary land acquisition, restrictions on land use, loss of crops, trees, fences, kiosks or other assets, access disruption, or livelihood impacts. Screening must identify all land and asset impacts before works and determine whether due diligence, voluntary land

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ES Standards	Objectives	Relevance to TLBRP2
		donation documentation, an abbreviated resettlement plan or a full resettlement plan is required. Compensation and assistance must be complete before displacement or civil works commence in affected areas.
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Applicable to projects that potentially affect biodiversity or habitats, either positively or negatively, directly or indirectly, or that depend upon biodiversity of their success. ESS 6 recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development.	ESS6 is Relevant. TLBRP2 activities may affect modified, natural or sensitive habitats through vegetation clearance, quarry and borrow area use, spoil disposal, etc. An early screening using IBAT plarform has been conducted and included in this ESIA.
ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Applies to communities or groups of Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities who, during the lifetime of members of the community or group, have lost collective attachment to distinct habitats or ancestral territories in the project area, because of forced severance, conflict, government resettlement programs, dispossession of their land, natural disasters, or incorporation of such territories into an urban area.	ESS7 is relevant to the required IP screening to determine whether the standard is triggered and requires free, prior, and informed consultation leading to broad community support. ESS 7 may not be formally triggered, as there is no distinct or vulnerable ethnic group within the corridor's area of influence that is set apart from the general population by the ESS7 criteria. Communities in the corridor Sucos share similar cultural, linguistic and social characteristics with the broader population of Ainaro Municipality and Timor-Leste as a whole. Nonetheless, the Project fully apply ESS7 by integrating its requirements into the Stakeholder Engagement Plan (SEP). This requires the project entities (the PMU, consultants, and contractors) to conduct consultations that respect local traditional leadership and cultural protocols and incorporate traditional conflict resolution practices, ensuring local communities can voice concerns about construction impacts, land acquisition, or environmental disruptions in a culturally aligned manner.
ESS 8: Cultural Heritage	Recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present and future. People identify with cultural heritage as a reflection and expression of their constantly evolving values, beliefs, knowledge and traditions. Cultural heritage, in its many manifestations, is important as	ESS8 is Relevant. The Project area has spiritual and cultural connection the communities maintain with their physical environment: - Sacred Sites (*Fatin Lulik)* such as ancient trees, large rocks, water springs, and mountain peaks—are considered *lulik* (sacred) and are believed to house ancestral spirits. Road widening or heavy

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ES Standards	Objectives	Relevance to TLBRP2
	a source of valuable scientific and historical information, as an economic and social asset for development, and as an integral part of people's cultural identity and practice. ESS 8 sets out measures designed to protect cultural heritage throughout the project life cycle. This ESS sets out general provisions on risks and impacts to cultural heritage from project activities.	machinery operations can easily disturb these sites. - Graves and burial sites: It is common for family graces or historical burial plots to sit right alongside rural roads within the ROW. The Project will ensure adequate site screening (E&S sensitive receptors) along the road alignment. A Chance Find Procedure is included in this ESMF. If a road alignment impacts sacred sites or graves, the Procedure will be applied with local customary resolution. It is mandatory for the contractor to coordinate with the local *Lian Nain* (traditional authorities/cultural custodians) to perform customary rituals and provide appropriate compensation or ritual items before any construction can begin.
ESS 9: Financial Intermediaries	This ESS applies to Financial Intermediaries (FIs) that receive financial support from public and private financial services providers, including national and regional development banks.	Not relevant to the Project
ESS10: Stakeholder Engagement and Information Disclosure	It recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation. ESS 10 applies to all projects supported by the Bank through Investment Project Financing.	ESS10 Relevant. TLBRP2 will affect and benefit a broad range of stakeholders, including roadside communities, landowners and land users, road users, women, persons with disabilities, vulnerable households, local businesses, public facilities, transport operators, *suco* and aldeia authorities. Meaningful, inclusive, and culturally appropriate engagement is required throughout preparation, construction, and operation. The Project is required to prepare a stakeholder engagement plan (SEP). The SEP will guide stakeholder identification, project information disclosure, consultation methods, engagement with vulnerable groups, documentation of issues raised, and feedback to communities. A project-level GRM will be maintained with accessible entry points, clear response timeframes, confidentiality options and records of grievances received, resolved and escalated.

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3.3.2. WBG EHS Guidelines and GIIP

All activities financed through the Project are subject to the World Bank Group Environmental, Health and Safety (EHS) Guidelines in addition to the Bank's ESS. These guidelines cover the following aspects: Environmental; Occupational Health and Safety; (iii) Community Health and Safety; and (iv) Construction and Decommissioning. These guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). Another GIIP that is relevant to the Project is: Water quality standards. World Health Organization (WHO - 2011 edition) and the Australian Drinking Water Guidelines (2011 edition) will be adopted; depending on parameter concerned, whichever guideline is stricter, shall be used.

3.4. Gap Analysis: WB ESF Requirements and Timor-Leste Regulatory Framework

This section builds on the review of Timor-Leste's relevant legal and regulatory framework and the World Bank ESF. It identifies the principal areas of alignment and any material gaps between national requirements and the applicable ESSs. For each ESS relevant to TLBRP2, corresponding national legislation or administrative requirements exist, although some gaps remain where the ESF sets more detailed project-level obligations. The table below summarizes and compares the key requirements of Timor-Leste's legislative and regulatory framework against the relevant Bank's ESSs.

Table 10. Gap Analysis E&S Requirements and Gap-Filling Measures

World Bank ESF	Timor-Leste Regulatory Framework	Level of Alignment	Recommended Gap-Filling Measures for TLBRP2
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	Timor-Leste's Environmental Basic Law, Environmental Licensing Decree-Law, and related ministerial decisions require environmental screening, assessment, licensing, public consultation, environmental management plans, and monitoring for projects with potential environmental impacts.	Broadly aligned for environmental assessment and licensing, but the ESF is usually broader because it integrates environmental, social, labor, community health and safety, land, vulnerable group, and cumulative risk considerations into one risk-management system.	Prepare an ESMF and any subsequent E&S risk management instruments that covers both national licensing requirements and ESF risk areas. Include a clear mitigation hierarchy, institutional responsibilities, budget, monitoring indicators, corrective action process, and ESCP commitments.
ESS2: Labor and Working Conditions	The Labor Code and workplace safety, health, and hygiene legislation regulate employment relationships, worker rights, workplace safety, and employer duties.	Partially aligned. National labor law has provided a reasonably solid general framework. Key gaps include a hazardous-work minimum age below ESS2 (as the child definition is below 17), and the absence of any legal mandate for project- or site-level grievance mechanisms. OHS provisions are comprehensive in principle but lack granular, site-specific detail, and also incident insurance, especially for	Prepare Labor Management Procedures (LMP) require each contractor to prepare a labour, OHS plan. Include worker minimum age, OHS and SEA/SH codes of conduct, induction training, insurance, PPE, incident reporting, emergency response, worker accommodation standards if applicable, and a confidential worker grievance channel.

World Bank ESF	Timor-Leste Regulatory Framework	Level of Alignment	Recommended Gap-Filling Measures for TLBRP2
		casual or informally engaged laborers. Despite strong criminal-law protections, there are no formal regulations that mandate an employer-level code of conduct, or a confidential reporting channel specifically addressing workplace SEA/SH.	
ESS3: Resource Efficiency and Pollution Prevention and Management	The Environmental Basic Law and environmental licensing system address pollution prevention, waste management, environmental quality, and environmental management conditions imposed through licenses and plans.	Broadly aligned on pollution prevention, but ESS3 may require more explicit treatment of resource efficiency, greenhouse gas considerations where relevant, material sourcing, hazardous materials, waste hierarchy, and good international industry practice.	Include contractor requirements for dust, noise, wastewater, fuel storage, hazardous materials, spoil, waste disposal, quarry and borrow area management, drainage, erosion control, and emergency spill response. Track material sources and require approved disposal and rehabilitation of disturbed areas.
ESS4: Community Health and Safety	Timor-Leste law addresses public safety through sectoral controls, environmental licence conditions, road and traffic management requirements, public administration responsibilities, and general civil and safety obligations.	Partially aligned. ESS4 is more explicit on community health and safety risk assessment, traffic and road safety, emergency preparedness, vulnerable road users, project-related security arrangements, communicable disease risk, and public exposure to construction hazards.	Include contractor requirements to prepare a Community Health and Safety Plan, Traffic Management Plan, and SEA/SH Action Plan. Include road safety audits, safe access arrangements for public facilities, speed controls, signage, detours, stakeholder notifications, emergency response, controls for worker-community interaction, and incident reporting to the implementing agency and the World Bank.
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Law No. 8/2017 on Land Expropriation for Public Utility and Law No. 13/2017 on the ownership of immovable property provide the national basis for land acquisition, property identification, public utility expropriation, and compensation.	Partially aligned. National law provides procedures for expropriation and compensation, while ESS5 also requires avoidance and minimization of displacement, livelihood restoration, support to informal users and non-title holders where eligible, replacement cost principles,	Prepare and implement a Land Acquisition and Resettlement Action Plan (LARAP) that also ensures non-titled road reserve occupants (structures, crops, livelihoods) are eligible for compensation and livelihood restoration assistance. LARAP should include a census, asset

World Bank ESF	Timor-Leste Regulatory Framework	Level of Alignment	Recommended Gap-Filling Measures for TLBRP2
		transitional assistance, consultation, grievance redress, and completion of compensation before displacement.	inventory, eligibility cut-off date, entitlement matrix, replacement cost valuation, livelihood restoration, vulnerable household support, compensation payment records, voluntary land donation protocol if used, and an independent completion review where required.
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	The Environmental Basic Law, National System of Protected Areas, and biodiversity conservation framework regulate protection of biodiversity, habitats, species, protected areas, and environmental management of activities affecting natural resources.	Broadly aligned on biodiversity protection. ESS6 may require more detailed classification of modified, natural, and critical habitat, ecosystem services assessment, biodiversity offsets only under strict conditions, and specific controls for primary suppliers where relevant.	Screen alignments, quarries, borrow pits, spoil disposal sites, bridges, and drainage works for biodiversity sensitivity. Avoid protected and critical habitats where feasible, limit vegetation clearing, prepare habitat restoration measures, control invasive species, and include biodiversity monitoring for sensitive locations.
ESS7: Indigenous Peoples / Culturally Distinct Communities	Timor-Leste's framework includes constitutional protections, cultural rights, local governance practices, customary land considerations, and consultation requirements, but there is no single national safeguards law equivalent to ESS7.	Partially Aligned. The Constitution and legal framework recognize customary law, cultural heritage, and traditional governance (Tara Bandu). However, national law treats the general Timorese population homogeneously and does not recognize any specific sub-groups as "indigenous peoples" or distinct vulnerable traditional groups as defined under international criteria. Meanwhile, ESS7 contains more detailed requirements for screening, culturally appropriate consultation, benefit sharing, impact avoidance or mitigation, and free, prior, and informed consent in specified circumstances.	Apply ESS7 principles through the SEP rather than a standalone IPP. Consult communities through recognized customary leadership and cultural protocols. Ensure the GRM reflects traditional conflict-resolution practices so concerns on land, construction, and environmental impacts can be raised in a culturally appropriate way.
ESS8: Cultural Heritage	The cultural heritage legal regime protects tangible and intangible cultural heritage, including archaeological,	Partially aligned. ESS8 adds project-level management requirements, stakeholder consultation on cultural heritage, assessment of	Conduct cultural heritage screening before works. Avoid known heritage and sacred sites, include a chance-find procedure in all

World Bank ESF	Timor-Leste Regulatory Framework	Level of Alignment	Recommended Gap-Filling Measures for TLBRP2
	historical, sacred, burial, architectural, ethnographic, artistic, scientific, and technical heritage.	impacts on both tangible and intangible heritage, and chance-find procedures integrated into contracts.	civil works contracts, train contractors, stop work in affected areas if objects or remains are found, and consult relevant authorities and communities before works resume.
ESS10: Stakeholder Engagement and Information Disclosure	Environmental licensing and assessment regulations require public consultation and disclosure during the environmental assessment process. Local governance systems also support consultation through municipal, suco, and aldeia structures.	Partially aligned. National procedures provide consultation during environmental assessment, while ESS10 requires continuous stakeholder engagement throughout the project cycle, stakeholder identification and analysis, targeted inclusion of vulnerable groups, disclosure of draft and final instruments, and a functioning grievance mechanism.	Prepare and implement a SEP. Maintain a stakeholder register, consultation records, disclosure materials in appropriate languages, grievance log, response timeframes, escalation process, confidentiality provisions, and periodic reporting on issues raised and resolved.

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4. Methodology

4.1. Screening and Scoping

Risl screening was undertaken to identify the project's potential E&S risks and impacts in a manner proportionate to the nature, scale and location of the proposed road works. The screening considered the road corridor length and alignment, road classification, proximity to settlements and sensitive receptors, road safety risks, biodiversity and habitat sensitivity, protected areas, waterways and drainage crossings, slope stability and erosion risks, cultural heritage resources, construction material sources, community health and safety, and potential cumulative impacts associated with related activities described in Section 2 of this updated ESIA..

The screening used GIS-based corridor and constraints mapping. The proposed alignment and preliminary area of influence were overlaid with settlements, land parcels, sensitive receptors, protected areas and habitats, waterways, flood-prone areas, slope-risk areas, cultural heritage locations, utilities, schools, health facilities, and roadside businesses. Further, field reconnaissance and ground-truthing were undertaken to verify E&S receptors, confirm site-specific conditions, validate access routes, inspect drainage and erosion risks, and document sensitive locations along the road corridor and associated facilities.

Scoping defined the key environmental and social issues to be assessed, the valued environmental and social components likely to be affected, and the spatial and temporal boundaries of the assessment. The spatial scope includes the direct road works footprint, drainage discharge areas, material extraction sites, haul routes, worker accommodation and site facilities, traffic diversions, access changes, and nearby sensitive receptors. The temporal scope covers pre-construction, construction, operation, maintenance, and closure or reinstatement of temporary facilities.

4.2. Determination of the Area of Influence (AoI)

To define the geographic scope of this ESIA, the Area of Influence (AoI) was first established. The AoI was delineated by considering the physical and social project footprint, including all ancillary project components, and the potential environmental, economic and social receptors that may be affected by project activities. For this assessment, the AoI has been determined using a precautionary approach. Table below presents the AoI delineations, which are based on good international practice and buffer distances applied in previous World Bank and ADB road-upgrade projects.

Table 11. Determination for Area of Influence

Valued environmental and social component	Spatial boundary of the AoI	Impact pathway / assessment category
Surface water, watersheds and drainage systems	Minimum 1 km downstream of each watercourse crossing, culvert, drainage outlet or discharge point, extended where catchment connectivity indicates a wider zone of potential influence.	Indirect impact pathway through runoff, sediment transport and drainage alteration; cumulative-effects screening where multiple project components or related activities affect the same catchment.
Biodiversity, vegetation and modified habitats	100 m ecological survey corridor centered on the road alignment and	Direct impact within the project footprint and immediately

Valued environmental and social component	Spatial boundary of the AoI	Impact pathway / assessment category
	all associated facilities, including borrow areas, spoil areas, stockpiles, camps and access tracks.	adjacent disturbance area; cumulative-effects screening where habitat loss, fragmentation or disturbance overlaps with other foreseeable works.
Air quality, dust and noise-sensitive receptors	200 m from the boundary of sensitive receptors, including dwellings, schools, health posts, markets, community facilities and roadside businesses.	Direct receptor exposure pathway for construction dust, emissions, noise and vibration from works, haulage and equipment operation.
Cultural heritage, sacred sites and community-valued places (*Fatin Lulik*)	Minimum 100 m cultural heritage screening buffer from the road edge and ancillary facilities, with site-specific buffers confirmed through consultation with *lia nain*, suco leaders, land users and women's representatives.	Direct impact pathway where works may physically disturb, restrict access to, or alter the setting of cultural heritage resources and community-valued places.
Community water sources and water-supply infrastructure (*Be'e Matan*)	Community water sources within 500 m uphill or hydraulically connected to the road, and all water-supply pipelines, distribution lines or public taps crossing or running parallel to the alignment.	Direct impact pathway for water-supply infrastructure within or adjacent to the construction footprint; indirect pathway for water sources potentially affected through drainage alteration, erosion, sedimentation, access disruption or accidental damage.

4.3. Baseline Data Collection

Baseline data collection for Section 1 was carried out to establish a verifiable and fit-for-purpose description of existing environmental and social conditions before project implementation. The baseline provides the evidentiary basis for impact prediction, mitigation design, monitoring indicators and future comparison during construction and operation. The baseline was developed using a combination of reliable secondary information, including previous studies undertaken in 2019, updated field verification, GIS-based mapping, consultation with affected communities and stakeholders, and targeted surveys within the defined Area of Influence. The approach was proportionate to the nature, scale and location of the proposed road works and focused on receptors and impact pathways most likely to be affected by the project.

- **Desk-based review:** review of available project documents, socio-economic data sources, earlier environmental and social studies, national and local planning information, relevant legislation, World Bank ESSs, and good international industry practice applicable to rural road upgrading.
- **GIS-based mapping:** GIS-based mapping of the road corridor, E&S sensitive receptors, waterways, drainage crossings, slope-risk areas, cultural heritage locations, community infrastructure, public services and access routes.
- **Field observations and ground-truthing:** verification of mapped features and site-specific conditions, including drainage and erosion risks, road safety conditions, vegetation and habitat

disturbance, community water points, schools, health posts, markets, roadside businesses, temporary facility locations and other sensitive receptors.

- **Stakeholder consultation:** consult with Suco authorities to verify baseline conditions, identify locally valued resources, and capture concerns not evident from secondary data alone.

4.4. Impact and Risk Identification for the Level of Significance

The significance of potential environmental and social risks and impacts was assessed through a risk-based and proportionate approach, drawing upon the Guidance Note on the UNDP Social and Environmental Screening Procedure (2022). The use of this methodology is intended to provide a systematic and well-established analytical framework for the assessment and a complementary to, and applied in a manner consistent with, the applicable World Bank environmental and social requirements governing the Project. Accordingly, the significance of each identified risk was determined with due consideration of the potential magnitude of consequences and the likelihood of occurrence, having regard to the nature of the proposed activities, the sensitivity of relevant receptors, potential exposure pathways, and the anticipated effectiveness of the proposed avoidance, minimisation, and mitigation measures.

The following factors were considered when determining the potential environmental and social impact:

- Type, scale and location: whether the project involves activities, components or locations with elevated environmental or social risk, including proximity to sensitive receptors, critical or natural habitats, protected areas, and culturally important sites.
- Magnitude and intensity: the expected severity, geographic extent and number of people or environmental receptors affected, including whether the impact could materially impair environmental functions, community health and safety, livelihoods, cultural heritage or access to services.
- Manageability and mitigation hierarchy: whether the impact can be avoided, minimized, mitigated or compensated through readily available and proven measures, or whether further assessment, design refinement, stakeholder engagement or specialist management measures are required.
- Duration and timing: whether the impact is short-term, intermittent, seasonal, medium-term or long-term, and whether it occurs during sensitive periods such as school hours, agricultural seasons, community events, wet season flows or periods of high livelihood dependence.
- Reversibility and residual risk: whether the impact is reversible, partially reversible or irreversible, and the level of residual risk expected after application of mitigation and monitoring measures.

Impact consequence (magnitude) and likelihood are then rated on a scale from 1 (low) to 5 (high) for each identified risk using the criteria presented in the tables below. The resulting significance rating informs the level of mitigation, monitoring, institutional oversight and stakeholder engagement required under the ESMP.

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Score	*Rating*	*Environmental and social impacts Magnitude*
5	Extreme	Severe, large-scale or irreversible adverse impacts on people or the environment, including impacts over a wide area or affecting many people; critical habitats or highly sensitive areas; Indigenous Peoples' rights, lands or resources; significant displacement or resettlement; substantial GHG emissions; transboundary or cumulative effects; or risks likely to generate significant social conflict.
4	Extensive	Adverse impacts of considerable magnitude, extent or duration, but generally more predictable, temporary or reversible than Extreme.
3	Intermediate	Medium-magnitude impacts that are site-specific, temporary and manageable through standard, proven mitigation measures.
2	Minor	Low-severity, short-duration impacts affecting a small area or few receptors, readily avoided, managed or mitigated.
1	Negligible	Negligible or no adverse impacts on people or the environment.

Table 3. Rating the 'Likelihood' of a Risk

Score	*Rating*
5	Expected
4	Very likely
3	Moderately likely
2	Low likelihood
1	Not likely

Table 4. Determining 'Significance' of Risk

Impact						
	5	M	S	S	H	H
	4	L	M	S	S	H
	3	L	M	M	M	S
	2	L	L	L	M	M
	1	L	L	L	L	L
		1	2	3	4	5
		Likelihood				

Low, Moderate, Substantial, High

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5. Environmental Baseline

5.1. Baseline Air, Water and Noise Quality

The 12 km Aituto – Hatubuilico Junction Road corridor is located within a modified rural setting where baseline environmental conditions reflect the interaction between existing natural processes and anthropogenic land uses. The surrounding environment is influenced by dispersed settlements, agricultural activities, local access movements, and intermittent road traffic from Dili and other areas.

5.1.1. Air Quality

The baseline air-quality assessment draws on field observations, land-use context, likely local emission sources, and secondary ambient air-quality data for the project area (https://www.accuweather.com/en/tl/ainaro/361580/air-quality-index/361580, accessed 19 September). Secondary data indicate an overall ambient air-quality classification of ***poor***, with reported PM2.5 and PM_{10} index values of 85 and 46, respectively. On a parameter-specific basis, the PM_{10} index value corresponds to a ***fair*** air-quality indication.

The existing air quality is primarily ***influenced by fugitive road dust, intermittent traffic, agricultural activity, domestic cooking smoke, periodic vegetation burning and seasonal wind-blown dust from exposed soils.*** Dust is a particular concern in sections of the study area where little original macadam paving remains, where road surfaces are covered by residual slide material, and where pavements are deteriorated or obscured. These conditions increase the potential for dust generation, particularly during the dry season. No industrial emission sources, persistent odours or visible smoke plumes were observed during the survey.

The key limitation is the absence of portable air-quality meters, dust-fall gauges, particulate samplers and meteorological monitoring equipment during the survey. Consequently, the baseline does not provide measured concentrations for total suspended particulates, NO_2, SO_2, CO or dust deposition, and should not be used as a quantitative compliance baseline. Observations were also limited to the survey period and may not capture seasonal variation, peak traffic conditions, construction haulage, episodic burning or temporary community activities. These limitations should be addressed through pre-construction monitoring at representative sensitive receptors and routine visual dust inspections during construction.

As Timor-Leste has not yet established national ambient air-quality standards under the existing environmental regulatory framework, the project will apply the WBG EHS Guidelines as the reference criteria for assessing ambient air quality and managing project-related emissions.

Table 12. WBG Ambient Air Quality Guidelines

Parameter	Averaging Period	Guideline Value (µg/m^3)
Sulphur dioxide (SO2)	10 minutes	500
	24 hours	20
Nitrogen Dioxide (NO2)	1 hour	200
	1 Year	40
Particulate Matter (PM10)	24 hours	50

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Parameter	Averaging Period	Guideline Value (µg/m³)
	1 Year	20
Particulate Matter (PM2.5)	24 hours	25
	1 Year	10

Adequate budget provisions will be secured under the Project to support environmental monitoring requirements, including the procurement of air-quality monitoring equipment or the engagement of qualified third-party monitoring services. These provisions will help ensure that sufficient resources are available to implement the monitoring program and verify compliance with the applicable World Bank Group Environmental, Health and Safety Guidelines, national requirements, and commitments set out in the ESMP.

5.1.2. Water Quality

Field observations along the 12 km road corridor indicate that ***water quality is closely influenced by the alignment's mountainous terrain, seasonal rainfall patterns, and generally limited roadside drainage infrastructure.*** During and after heavy rainfall, surface runoff, temporary ponding, muddy conditions, and sediment-laden flows commonly occur along unpaved or poorly drained sections. These effects are particularly evident where steep slopes direct stormwater across the road surface and where side drains and culverts are absent, undersized, or poorly maintained. Such conditions increase the risk of erosion, sediment transport, and short-term deterioration in downstream water quality, especially near stream crossings, drainage discharge points, and community water-use locations.

For the ESIA, these observations indicate that construction-phase risks to water quality should be managed through site-specific drainage controls, erosion and sediment-control measures, protection of community water sources, and pre-construction monitoring to verify representative baseline conditions for subsequent ESMP compliance monitoring. Detailed data for all locations are provided in Annex 4.

Data limitation and pre-construction baseline requirements: Field sampling undertaken for this ESIA was limited to selected points along the road corridor and should therefore be treated as an indicative baseline rather than a comprehensive quantitative characterization of all water resources that may be influenced by construction activities. Consistent with the World Bank ESF requirements for risk-based assessment, pollution prevention and adaptive environmental management, the Supervision Consultant should complete pre-construction water-quality verification before mobilization and before the establishment of ancillary facilities.

The verification program should cover representative upstream and downstream locations at stream crossings and drainage discharge points, as well as water resources near proposed workers' camps, laydown areas, fuel and equipment storage areas, batching or concrete washout areas, spoil disposal sites, borrow areas and community water-use points. At a minimum, the baseline should record pH, Biological Oxygen Demand, Chemical Oxygen Demand (COD), turbidity, total suspended solids (TSS), oil and grease, and hydrocarbon. Where water is used by communities for domestic purposes, additional microbiological monitoring, such as *E. coli* or fecal coliforms, should be included.

5.1.3. Noise

Field observations indicate that ***the existing acoustic environment along the road corridor is already influenced by continuous daytime traffic movements, settlement activity and the presence of public and community facilities***. At some locations, particularly where dwellings, schools and health facilities are located close to the road edge, ambient noise levels are likely to periodically exceed the World Bank Group residential, institutional and educational guideline value of 55 dB(A) Leq during the daytime. Night-time conditions may also be affected by intermittent traffic, community activity and other localized sources, and exceedances of the 45 dB(A) night-time guideline may occur in villages where receptors are close to the corridor.

The qualitative baseline was complemented by indicative daytime noise monitoring using portable equipment at representative sensitive receptors, including houses, schools, health posts, churches and market areas along the corridor. ***It shows existing ambient noise nearby the receptors is 52 to 57 dbB(A) range; which means that the area is already right at—or slightly exceeding—the thresholds during parts of the day due to natural or existing localized sounds.*** This data should be used to establish local background conditions, identify receptors where existing noise is already elevated, and provide a reference point for construction-phase compliance monitoring and complaint investigation.

Given this context, and consistent with the World Bank Group EHS Guidelines approach for areas where existing ambient noise is already elevated, construction noise impacts will be assessed against the more conservative criterion of no more than a 3 dB(A) increase above the established background level at the nearest sensitive receptor, in addition to consideration of the absolute guideline values.

Table 13. WBG Noise Level Guidelines

Receptor	One-hour Leq (dBA)	
	Daytime (07.00-22.00)	Night-time (22.00 – 07.00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

The baseline is limited by the absence of continuous 24-hour monitoring and by the use of daytime spot measurements only; therefore, pre-construction verification monitoring should be undertaken at priority receptors before major works commence, with monthly monitoring during active works and additional measurements where complaints are received or where high-noise activities are planned near sensitive receptors. Adequate budget provisions will be secured under the Project to support environmental monitoring requirements, including the procurement of water quality monitoring equipment. This provision will help ensure that sufficient resources are available to implement the monitoring program and verify compliance with the applicable World Bank Group EHS Guidelines, national requirements, and commitments set out in the ESMP.

5.2 Physical Environmental Conditions

5.2.1. Rainfall and Temperature

Ainaro Municipality experiences a marked seasonal rainfall pattern, with a wet season generally extending from about November or December to April and a pronounced dry season from around

May to October. Available climate datasets for Ainaro indicate tropical wet-and-dry conditions and show the highest rainfall typically occurring between December and March, with much lower rainfall during the mid-year dry months. In highland areas near Hatubuilico and Mount Ramelau, local rainfall may be influenced by elevation, orographic effects, cloud cover, and exposure to prevailing winds.

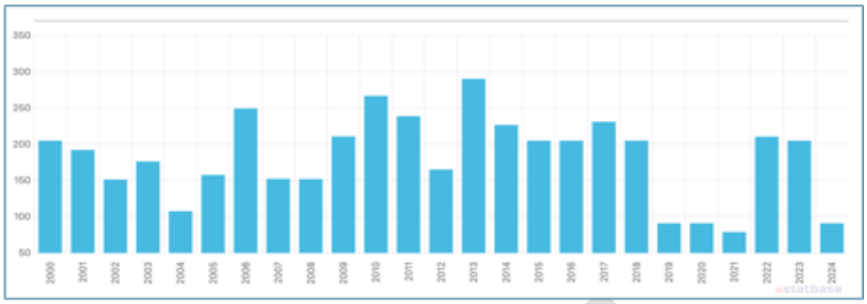
Figure 4. Surface Temperature in Ainaro, Timor-Leste

Temperature (°C)		
Average	Maximum	Minimum
17	22.7	11.4
Precipitation (mm)		
Precipitation Driest Month	Precipitation Wettest Month	
20.8	386	
Annual precipitation	Annual precipitation prediction for 2050	Change in Annual Precipitation in 2050
2,250.8	2,441.5	190.74

Source: WBG Geospatial Platform

Rainfall is a primary driver of construction and operational risk along the corridor. Intense rain can cause rapid surface runoff, blocked drains, sediment-laden discharge, slope failures, washouts, and temporary isolation of communities. The project should therefore assume that drainage capacity, erosion control, slope stabilization, and staged construction during drier months will be critical for environmental performance and climate resilience. Baseline rainfall information should be updated during CESMP preparation using the nearest available meteorological records and, if possible, local knowledge on flood-prone and landslide-prone road sections.

Figure 5. Average Mean Monthly Precipitatio in Ainaro, Timor-Leste



Source: Climate Change Knowledge Portal

5.2.2. Climate Conditions and Natural Hazards

Climate. The climate of Ainaro is generally classified as tropical savanna or tropical wet-and-dry, modified locally by altitude. Compared with lowland coastal areas, the highland corridor near Hatubuilico and Mount Ramelau can experience cooler temperatures, higher humidity, frequent cloud cover, and greater exposure to wind and fog. Seasonal climatic variability affects road conditions, construction scheduling, worker safety, material handling, and community access.

The principal natural hazards relevant to the road corridor are landslides, rockfall, erosion, flash flooding, drainage overtopping, and damage from intense rainfall events. Timor-Leste is also exposed to seismic risk due to its regional tectonic setting, and earthquake shaking may exacerbate slope instability in steep terrain. Climate change is expected to increase the importance of resilient drainage, slope protection, and maintenance systems, particularly where road infrastructure crosses steep catchments or supports access for isolated communities.

Seismicity. Timor Island is prone to earthquakes because it lies within a tectonically active region along the collision zone between the Australian and Eurasian plates. Earthquake-related hazards, including severe ground shaking, tsunamis and ground subsidence, are therefore among the natural hazards affecting Timor-Leste. A compilation of major shallow earthquakes in Indonesia between 1897 and 1984, prepared by the Southeast Asia Association of Seismology and Earthquake Engineering, identified several earthquakes with epicentres located offshore to the north of Timor Island (SEASEE, 1985).

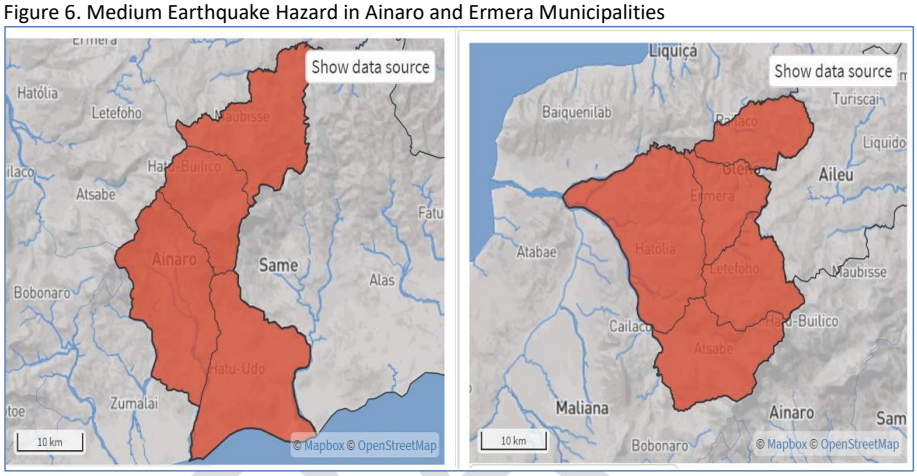
Timor-Leste's exposure to seismic hazards, heavy monsoonal rainfall, high winds and steep terrain, together with widespread deforestation, increases its susceptibility to flooding, landslides, river-channel shifts and erosion. Rural communities are also exposed to hazards affecting agricultural livelihoods, including crop and livestock diseases and pest infestations. Urban areas remain poorly prepared for potential emergencies such as disease outbreaks, fires, chemical spills and sewage overflows (UNDP, 2010; WFP, 2006).

Although Timor-Leste has a medium level of exposure to natural hazards, its limited coping and adaptive capacity contributes to its ranking as the seventh most disaster-prone country in the world (UN WRI, 2011). The earthquake hazard in Ainaro and surrounding areas, including Ermera Municipality, is classified as medium. This classification indicates a 10% probability of potentially

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damaging earthquake-induced ground shaking occurring within the Project area over the specified assessment period (GFDRR, 2018) as shown in the figure below. The potential effects of seismic activity have been considered during DED. The seismic coefficient used for bridge deisng is 0.25. Project planning, engineering design and construction methods should reflect the assessed level of earthquake hazard. Since the bridge type of this project is simple girder, no seismic analysis required. Supervision Consultant will conduct static analysis against earthquakes during project implementation.

Figure 6. Medium Earthquake Hazard in Ainaro and Ermera Municipalities



Source: Global Facility for Disaster Reduction and Recovery (GFDRR), 2018

Flooding in Timor-Leste occurs as flash-flooding when heavy seasonal rains in high catchment basins converge in tributaries as they descend, resulting in a rapid rise of discharge in the water courses (UNDP 2010). La Nina, which brings heavy rainfall, causes an increase in floods. According to the data from National Disaster Management Directorate (NDMD), the number of floods has increased since 2010. From 2001 to 2009, NDMD recorded 32 floods, a number which has increased to 185 since 2010.

Mainly there are two types of flood i.e. riverine flood and flash floods. The main causative factors of flooding in Timor-Leste include heavy rains; rapid excessive runoff from the slopes to streams; and high mountainous ranges having steep slopes and low soil permeability (WB, 2015). As reported on Build Disaster in Timor-Leste (WB, 2015), informed some findings that area of Letefoho and Ainaro Administrative Post are the most flood-affected area. Subsequently, in terms of the residential sector, Letefoho Administrative Post registers an average annual loss of USD 29,942 due to flooding.

Other natural hazards. Timor-Leste has been experiencing a severe drought due to the El Niño/Southern Oscillation (ENSO) phenomenon since the end of 2015; it is a related weather anomaly associated with droughts regionally and occurring in cycles every couple of years. Meanwhile, the latest rainy season which takes place from November 2016 to May 2017, has been insufficient and erratic maintaining drought conditions on most of the island. In addition to El Niño, the La Niña weather phenomena have had a significant impact on Timor-Leste communities, both positive in

terms of improving agricultural production and water security; and negative in terms of increased flooding, landslides, and erosion (GoTL 2008).

Besides, floods and landslides occur in the event of heavy rains. Generally, landslides occur at higher elevations with a slope about 45° or higher, and on lands along rivers during the times when heavy rains increase the water volume. While on soil structures with cavities and plenty of cracks, the beginning of the rainy season brings a water content which increases rapidly and the soil quickly becomes saturated. Rainwater infiltrates the cracks and accumulates at the bottom of the soil layer and results in lateral soil movement which causes landslides.

According to the assessment conducted by the World Bank in several sucos along the Dili to Ainaro road corridor, the communities in these areas consider that weather will become increasingly unpredictable from three years ago. The dry season extends over a longer period of time, and the wet season can occur twice in one year. The beginning of the wet season has been delayed over two to three months. Moreover, strong wind is one of the most destructive hazards in the studied area. Strong wind events normally occur during March-April and September- October. The country experienced about 19 strong wind events (2002 – 2011) affecting 2015 individuals and damaging 1,863 houses.

5.2.3. Topography

The Timor-Leste's landscape is dominated by mountain ranges which cover about 1/3 of the country's land area (UNESCAP, 2003). It is estimated that more than 40% of the land in Timor Leste has more than 40% slope (MOI, 2009). One prominent mountain range is the Ramelau Range; highest elevation 3,037 m above sea level (asl) at Tatamailau.

This steep topography is present as part of the Project, as road Project of Aituto – Gleno is one of the north-south connectors across the mountainous ridge along the foot of Mt. Ramelau. In the first section, it starts from the south and road rises, then falls and sometimes winds up/down mountainous slope, with an altitude of a maximum of 2,160 m from Aituto to Hatubuilico.

Given the mountainous terrain of the Project corridor, one of the challenges of the rehabilitation work is the identification of spoil disposal sites. No tipping shall be allowed on the steep slopes without establishing the engineering safety and obtaining permission from the authorities, PMU, and landowners (if any).

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Figure 7. Bathymetry and Topography of Timor Leste

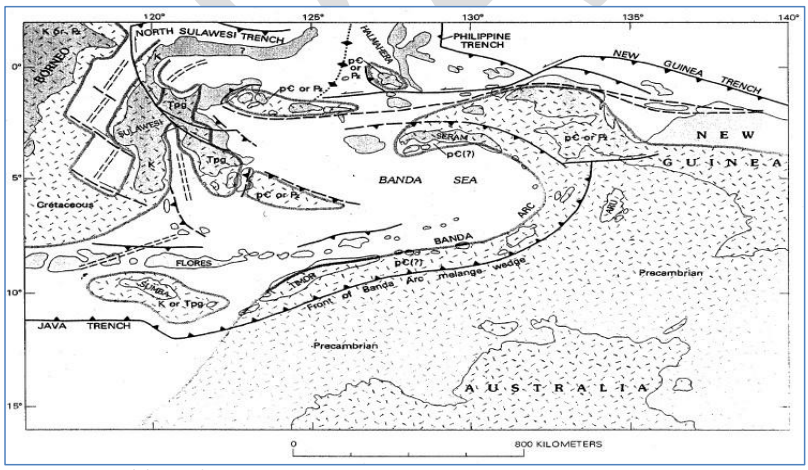


Source: National Ecological Gap Assessment (NEGA), 2010.

5.2.4. Geology

Geologically, Timor is part of Banda Arc, which was formed by a complex subduction setting present as in following Figure.

Figure 8. Distribution of the Two Major Rock Types in Timor Area



Source: KEI, Feasibility Study 2018

Timor Island is located in an active tectonic region, where subduction of the Australian plate beneath the Eurasian plate is taking place. The formation of Timor Island is related to this subduction. The top layer of the subducting plate is scraped and accreted with the accretion probably taking place from approximately 10 million years ago (mya) to ± 3 million years ago (Late Miocene and Early Pliocene).

As the accretionary wedge thickened, it continued to be uplifted throughout to Pliocene and Pleistocene (3 mya to ± 0.3 mya) reaching heights of over 3,000 meters above the sea level in some places.

The Timor trough is running parallel to the southern coast of Timor Island, while the northern edge of Timor is an extension of Australia continental crust. The collision began in the late Miocene, ± 11.6 to 5.3 million years ago. Timor has older geology and lacks the volcanic nature of the northern Lesser Sunda Islands. Timor Island built up with contributions from the Australian continental plate, the mélange, and the ophiolitic Banda terrain.

Given the island is the tectonic origin, the rocks that formed Timor Island are of continental origin (Australian origin), metamorphosed marine sediments (mélange) and rocks associated with the oceanic crust, collectively referred to as ophiolite. One suite of metamorphic rocks referred to as the Alieu Formation occurs widely in the northern part of central Timor. The Alieu Formation consists of a series of shales, phyllites, slates, and occasional low-grade metamorphosed eruptive rocks. This formation has been repeatedly exposed to deformation especially on the north coast. This deformation including the pervasive presence of platy minerals such as chlorite and mica structurally weakens the rock.

In this area, the geological basement consists of the Permian Aileu Formation and Maubisse Formation which has been thrust over the older Formations, Permian Cribas FM, Triassic Aitutu FM, and Jurassic-Cret. Wailuli FM. The boundary between Aileu FM and the Maubisse FM north of Maubisse was interpreted as a thrust, with the Aileu meta- morphic structurally overlying the Maubisse block.

The limestone of Maubisse Formation is widespread in Timor-Leste. The limestone is well bedded and consists of dense beds and massive reef. They are colored red, pink, white and gray. The fauna is rich, especially in the reef facies. Conglomerates contain clasts of eruptive rocks and stuff. A sequence of 500 meters of basalt is found on Mt. Ramelau. The environment of deposition was shallow marine in warm water.

From the geological engineering points of view, it is important to issue, how dip and strike are the schistosity and joints of the metamorphic rock mass and how degrees of weathering affect its rock mass for slope stability and construction practice.

The geology of the road alignment based on exposed rocks along road cuts is mostly metamorphic rocks belonging to the Aileu metamorphics and recent colluvial deposits. The colluvium deposit is an accumulation in depression/gullies of eroded materials from adjoining

Slopes. It consists of angular rock fragments ranging from gravel size to boulder size with soil and clay. This deposit is stable when dry but weakens with the presence of water as it is prone to debris flow and slippage.

5.2.5. Hydrology and Water Resources

From the geographical condition of Timor-Leste, this country is a relatively desiccated country with an unstable balance, between dry season and wet season, the dry season is relatively longer than the wet season. This is also separated by the general condition of Timor- Leste geology which is formed from karst rocks which are porous in nature. The ability of the soil to hold water is very low a phenomenon which can be observed from the shriveled rivers in the dry season and the flooding in

the rainy season. Timor-Leste has been broadly divided into 12 Hydrologic Units, which are groupings of climatologically and physiographically similar and adjacent river basins. Each of these hydrologic units comprises a number of rivers, 29 main river systems in total, of which 12 in the north and 17 in the south. All rivers are generally short and fast-flowing (AWRF, 2006).

Hydrology. Ainaro Municipality has a complex and highly variable hydrological environment shaped by rugged mountains, sharp changes in elevation, and marked seasonal differences in rainfall. The municipality stretches from Timor-Leste's highest mountain areas to the southern coastal lowlands and contains important surface-water and groundwater resources. However, the availability of these resources varies considerably by season and is influenced by climate variability, catchment health, and the condition of water infrastructure. Ainaro's hydrological characteristics are governed mainly by its elevated terrain, particularly the Mount Ramelau massif. This topographic setting affects the spatial distribution of rainfall, the generation of runoff, river slope and flow behaviour, groundwater replenishment, and the formation of springs.[2]

Localised fractured-rock aquifers as groundwater systems are widespread in the mountainous areas and are replenished where rainfall seeps into weathered or fractured bedrock. Water then moves through fractures and can emerge farther downslope as springs. Although their storage capacity is often limited and unevenly distributed, these springs provide an essential water source for rural communities in the upper catchments.

Water Resources. Water availability is central to livelihoods in Ainaro, where more than 80% of the population relies on subsistence agriculture. Reliable springs, streams, and water infrastructure therefore support not only domestic supply, but also irrigation and small-scale electricity generation. Because of the steep landscape and the practical difficulties associated with drilling boreholes, many settlements depend on gravity-fed water systems. These schemes transport water from protected upland springs through pipelines to communal tanks or tap stands. Their reliability is determined by spring yield, protection of the source catchment, routine maintenance, and the physical condition of the distribution network.

In Ainaro, the Nugupo Water Purification Plant supplies treated water for only part of each day. When the plant is not operating, untreated river water is delivered directly through the tap-water system (Shimoyama, Hisamitsu 2011). Spring water is the principal year-round water source in the Project area. Before use by communities, it must be conveyed by pipeline and stored in tanks. Many local water facilities have been developed with support from external organizations. For example, the Northbridge Rotary Club supports clean-water and sanitation services for remote communities in Letefoho Municipality. A three-kilometer pipeline through this mountainous area took three months to construct and supply clean water to Letehofo Suco, including its primary school, middle school, and medical clinic.

Timor-Leste's arid climate and prolonged dry season contribute to recurring water shortages. Key measures to address these shortages include developing inter-seasonal or multi-year water-storage facilities at various scales; harnessing the country's substantial groundwater potential for agriculture

[2] https://timorleste.embassy.gov.au/dili/028.html; https://www.laohamutuk.org/econ/SDP/SDPdraft/Plan%204.175-4.188.PDF; and https://ewb.org.au/blog/2021/04/18/spring-water-successes-in-timor-leste/

in river valleys and for domestic supply; and improving water-supply and irrigation infrastructure to increase water productivity and reduce losses (WB, 2017).

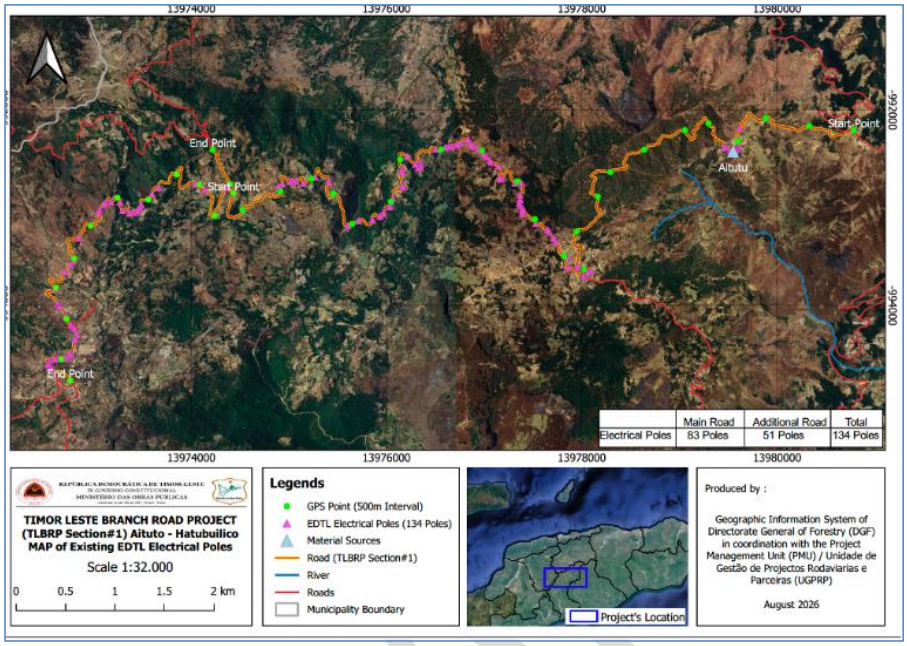
5.2.6. Power Supply

Timor-Leste's electricity system is relatively small and fragmented and remains heavily dependent on small- and medium-sized diesel power plants. Access is uneven: the electrification rate is approximately 88% in urban areas, compared with 19% in rural areas. Reflecting this disparity, the East Timor Planning Commission (2002) estimated that about 60% of the population lacked access to electricity.

Along the 12 km Aituto – Hatubuilico Junction Road, the electrical poles are generally positioned close to and repeatedly follow the existing road alignment.The poles are most densely concentrated along the western and central portions of this road section, including the winding approaches to Hatubuilico Junction and the central ridge section with smaller number of poles appears toward the eastern Aituto end. The map records 83 EDTL (stated-owned electticity company) electrical poles along this road section as shown in the figure below. Because many main-road poles occur beside sharp bends and on steep slopes, road widening, drainage works, slope cutting, retaining structures, and construction access could affect them. Their exact offset from the carriageway cannot be determined from this map scale, so a detailed survey would be needed to identify poles within the construction footprint and confirm which require protection, temporary support, or relocation.

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Map 4. Existing EDTL Electrical Pole



5.2.7. Climate Change

Increasing climate variability and uncertainty, particularly in rainfall patterns and extreme weather events, pose significant additional risks to the lives and livelihoods of rural communities, especially those in remote areas of Timor-Leste. These risks include more severe flooding and landslides that damage critical rural infrastructure and progressively impair its intended function, including water-supply systems, drainage, embankments, river-protection structures, and community feeder roads and bridges linking rural roads to the national and district road network. Accordingly, the Road Climate Resilience Project for Timor-Leste aims to invest in key road infrastructure to reduce the effects of high-volume, high-intensity rainfall on the road corridor.

Erosion is a serious problem in Timor-Leste because of its steep topography, shallow soils, and loose, poorly consolidated geological materials coupled with extreme rainfall rate during rainy period. On steep slopes, limited vegetation cover increases runoff and provides little protection against erosion. The terrain also accelerates runoff and shortens catchment response times, while the underlying materials are readily eroded. Higher precipitation and a shift in rainfall from drier to wetter months are expected to exacerbate these conditions. The principal consequences are higher sediment loads and an increased risk of damage to drainage systems through sediment deposition.

More intense short-duration rainfall and the resulting increase in runoff are significant concerns for the proposed Project. In small catchments, higher rainfall intensity can sharply increase peak runoff. Where longitudinal and transverse drainage systems lack sufficient hydraulic capacity, this may increase the incidence of localized flooding. Although inundation may be limited to an extent, its

effects can be substantial, including accelerated erosion, hazards from water on the carriageway, and pavement weakening caused by saturation. Greater runoff volumes will further intensify erosion.

Climate projections prepared through the Pacific–Australia Climate Change Science and Adaptation Planning (PACCSAP) program build on the findings of the IPCC Fifth Assessment Report (2013) and use updated emissions scenarios and climate models. The mid-century projections for Timor-Leste are as follows:

- An increase in temperature of 1.25–1.75°C by 2050;
- Longer-lasting heatwaves;
- A 4–10% increase in rainfall by 2050, equivalent to an increase of up to 100–120 mm in coastal areas and 260–300 mm in mountainous areas;
- More intense, but less frequent, heavy-rainfall events;
- An increase in sea-surface temperature of 0.6–0.8°C by 2030;
- A sea-level rise of 150–340 mm by 2050; and
- More intense, but less frequent, cyclones, with higher wind speeds.

The projections indicate that heavy-rainfall events will become more intense, although less frequent, increasing the magnitude of rainfall-induced geological processes such as erosion, landslides, and sedimentation. These risks have been considered in the rehabilitation and upgrading plan through measures such as improved road alignments, retaining walls to reduce landslide risk, and larger culverts to accommodate higher flows and sediment loads.

Adaptation strategies have been developed for each significant infrastructure risk. They are intended to protect infrastructure from climate-related hazards and combine engineering interventions with maintenance measures to support a safe and reliable transport link. The following strategies should be incorporated into the detailed design to address more intense short-duration rainfall in identified vulnerable areas:

- Increase transverse drainage capacity: to accommodate more intense precipitation, provide additional culverts and replace undersized existing culverts with larger structures.
- Improve longitudinal drainage: increase capacity for higher runoff volumes by lining drains and providing larger culverts where required.
- Provide erosion and landslide protection: protect erosion-prone and landslide-susceptible areas adjacent to the road using an appropriate combination of structural and bioengineering measures.
- Increase maintenance: adjust inspection and maintenance frequency to address the expected acceleration of physical deterioration.

Project activities are not expected to cause measurable effects on the climate. Nevertheless, emissions from project activities and equipment will be controlled in accordance with good international industry practice, and open burning will be prohibited.

5.2.8. Erosion and Sedimentation

The inherent weakness of the rocks, the steep terrain and the occurrence of intense rainfall make erosion and sedimentation very active geologic processes in the northern parts of Timor-Leste. Erosion and sedimentation in this part of the country consist of both the slow erosion deposition and rapid

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mass wasting processes which include debris flow, rock falls and landslides. After completion of the Project corridor and adjacent projects, the occurrence of the landslide is expected to be minimized.

Since the road improvements require widening, three (3) measure works are to be considered: (i) cutting in mountain-side slope; (ii) filling in valley ward slope, and (iii) both works. In addition, the countermeasures for the potential landslides, which consist of a landslide, slope failure, and debris flow shall be considered.

Filling: the existing road sections have two types of damage: (i) deformed retaining wall (stone masonry and gabions) and (ii) landslide. In order to circumvent the problem on the retaining wall, adequate compaction on the soil materials as desirable backfill, and considering sufficient safety factors in the design for overturning, sliding, and bearing capacity are required. The adequate load-bearing layer is necessary during construction.

Debris Flow. Debris on the road run along the mountain ridge and through the flat hill, the potential debris flow is low to small catchment areas from the intersection of road and torrent. If there is a flow of debris in the area, the return period of occurrence is probably over 100 years, hence, countermeasures are not indispensable because it is not of high risk. However, debris flows have cascaded in few places, and it needs adequate countermeasure for those road crossing structures, to have enough capacity taking into account the debris flow.

Cutting Slope. Many artificial cut slopes exist along the entire length of the project road. These existences are of various conditions, i.e. geomorphology, geology, weathering, and soil, with various shapes, i.e. height, width and inclination, and also in different time. Road widening along Section 1 will require extensive cut-and-fill works. Based on the estimated BOQ quantities, approximately 112,855 m³ of rock will be required for protection works, including stone masonry, gabions, riprap, and concrete. This demand can be met from the estimated 123,600 m³ of surplus hard-rock excavation. In addition, the works are expected to generate approximately 236,100 m³ of surplus common excavation and 239,400 m³ of surplus soft-rock excavation, resulting in a combined spoil volume of about 475,500 m³. Suitable material-disposal areas will therefore need to be identified, assessed, and designated.

High sedimentation rate of the rivers within the northern part of Timor-Leste is quite obvious. This is indicated by the presence of uplifted river alluvial terraces and wide alluvial filled river channels, from the lower reaches to the headwater sections. The high sedimentation rate causes a river bed to aggrade and lead to a reduction of the river's bank full capacity. As a consequence, banks are overtopped, and flooding and river channel migration take place.

5.3. Biological Environment

5.3.1. Flora and Forest Vegetation

In accordance with Timor-Leste's 4th National Report to the UN Convention on Biodiversity (Timor-Leste, 2011b), the main cereal crops in Timor-Leste are rice and maize, and the main cash crop is coffee. Upland agriculture faces additional challenges in the form of 'slash and burn' methods and the loss of soil during heavy rains.

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Improved breeding materials of key food crops such as maize, sweet potato, cassava, peanuts, and rice have been introduced into the country through the Seeds of Life Programme (SoL Annual Research Report 2007). Furthermore, the number of examined species was expanded to include potatoes, mung beans and climbing beans (cf. SoL Annual Research Report 2009). Rice is commonly grown in the warmer lowland areas while maize is grown at medium altitudes. Other crops such as root crops are grown at even higher elevations.

The generic situation of flora and vegetation is well documented; however, there are no comprehensive floral and forest inventories. Preliminary survey of the flora and fauna of Timor-Leste conducted in collaboration with Birdlife International, more than 251 tree species had been identified as native. Most valuable native species are sandalwood (*Santalum album*; considered critically endangered species) and rosewood (*Pterocarpus indicus*).

The dominant natural vegetation of Timor-Leste originally csisted of the closed forest with areas of natural sedge and grassland vegetation on the floodplains of Lake Iralalaru. The primary forests around Los Palos and in the Lake Iralalaru basin have extensively been converted by humans into grassland, cropland and secondary forests (the Democratic Republic of Timor-Leste, 2011b). According to the first detailed forest cover maps released under a JICS, the total cover of a forest is 58.9%, of grassland 27.4%, of very sparse forest 4.2%, of bare land 3.3%, rice paddies 2.8%, water bodies 1.6%, dry farmland 1.5% and settlements 0.2%.

In 2011, it was estimated that forest cover makes up some 453,850 Ha of Timor-Leste's land area with primary forest vegetation covering a minimal 1 - 6 % of the country's land area. The main types of forest in Timor-Leste according to the Ministry of Agriculture and Fisheries (MAF) are dry lowland forest, moist forest, montane forest, and swamp. The typical trees of the slopes according to MAF include *Sterculia foetida* (a tropical chestnut) *Calophyllum teysmannii* and *Aleurites moluccana* (candlenut) but the three dominant native species are *Eucalyptus alba*, *Eucalyptus urophylla* and *Pterocarpus indicus* (narra). *Narra Callophyllum teysmannii* and *Santalum album* (sandalwood) are valuable species.

The study done by Trianor, C.R (2010) found that the distribution and status of vegetation types in Timor-Leste are poorly known, makes it difficult to categorize Timor's tropical forest types. However, several schemes have been published for silvicultural studies (Meijer-Drees 1951), transmigration studies (RePPProT 1989) and conservation assessments (Cowie 2006). Comparison of names used for tropical forest, mangrove and wetland vegetation on Timor (and Nusa Tenggara region) presented in Table 6.3.

Farmland and plantation dominate the medium elevations (800 – 1500 m, a.s.l), whereas woodland dominates the high elevations. The roadside woodlands on Section 1 at medium and higher levels are dominated by plants such as *Falcataria molucanna (*Moluccan Albizia*), Albizia chinensis* (Silk Tree), *ai fuanbot* (ai anan tun), *Acacia montana, Ageratina riparia (Mist Flower), shrubs* and *grasses*. Furthermore, from the road hinterland at lower levels are *Musaceae sp., Psidium guajava*, avocado, albizia woodlands, and coffee plantations. The vegetation in the project area varies with topography and soil type except for perennial species that grow in all areas such as shrubs and grasses.

The wooded areas extend on the slopes above and below the road to the hinterland. Among the tree species recognized along the road i.e. *Eucalyptus urophylla, Albizia sp., Pinus* sp. (pine tree), *Araucaria*

heterophylla, Prosopis palida, Terminalia catappa, Gmelina arborea, and *Lannaea coromandelica*. The typical vegetation cover along the Project corridor is shown in Chapter 7 (E&S Sensitive Receptor) of this updated ESIA.

5.3.2. Fauna and Wildlife

The wider Monte Tatamailau landscape is important for endemic and restricted-range species. Available KBA information indicates that ten restricted-range bird species have been recorded in the area, including the Near Threatened (NT) Timor Imperial Pigeon. Other birds recorded in the Mount Ramelau area include Timor-associated species such as the Timor Leaf Warbler, Timor Heleia, Timor Bushchat, Black-breasted Myzomela, Yellow-eared Honeyeater, Streak-breasted Honeyeater, and Timor Friarbird. However, their presence, abundance, breeding status, and use of habitats within the specific road corridor remain to be confirmed.

Part of the road section passes through the Mount Ramelau (Tatamailau) Protected Area, which begins 12 km south of the project road. In the early 1980s, Mount Tatamailau was extensively covered by old-growth montane forest and was identified by BirdLife International (BI) as an Important Bird Area because it supported several endemic and restricted-range bird species. According to Trainor et al. (2007), this conclusion was supported by the UN Administration of Timor-Leste in 1989.

Commented [BS3]: Please revise this sentence to make the meaning clearer, any estimate on how many km of the 12-km road overlap (pass through) the protected areas; what does it means by begins 12 km south of project road. The term road section and project road are used within one sentence, but it does not clearly refer to which road.

The Government of Timor-Leste formally designated the Mount Ramelau Protected Area in 2016 to protect 20,000 ha of dry tropical forest and associated wildlife on Mount Ramelau. Together, BirdLife International's designation of the area as an Important Bird Area and the Government of Timor-Leste's designation of it as a protected area highlight its recognised biodiversity importance.

The Key Biodiversity Area (KBA) factsheet published by BirdLife International indicates that several species endemic to Mount Tatamailau (Ramelau), primarily birds, are globally threatened under the IUCN Red List categories. These endemic species are listed in Table 6.4. However, no threatened habitats or threatened plant or animal species were recorded within the part of the protected area traversed by the Branch Road Project, despite BirdLife International's identification of globally threatened endemic bird species on Mount Tatamailau (Ramelau). This apparent discrepancy may reflect the highly degraded forests along the Section 1 road corridors and the presence of open areas reportedly created by burning and clearing for military operations in the 1990s.

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Commented [BS5]: Does this refer to the 12-km road?

Humans have had a major direct impact on the biodiversity of Timor by hunting some species to extinction and introducing others, and by indirectly altering landscapes by clearing and burning for agriculture, including the road infrastructure built as access for agricultural purpose. The colonization of Timor by hunter-gatherers, and later by the Austronesian's, together with the relatively recent period of Portuguese and Indonesian colonial rule, and traditional forms of resource management, has also played a role in the distribution and extent of habitats, and consequently on wildlife populations (Trainor, C.R, 2010).

Birdlife is still the main reference for wildlife fauna of Timor Leste (Trainor et al, 2007a). The report describes the fauna wildlife of Timor-Leste as characterized by the biodiversity of Southeast Asia with certain elements of the Australian continent. Some common birds of open country and forest on Timor: Black-backed Fruit-dove (Romang Island); Wallacean Cuckooshrike, Helmeted Friarbird, Emerald Dove, Kara Vella (Vermasse), Richard's Pipit, all found in Hatu Builico village (Trainor, C.R, 2010).

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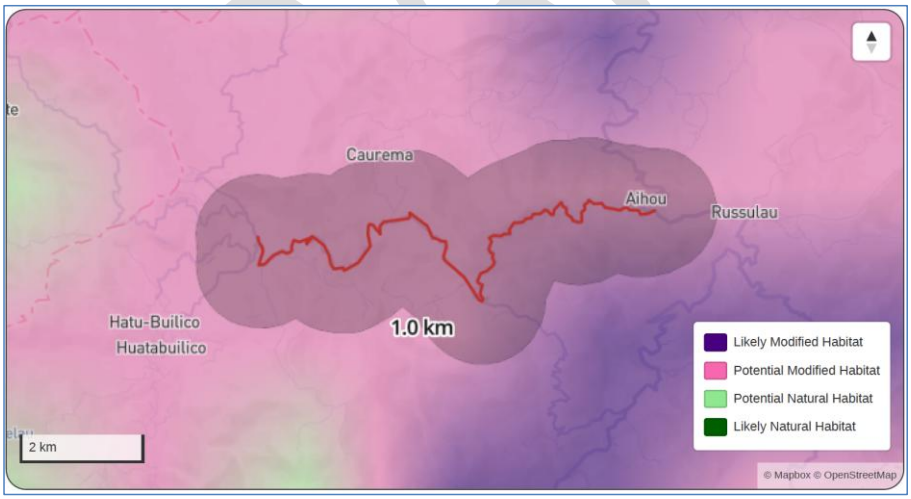
The wildlife fauna of Timor-Leste (Trainor et al, 2007a) is made up of the following: (i) 224 species of birds, of which seven species and two genera are endemic to the island. Most of the birds and larger mammal species native to Timor-Leste are arboreal and majority of these species are dependent on closed canopy tropical forest; (ii) Minimal 52 mammal species occur in Timor- Leste, mostly small and mobile species; (iii) bats are a well best represented group in Timor- Leste with at least 34 species, including 12 species of fruit-bats; (iv) 15-20 amphibian species and 40 or more reptilians were found in Timor-Leste; and (v) saltwater crocodile is also present in the coastal zones.

The road is the main transport mode in Timor-Leste, while roads are critical for economic growth and social development; ecosystems and the services they provide are vital for sustaining life. However, roads are key drivers of land use change and deforestation threatening biodiversity, as roads can act as physical barriers or may serve as behavioral barriers for wildlife. Road width, verge characteristics, the animals' behavior and its sensitivity to habitat disturbances are also key factors to increase fragment isolation that generally reduces the abundance of birds, mammals, insects, and plants.

5.3.3. Terrestrial Habitats

Terrestrial habitat condition was screened as Natural or Modified in accordance with the definitions set out in IFC Performance Standard 6 (PS6). A 1 km buffer was applied to assess potential direct and indirect impacts at the broader landscape scale. As shown in the maps below, the Area of Influence (AoI) is classified as Potential Modified Habitat. This screening-level classification is indicative and was verified and confirmed through field observations as shown in the following maps.

Map 5. Terrestrial Habitat



Source: IBAT PS6 Report. Generated on 27 September 2026 (GMT). www.ibat-alliance.org

Map 6. Broad Land-cover Patters and Potential Indicators of Antrhopogenic Disturbance



Source: IBAT PS6 Report. Generated on 27 September 2026 (GMT). www.ibat-alliance.org

5.3.4. Vulnerable or Endangered Species

The IBAT screening provides an indicative list of potentially occurring species within the Project Area of Influence and associated buffer areas, based on the proportion of suitable habitat overlapping the site and buffer and weighted by each species' IUCN Red List category. The screening outputs include scientific names and, where available in the IUCN Red List, corresponding to common names.

For the purposes of the ESIA, the biodiversity Area of Influence (AoI) has been defined in accordance with the methodology (Chapter 4) as a 100 m ecological survey corridor centered on road alignment. This corridor represents the area of direct impact, including the project footprint and immediately adjacent areas that may be subject to construction-related disturbance, vegetation clearance, habitat modification, dust, noise, and increased human activity. In addition, a 1 km buffer from the road centerline has been applied to screen for potential indirect impacts, particularly in relation to avifauna and other mobile fauna that may use habitats beyond the immediate construction corridor. The IBAT results are therefore used as a preliminary biodiversity risk-screening tool to inform baseline survey planning, impact assessment, and the identification of mitigation and monitoring requirements consistent with good international industry practice and World Bank environmental and social requirements.

This updated ESIA uses two IBAT reports: the Proximity Report and the Estimated Species Report. The Proximity Report identifies all species whose raw geographic range polygons overlap the defined 1 km buffer area, which can result in a broad or less refined species list. In contrast, the Estimated Species Report filters species according to the Area of Habitat (AoH) available within each species' range, excluding unlikely occurrences and providing greater analytical precision.

IBAT – Proximity Report. The following table, drawn from the Proximity Report, lists species potentially occurring within the 1 km buffer applied to the Area of Influence (AoI). It counts of species

categorized as Endangered (EN) or Vulnerable (VU) under the IUCN Red List of Threatened Species and found within 1 km of the Project's Area of Influence/Impact (AoI).

Table 14. Species Listed Within Buffer of 1 km – IBAT Proximity Report

Species Name	Common Name	Taxonomy	IUCN Category	Biome
Acerodon mackloti	Sunda Fruit Bat	Mammalia	VU	Terrestrial
Macaca fascicularis	Long-tailed Macaque	Mammalia	EN	Terrestrial
Pteropus griseus	Gray Flying Fox	Mammalia	VU	Terrestrial
Ducula Cineracea	Timor Imperial Pegeon	Aves	NT	Terrestrial
Numenius madagascariensis	Far Eastern Curlew	Aves	EN	Marine, Freshwater, and Terrestrial
Calidris tenuirostris	Great Knot	Aves	EN	Marine, Freshwater, and Terrestrial
Calidris ferruginea	Curlew Sandpiper	Aves	VU	Marine, Freshwater, and Terrestrial
Calidris falcinellus	Broad-billed Sandpiper	Aves	VU	Marine, Freshwater, and Terrestrial
Pluvialis squatarola	Grey Plover	Aves	VU	Marine, Freshwater, and Terrestrial
Eucalyptus urophylla	Timor White Gum	Magnoliopsida	EN	Terrestrial

Source: IBAT Proximity Report (Within Buffer of 1km). Generated on 26 September 2026 (GMT). www.ibat-alliance.org

Potential biodiversity impacts are of particular concern on higher ground elevation of the project areas. IBAT screening indicates records of Endangered (EN) species within 1 km of the Area of Influence (AoI). Field observations did not identify the Timor white gum (*Eucalyptus urophylla)* along the existing road corridor; however, higher-ground areas could not be surveyed because of steep terrain and access constraints. The species' presence, and the presence of suitable habitat, therefore, cannot be excluded in those areas. Any shortcut alignment, spoil placement area, batter extension or construction access extending upslope should consequently be treated as a potential biodiversity risk pending targeted field verification. Potential impacts include direct loss or degradation of listed flora and suitable habitat; indirect effects from sediment deposition downslope or within drainage lines; and hydrological changes where cut batters intercept, concentrate or redirect surface or subsurface flows.

Annex 7 provides species profiles, including information on habitat, behaviour, and breeding. It also presents a preliminary assessment of the likelihood of each species occurring within the project site and its relevance to TLBRP2. Based on species profiles, a preliminary assessment was conducted. Of the species assessed, two were determined to be of **high relevance** to the Project:

- *Ducula cineracea* (Timor Imperial Pigeon), listed as **Near Threatened (NT)** on the IUCN Red List. The Timor Imperial Pigeon is considered to have a moderate to high likelihood of occurrence within suitable montane forest, woodland, wooded gullies and coffee agroforestry containing

retained trees. Potential Project impacts include the loss or disturbance of mature fruiting and nesting trees, displacement of individuals and reduced connectivity between habitat patches.

- *Eucalyptus urophylla* (Timor White Gum), listed as **Endangered (EN)**. Timor White Gum is native to Timor-Leste and occurs in montane forest at elevations of approximately 500–3,000 m; consequently, the road corridor lies within its potential ecological and elevational range. Cut-and-fill activities (especially the high ground slope/short cuts), spoil disposal, vegetation clearing and disturbance within root zones may result in the removal of mature trees, reduced natural regeneration and fragmentation of remaining stands. Accordingly, pre-construction flora/botanical surveys should be undertaken with the Department of Forestry to identify *E. urophylla* stands within the Project's area of influence. Where practicable, impacts should be avoided through design refinement and the establishment of clearly demarcated no-go areas. Where avoidance is not feasible, clearing and root-zone disturbance should be minimized, habitat connectivity and wooded gullies should be protected, erosion and sediment controls should be implemented, and restoration or offset measures should use locally sourced biological material.

IBAT – Estimated Species Report. The ESIA applies a 2.2 km evaluation zone encompassing the project's physical footprint and a 100 m buffer. The table presents the species that collectively contribute 90% of the site's START score, excluding species that contribute less than 2%. Higher-scoring species are more threatened and/or have a larger proportion of their global Area of Habitat within the site and buffer.

Table 15. Estimated Species Identificaation Within 100 m Buffer

Taxonomic group	Scientific name	Common name	Red List category	Percentage of global AoH	Percentage of $STAR_T$ score
BIRDS	Ducula cineracea	Timor Imperial-pigeon	Near Threatened	0.277	94.7
MAMMALS	Pteropus griseus	Gray Flying Fox	Vulnerable	0.005	3.5

Source: Species Report IBAT – Accessed on Sep 27, 2026

- ***Ducula cineracea* (Timor Imperial Pigeon)*:*** This site and buffer contains 0.28% of the estimated Area of Habitat for *Ducula cineracea*. This bird species accounts for 94.7% of the estimated START score within the site and buffer. The mountains of Timor-Leste were heavily deforested early in the 20th century, but habitat destruction has recently accelerated: an estimated 50% decline in remaining forest-cover occurred during Indonesian rule (1975-1999). Monsoon-forests now only cover an estimated 4% of West Timor, scattered around seven unprotected patches that are continually declining in size due to continued illegal cutting, intensive grazing and burning. In addition, pigeons are apparently hunted extensively in Timor-Leste, a factor that has presumably contributed to the decline of this species. The species occurs commonly down to the lowlands, thus its habitat is threatened by the expansion of mining activities and agricultural expansion, particularly driven by the cultivation of cash crops (Species Report Estimated STAR, IBAT)

- ***Pteropus griseus* (Gray Flying Fox):** This site and buffer contains 0.01% of the estimated Area of Habitat for *Pteropus griseus.* This mammal species accounts for 3.5% of the estimated START score within the site and buffer. The species is hunted for bushmeat in Sulawesi, along with other co-occurring flying fox species. Habitat quality is declining, as logging is a threat both in the Lesser Sundas and Sulawesi. Logging of forests leads to high levels of erosion, resulting in silt and rock

discharge from rivers into coastal wetlands, thus negatively impacting them by depositing too much material at once. In Timor, there is both slash-and-burn agriculture and timber harvesting. There is also unregulated manganese mining, which can negatively impact the watershed and result in further erosion and logging (Species Report Estimated STAR, IBAT)

5.3.5. Ecosystem Services

The highland ecosystems surrounding Hatubuilico and Mount Ramelau provide important provisioning, regulating, cultural, and supporting ecosystem services. Provisioning services include fuelwood, fodder, timber and poles for local use, wild plants, medicinal resources, agricultural land, water for households and livestock, and materials used in community practices. Regulating services include slope stabilization, soil retention, moderation of runoff, groundwater recharge around springs and seepage areas, local climate regulation, carbon storage in vegetation and soils, and reduction of sediment transport to downstream catchments.

Cultural ecosystem services are especially significant. Mount Ramelau/Tatamailau is an important national landmark, pilgrimage destination, sacred landscape, and tourism asset. The road supports access for residents, pilgrims, guides, small businesses, and visitors, while the surrounding landscape contributes to identity, spiritual practice, recreation, scenic value, and local livelihoods. Construction planning should therefore avoid degrading visitor experience, sacred or customary areas, community water sources, and landscape values. Supporting services include habitat connectivity, pollination, seed dispersal, soil formation, and ecological processes that sustain the remaining montane vegetation and associated fauna.

5.3.6. Protected Areas

In the short time since independence, Timor Leste has acted quickly to institute processes to form protected areas consistent with the Programme of Works for Protected Areas (PoWPA), under the United Nation's Convention on the Biodiversity Conservation (UNCBD). The Timor-Leste government signed the Convention on 10 October 2006 and became a Party to the Convention on 8 January 2007. As a signatory to the UNCBD, Timor-Leste undertakes to fulfill the Convention's requirements which include the PoWPA. The PoWPA is a global action plan to assist with the establishment of protected areas to cover at least 10% of each country. The focus of the global programme is for governments to identify and then fill gaps in their existing protected area networks (PANs).

The UNTAET Regulation No. 19/2000 on protected places lists 15 'Protected Wild Areas'. According to Birdlife International, many of these areas were identified as priority conservation areas by FAO/UNDP and the Indonesian Government back in 1982. However, boundaries had not been defined and the 15 sites have not been recognized in land use planning (Trainor 2007, cited in Trainor 2010). This regulation states that one of the protected wild areas is the summit of Tatamailau (Ramelau) Mountain, all elevations on Tatamailau Mountain above 2000 meters, and the surrounding forest, an area of approximately 20,000 hectares.

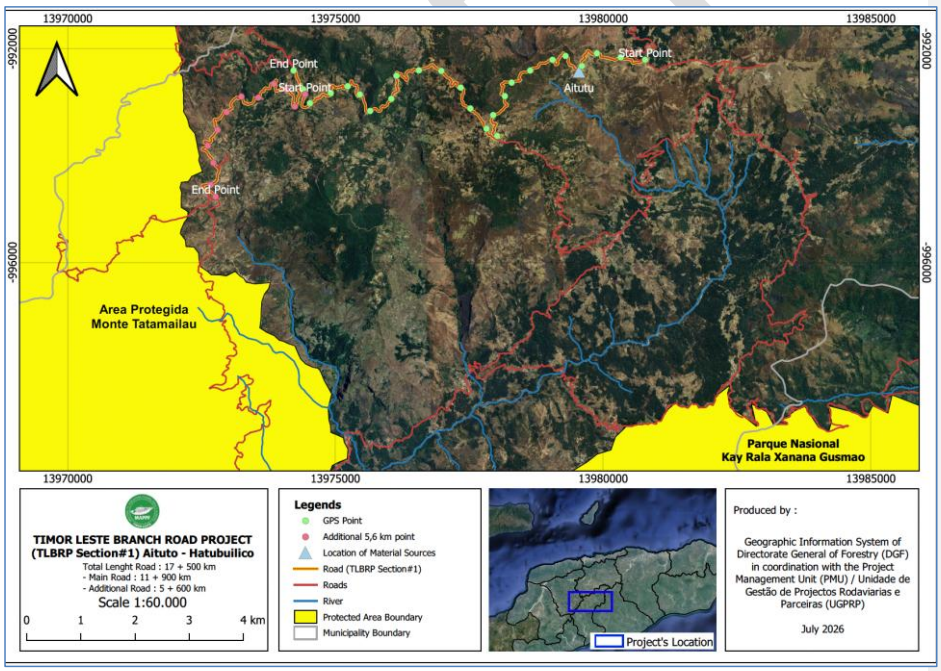
The national system for the protected area came into force through Decree Law 05/2016 (*Decreto Lei* No. 5 of 2016 *Sistema Nacional De Areas Protegidas*). The decree identifies 44 terrestrial and 2 marine protected areas and supersedes UN regulation (UNTAET Regulation No. 19/2000). Currently, all protected areas are in various stages of biological assessment and planning. Most of the areas have not

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yet been systematically surveyed due to the Government's lack of personnel and financial resources, hence formal boundaries have not been established.

The map below illustrates the spatial configuration of TLBRP2, which comprises the Aituto–Hatubuilico road corridor (Section 1) and an additional 5.4 km road section extending from Hatubuilico to the Ramelau Sanctuary. For the purposes of this ESIA, the assessment focuses on the Section 1 road corridor. This corridor traverses steep, mountainous terrain and follows a highly sinuous alignment, reflecting the rugged topography of the area. It also crosses or passes near a number of minor drainage channels, which may influence drainage design, erosion risk and slope-stability considerations. The western portion of the Hatubuilico–Ramelau Sanctuary road alignment lies adjacent to the mapped boundary of the Mount Tatamailau/Ramelau Protected Area. By contrast, Section 1 does not appear to intersect or directly adjoin the protected area. As this interpretation is based on mapped spatial data, the relationship between the road alignments and the legally defined protected-area boundary was confirmed through field verification by the Department of Protected Areas of the Ministry of Agriculture and Fisheries as shown in the following map.

Map 7. Protected Area Boundary and the Section 1 Road Alignment



The road section of Aituto – Hatubuilico Junction – Letefoho was not laid such in the protected forest; it was the land owned by the community for their residential area or farmlands. The farmlands and residential could be seen along the way of the existing road, hence there are no plant and animal species that could be of conservation significance were observed (at the time of site visit). The 12 km road at Hatubuilico junction 1 is ending at the existing road area of Nunomogue Suco, as the nearest

village and access to the Ramelau Mountain, the protected area. Community from vicinity villages has developed the area, mostly for their farmlands. The land use change is shown in Figure below.

Commented [BS6]: What is the estimated distance from this suco to the protected areas?

No threatened plant or animal habitats were recorded within the protected area traversed by the Branch Road Project. However, BirdLife International has identified Mount Tatamailau (Ramelau) as supporting endemic bird species classified as globally threatened under the IUCN Red List. The absence of recorded threatened habitats may be attributable to the highly degraded forests along the Section 1 road corridor and several open areas reportedly created by burning and clearing associated with military operations in the 1990s.

Figure 9. The Existing Land Use Change



The proposed Project area comprises open forest, agricultural land, and coffee plantations rather than primary forest. It is therefore botanically impoverished, with no plant species of conservation interest recorded. Furthermore, the endemic bird species are associated with primary forest habitat, which does not occur within the TLBRP 2 area.

6. Social, Economic, and Cultural Baseline

6.1. Demographic Baseline

Based on census 2022[1], Timor-Leste's estimated population was 1.34 million. The population is mostly concentrated around Dili, the capital city of Timor-Leste, with a population of 267.623 inhabitants. The population of 1.34 million is higher than in the year 2018 that of 1.32 million inhabitants. Ainaro Municipality has 73.115 inhabitants, less than 25% 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 municipalities. The selected demographic data (population, density, male/female ratio) of communities within the Aituto – Hatubuilico corridor are enumerated in the tables below. Household size on average is 6 people.

Table 16. Population Data of the Project Corridor based on the National Census 2022

Commented [BS7]: Convert the decimal system into an English system.
Are 37400 % and 35715 correct?

Administrative Unit	Area (Sq. Km)	Population (2022)	Number Of Private Household	Male	Female
Ainaro Municipality	234,65	73.115	12328	37400 (%)	35715 (%)
Hatubuilico Administrative Post	129,34	15.134	2380	7.748	7.386
Maubisse Administrative Post	191,60	28.577	4612	14.633	13.944
Suco Horai-Quik	10,40	2.114	376	1.030	1.084
Suco Mulo	46,65	6.718	1055	3.403	3.315
Suco Nunumoge	31,93	5.306	845	2.747	2.559

Table 17. Population at the Suco level based on Suco Administrative Data per Field Assessment September 2026

AINARO DISTRICT	POPULATION			
	Total	#Household	Male	Female
Suco Horaiquik	2277	479	1119	1158
Suco Mulo	8141	1706	4073	4058
Suco Nunumoge	5926	1209	3195	2731

6.2. Access to Education and Health Services

6.2.1 School Attendance and Literacy

Timor-Leste operates a 2-6-3-3 formal education structure (pre-primary, primary, lower secondary, upper secondary), with nine years of basic education officially free and compulsory. Primary schools are present in most Sucos along the 12 km road project corridor, but lower- and upper-secondary schools are concentrated in administrative-post centers, meaning secondary-age students from outlying Aldeias depend on road quality and transport to continue their education.

School Attendance. The 2022 Census measured school attendance (age 3–29) and youth literacy (age 15–24) at municipal and administrative-post level. Ainaro Municipality trails the national rate on both indicators, and the two administrative posts along project corridor diverge sharply from one another: Hato-Builico performs close to the municipal average, while Maubisse, despite hosting the area's main secondary school, records among the weakest indicators in the Municipality, reflecting the large, dispersed rural population the post serves beyond the town itself.

National school attendance stood at 54.6%. Ainaro Municipality was close to the national rate at 52.2%. Within the road corridor, however, the two administrative posts show a marked contrast: Hato-Builico posted a relatively high attendance rate of 55.8%, while Maubisse posted a markedly lower rate of 45.9%.

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Area	School attendance, age 3–29 (%)		
	Total	Male	Female
Timor-Leste (national)	54.6	53.6	55.7
Ainaro Municipality	52.2	50.5	53.9
Hato-Builico Admin. Post	55.8	53.4	58.3
Maubisse Admin. Post	45.9	44.8	47.1

The 2022 Census also recorded 7,239 people living in the urban area of Maubisse Administrative Post, illustrating that Maubisse is an important population centre within the municipality. However, the project communities include rural sucos and settlements where distance to schools, road conditions, household economic circumstances and availability of teachers may affect children's regular attendance and progression through the education system.

Literacy Baseline. The 2022 Census reports a general literacy rate of 72.4% nationally among people aged 10 years and above. In the project corridor, general literacy was 61.6% in Hato-Builico and 50.9% in Maubisse, indicating greater literacy constraints, particularly in Maubisse. The Census does not provide directly comparable literacy rates for the suco level.

Meanwhile, the table below indicates youth literacy (ages 15–24) was considerably higher: 87.3% nationally (86.4% male, 88.3% female), 79.4% in Ainaro Municipality (78.2% male, 80.7% female), 82.4% in Hato-Builico (81.0% male, 83.9% female), and 66.5% in Maubisse (64.4% male, 68.6% female). The higher youth literacy rates suggest generational improvements in access to education, although progress has been uneven, with Maubisse continuing to show a significant literacy gap. This generational difference matters to the project area because younger residents likely benefited more from expanded access to formal schooling than older adults. The census data also show that young women have higher youth-literacy rates than young men across the national, municipal and administrative-post data. However, this does not necessarily indicate that gender disparities have been eliminated among older cohorts, particularly women who may face greater access and mobility constraints.

Area	Youth literacy, age 15–24 (%)		
	Total	Male	Female
Timor-Leste (national)	87.3	86.4	88.3
Ainaro Municipality	79.4	78.2	80.7
Hato-Builico Admin. Post	82.4	81.0	83.9
Maubisse Admin. Post	66.5	64.4	68.6

Nevertheless, the relatively low literacy level recorded for Maubisse suggests that adult and older-generation literacy remains an important consideration, particularly for community engagement and access to project information. Project communication should therefore avoid relying exclusively on written materials. Community meetings, verbal explanations, visual materials, and locally appropriate communication channels should complement written notices, particularly where activities involve households with limited literacy.

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6.2.2 Health Facilities and Services

Health service provision along the corridor is concentrated in administrative-post centers, with Maubisse and Hatubuilico Municipality serving as the main locations for health centres and clinics. Community health workers and periodic mobile clinics provide limited coverage to outlying aldeias, but travel time to fixed facilities remains a key access constraint for the corridor's population, including for maternal health needs and emergency referral. This constraint is compounded by the area's mountainous terrain, marked dry-season/wet-season variability in road condition, and a dispersed settlement pattern, and is a primary access issue the corridor upgrade is intended to address.

During the field observation in September 2026, a new health centre was under construction in Sucos Nunumoge, with branch road about 600 meters from the corridor. The health centre is being built by Haburas Dezenvolve Talento (HADEZTA) with support from the Government of Japan, as part of an effort to improve access to primary health care and strengthen basic service provision in rural areas. The 12 km Aituto – Hatubuilico Junction Road is the clinic's only main access route, meaning construction activities along the area of impact must ensure unimpeded public access to the facility and safeguard community health and safety throughout the works period.

WHO data 2021[3] identify tuberculosis as the leading cause of death for both men and women in Timor-Leste, and communicable diseases collectively account for approximately 39% of deaths nationally. Timor-Leste has historically maintained a low overall HIV prevalence (below 1% in the general population), though recent data point to a concerning rise among specific population groups, alongside persistent challenges related to stigma and sexual health literacy[4]. Ainaro is additionally identified as one of the high-risk municipalities for rabies infection[5].

6.3. Employment and Livelihood

6.3.1 Agriculture and Livestock

Beneficiaries in the Project area are predominantly rural subsistence farmers who earn income by cultivating and marketing cash crops. Agricultural production within the Ainaro Municipality section of the corridor focuses heavily on horticulture and food crops. Major horticultural crops grown in Ainaro[6] include cabbage, white mustard, black mustard, white squash, shallots, garlic, carrots, lettuce, and legumes such as green beans. Food crop production is led by local maize, cassava, sweet potato, and potato. In terms of industrial tree crops across Ainaro Municipality, coffee remains prominent (up to 4,116,612 cofee trees)., concentrated heavily in the project-affected administrative posts of Maubisse Coffee income is concentrated in the June–August harvest window and typically spent within a few months, producing a recurring seasonal food-security gap for many households between roughly November and March.

Livestock rearing constitutes a core pillar of rural household savings, social transactions, and food security throughout the project's influence area. According to the 2019 Timor-Leste Agricultural

3 https://data.who.int/countries/626
4 https://timor-leste.unfpa.org/en/topics/hiv-and-aids
5 https://rr-asia.woah.org/app/uploads/2025/02/11-Timor-Leste.pdf
6 Agriculture Municipality of Ainaro, 2018. https://inetl-ip.gov.tl/pt/2024/01/11/ainaro-in-figures-2021/

Census[7], Ainaro Municipality recorded 7,052 agricultural households owning any livestock. Earlier 2015/2016 suco-level census benchmarks in the corridor confirm widespread household participation in livestock rearing, with 1,061 households engaged in Suco Mulo, 621 in Suco Nuno-Mogue, and 274 in Suco Horai-Quic[8]. Within the project-influenced administrative posts directly traversed by the Gleno–Maubisse corridor: Hato-Builico maintains 816 buffaloes, 503 cattle, 985 sheep, 423 horses, 2,155 pigs, 7,345 native chickens, and 15 goats. Maubisse holds 1,447 cattle, 896 buffaloes, 2,228 sheep, 1,422 horses, 3,294 pigs, 9,101 native chickens, 539 goats, and 2 dairy cattle.

Because most households depend on farming and livestock, road construction could harm livelihoods without proper mitigation. Land take may cause loss of cropland and coffee trees, while dust, runoff and road closures may damage crops, disrupt water points and cut off access to fields and markets. Free-ranging livestock is at risk from construction, traffic and excavations. These risks can be managed by minimizing land used for the project, compensation, scheduling works, road safety, and maintaining access during construction. Once completed, the road should improve market access for crops and livestock.

6.3.2 Tourism

Ainaro Municipality is one of the most popular tourist sites in Timor-Leste, with Mt. Ramelau as the country's highest mountain located in this area; hence both administrative posts of Maubisse and Hatubuilico also receive a lot of visitors. Ainaro well-known with spectacular scenery that provides wonderful opportunities for exploring and hiking from the central mountains to the summit, includes pilgrim tourism to Mt. Ramelau, which is sacred to the Timorese.

The corridor itself is central to Timor-Leste's principal domestic and international tourism circuit: Maubisse is an established weekend/overnight destination, and Hatubuilico Junction is the gateway for pilgrim and trekking tourism to Mount Ramelau (2,986 m, with a Virgin Mary statue at the summit), reached via the Hatubuilico Junction–Ramelau Sanctuary Road, which is under separate project preparation and outside the scope of this updated ESIA. Community-based ecotourism (guesthouses, homestays, small restaurants) has begun to develop along the project corridor itself where the local community has substantial control over, and involvement in, its development and management. Particularly around Maubisse and Hatubuilico town, road improvement will improve access and tourism activities.

6.3.3 Small Enterprise, Trades, and Employment

The Timor-Leste Census 2022 Thematic Report on Labour Force provides updated national and municipal labour-market context for the corridor. Nationally, labor force participation stood at 35.9% (41.9% male, 29.7% female), with the employment-to-population ratio was 34.9% (40.7% male, 28.8% female). Ainaro Municipality recorded 14,163 employed persons (8,053 male, 6,110 female) and an

7 Timor Leste Agriculture Cencus 2019. https://inetl-ip.gov.tl/2023/03/16/2241/

8 SEIS/ ESIA 2019

employment-to-population ratio of 31.4% (35.0% male, 27.7% female), below the national average and among the lower rates of any municipality.

The same source confirms that by occupation, "skilled agricultural, forestry and fishery workers" (33.2% of national employment) and "service and sales workers" (17.9%) are the two largest categories nationally, mirroring the corridor's own farming-plus-petty-trading livelihood pattern. Own-use subsistence agricultural production (distinct from employment) is also significant in Ainaro specifically: 8,244 individuals (27.3% of the municipality's population outside the labor force) were engaged in agricultural production for own consumption in 2022. Ainaro's youth NEET (Not in Employment, Education or Training) rate of 36%, above the 32.4% national rate, further signals limited local formal employment and training opportunities for corridor youth, reinforcing the relevance of the Project's local-labor-recruitment provisions.

In peri-urban stretches, livelihoods diversify to include kiosks and food stalls, passenger-transport services, construction trades, and government/service employment. Few small enterprises such as kiosks line rural areas within the corridor and sell basic necessities, but local residents mostly sell agricultural produce for cash to community members and travellers through roadside shelters and small municipal marketplaces built by the government. One periodic market in Suco Nunumoge operates weekly, every Tuesday, near the corridor. Unlike the smaller informal roadside kiosks described elsewhere in this section, this market draws traders and buyers from multiple surrounding Aldeias on its trading day and represents a concentrated, time-bound point of community and economic activity that will need specific traffic-management and trading-continuity measures during construction.

6.3.4 Poverty Levels

The Council of Ministers of Timor-Leste has endorsed the publication of the Summary Report on Poverty in Timor-Leste, based on findings from the 2024 Timor-Leste Living Standards Survey (TLSLS), and provides updated information on the incidence and characteristics of poverty across the country[9]. The results show that Timor-Leste's national poverty rate declined from 41.8 per cent in 2014 to 37 per cent in 2024, representing a reduction of 4.8 percentage points over the decade. However, poverty remains significantly more prevalent in rural areas, affecting 45.5 per cent of the rural population compared with 18.4 per cent in urban areas. Considerable differences also persist across municipalities.

Ainaro is consistently identified as one of Timor-Leste's most vulnerable municipalities. Data from the 2014 National Institute of Statistics of Timor-Leste (INETL) recorded a poverty rate of 43.2 per cent in Ainaro, based on the national poverty line[10]. More recent multidimensional poverty analysis from 2021 also highlights the severity of deprivation in the municipality. Approximately 68 per cent of Ainaro's population was classified as multidimensionally poor, placing Ainaro among the municipalities with the highest levels of multidimensional deprivation in the country, alongside Ermera. This indicates that nearly seven out of every ten residents experienced overlapping

9 https://timor-leste.gov.tl/?p=51782&lang=en
10 https://inetl-ip.gov.tl/sei/t/poverty-inequality/poverty/dynamic-table/poverty-rate/by-district/2014

deprivations across at least one-third of the weighted Multidimensional Poverty Index (MPI) indicators, including access to clean water, electricity, and basic education.

Taken together, these findings indicate that although poverty has declined nationally over the past decade, significant geographic disparities remain, with rural municipalities such as Ainaro continuing to experience high levels of both monetary and multidimensional poverty.

6.4 Gender and SEA/SH Profile

The Government of Timor-Leste, United Nations agencies, international development partners and civil society organizations have continued to promote gender equality and women's empowerment through legislation, policies, programs and services. Timor-Leste's electoral framework requires political party lists to include at least one woman in every group of three candidates, which has contributed to relatively high representation of women in the National Parliament. Women held approximately 35.4% of parliamentary seats as of February 2024[11].

Despite progress in women's national political representation, decision-making at customary, household and community levels remains predominantly male in many rural areas. Gender roles along the project corridor broadly reflect the patriarchal and patrilineal-leaning social structure of Timor-Leste's central highlands, mediated by the Mambae uma ("house society") system prevalent in Ainaro. Tara Bandu processes and Suco/Aldeia leadership structures, including the roles of Suco Chief, Nai Liurai, Nai Dato and Rai Nain, are generally more likely to be occupied by men. Consequently, consultation through household heads, customary leaders or other community representatives alone may not adequately capture women's views. This is particularly relevant to land acquisition, compensation, livelihood restoration, employment, road safety and community infrastructure. Project engagement should therefore provide opportunities for women to participate directly and should avoid assuming that the views of male household heads represent all household members. Separate women's consultations or targeted engagement may be appropriate where social norms inhibit women's participation in mixed meetings.

Access to Services, Education and Employment. Previous consultations with the community in 2018 identified travel time, transport availability, cost and safety as constraints on women's and girls' mobility, particularly for travel beyond primary schools and to larger markets. Women's market activities are largely concentrated in informal roadside stalls, shelters, and periodic markets. Access to larger markets in Ainaro, Maubisse and elsewhere is constrained by transport costs, travel time and safety concerns.

Girls' continuation into lower- and upper-secondary education is particularly sensitive to travel distance, travel time and safety, as secondary schools are concentrated mainly in Maubisse town. This contributes to the broader pattern in which primary-school attendance is relatively high while secondary participation is substantially lower. Gender disparities in literacy and education also remain relevant, particularly among older generations. Improvements in road quality and transport services

11 https://data.ipu.org/parliament/TL/TL-LC01/data-on-women/?utm_source

are therefore expected to have potential gender benefits by reducing travel time and improving the reliability and safety of access to education services.

Women's participation in the formal labor market remains lower than men's, particularly in rural and agriculture-dependent areas. The 2021 Timor-Leste Labor Force Survey[12] recorded a labor-force participation rate of 24.2% for women compared with 36.9% for men, with an overall participation rate of 30.5%. Women accounted for approximately 92,300 of the 234,300 employed persons recorded by the survey. These national figures are consistent with the need to consider gender-specific barriers to employment in rural infrastructure projects. At the same time, women's demonstrated participation in Roads for Development program (R4D)[13] labor-based road works indicates that women can and do participate in road construction and maintenance when opportunities are accessible. However, female-headed households and women with limited independent income may be particularly vulnerable to exclusion from project-related employment or contracting opportunities. The Project should therefore incorporate gender-responsive recruitment and employment measures, including local recruitment, equal opportunity for women and men, transparent selection procedures, suitable working arrangements, safe workplaces, appropriate facilities and prevention of sexual harassment and exploitation.

Gender Based Violence (GBV) and Sexual Exploitation and Abuse, and Harassment (SEA/SH) profile. Gender-based violence in Timor-Leste is widespread and one of the critical social issues. The Nabilan Baseline Study 2016[14] found that GBV is the largest category of crime reported to police, although most cases are dealt with informally and never reported. The report also found that 59% of ever-partnered women had experienced physical and/or sexual Intimate Partner Violence (IPV). The 2016 DHS[15] gives lower but still substantial estimates, with IPV at 36.8% among ever-married women, and in 2018[16], 28.2% of women aged 15–49 reported physical and/or sexual violence by a current or former partner in the previous 12 months.

Sexual exploitation and abuse are also serious concerns. Nabilan Baseline Study 2016 also found 14% of women have been raped by a non-partner. Childhood sexual abuse affects 24% of women and 42% of men. Only 5% of survivors reported to police, and most perpetrators faced no legal consequences. Sexual harassment in public spaces, schools, and workplaces is increasingly reported in online news, but there is no updated population-based SEA/SH or workplace harassment survey.

Timor-Leste has a strong legal, policy and institutional framework for addressing its gender-based violence. It criminalizes SEA/SH offences, including rape, sexual abuse, and any sexual act with a child under 14, with heavy prison sentences, and accountability for sexual offences is reportedly improving despite gaps in judicial capacity. Within the project-affected area in Ainaro Municipality, however, survivors have very limited access to local social and legal support services. No specialized SEA/SH shelter, medical-forensic or legal aid provider is based in the municipality. The nearest dedicated service is in Suai, which covers Covalima, Ainaro and Manufahi and provides counselling, medical-

12 https://www.ilo.org/sites/default/files/wcmsp5/groups/public/%40asia/%40ro-bangkok/%40ilo-jakarta/documents/publication/wcms_863064.pdf

13 https://www.ilo.org/resource/article/women-are-capable-working-rural-road-works
14 https://asiafoundation.org/wp-content/uploads/2017/06/nabilan-main-report-screen-2017_06_08.pdf
15 https://timor-leste.unfpa.org/sites/default/files/pub-pdf/summary_data_mapping_report_2_pages_4_june_2021.english_0.pdf
16 https://data.unwomen.org/country/timor-leste

forensic examinations and emergency accommodation, so survivors must travel outside the municipality for specialized care. Locally, support is limited to social welfare officers at Administrative Post level, who liaise with the national referral network and the police Vulnerable Persons Unit, and general health services, including Maubisse Referral Hospital.

The TLBRP provides a tested basis for managing SEA/SH risks in this setting. The project made notable progress in SEA/SH prevention and risk management by preparing and implementing a SEA/SH Action Plan. Under the Plan, the PMU developed inclusive communication materials on SEA/SH prevention and delivered SEA/SH training. It also established a specific mechanism to receive and handle SEA/SH grievances and cases confidentially. These arrangements can be adopted for the proposed Project and adapted to its scope and to the limited-service landscape in Ainaro.

Figure 10. Example of an SEA/SH Prevention Poster in the Administrative Post Office



6.5. Social Organization and Cultural Practices

Language. Ethnic association in Timor-Leste mostly associated with language. About 17 languages are spoken across the country, each with a distincinguistic origin. Broadly, Timor's languages derive from one or two major language groups: Austronesian (Malay-Polynesian) and Papuan (Melanesian). The constitution and national vision statement have ensured that any differences existing between Timorese people due to language, religion, ethnicity would be respected; values would be preserved within the framework for establishing equal and universal rights for all Timorese. The main ethnic group is the Mambae, predominant in Ainaro together with Tetun Prasa and Bunak. Most of the population is bilingual, speaking their own language plus Tetum. Portuguese is still spoken by the intellectual leadership and a few older people, and most of the population understands Bahasa Indonesia.

Religion. The majority of the local population is affiliated with the Roman Catholic faith, consistent with the wider religious context of Timor-Leste. Churches and chapels serve not only as places of worship but also as important community spaces where residents participate in regular Mass, religious instruction, celebrations, and other parish activities. Religious occasions, including patron saint feast days and other Catholic festivals, provide opportunities for families and community members to

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gather and strengthen social relationships. Catholic beliefs and practices commonly coexist with customary traditions and ancestral beliefs.

Social Organization and Governance. Local governance within the corridor of Sucos (Horai-Quic, Mulo, and Nuno-Mogue) operates through a dual system that integrates formal state administrative structures with customary authority. At the local level, each Suco is led by an elected Suco Chief supported by a Suco Council comprising Aldeia (hamlet) Chiefs, respected elders, and mandated representatives for women and youth. Suco Chiefs are broadly recognized as effective coordinators and mediators, and while women and young people hold formal seats within council structures, entrenched social norms often limit their practical influence in decision-making. Above the Suco level, the Administrators of the Maubisse and Hatubuilico Administrative Posts coordinate administrative matters between individual Sucos and the Ainaro Municipality. Community decision-making throughout the area is fundamentally communal rather than individual, relying primarily on public meetings convened by Suco or Aldeia Chiefs to plan development, discuss shared concerns, and resolve local disputes.

Customary institutions and traditional authorities remain central to community governance, particularly regarding conflict resolution and the management of land and natural resources. Respected elders provide essential guidance during communal forums and serve as the first point of contact for everyday dispute mediation, reinforcing social cohesion around shared norms. Crucially, the customary conduct and resource-management code known as Tara Bandu operates through a direct partnership between elected leaders and customary authorities, conferring legitimacy across both formal and traditional governance spheres. Tara Bandu is a spiritual and customary Timorese system that establishes social contracts governing relationships among people, livestock, and the environment. Rooted in communal consultation, it sets local rules, resource-harvesting restrictions, and penalties—from physical fines to supernatural consequences—and is symbolically marked by a wooden pole. Tara Bandu is regularly utilized to establish and enforce community rules regarding environmental protection, resource access, and social obligations.

Beyond formal administrative bodies, several non-governmental and religious institutions play key roles in local social organization. The Catholic Church is the most consistently active institution across the project corridor, shaping community life through religious services, welfare activities, and social support network delivery. Formal community-based organizations are relatively limited, consisting mainly of informal farmer groups organized around coffee production, as well as smaller youth and women's associations that offer occasional avenues for collective action. Together, customary leaders, elders, Church representatives, and local group leaders provide vital channels for community communication and conflict mediation. Involving these respected key stakeholders will be essential for designing culturally appropriate consultation processes, managing information disclosure, and establishing effective Project grievance mechanisms.

Culture and Tradition. The Lulik demands that nature (land, water, trees/forest, rocks/stone) must be respected. This is the reason for ceremonies like the ritual after the harvest of corn and before planting. The ritual is meant to show gratitude and to value the fertility of the land such as the Sau Batar ceremony performed before the corn harvest; one of the important rituals of the Timorese people. A prior social assessment conducted for the BRP indicates that community practices on Luliks were neither identified nor reported along the proposed road corridor (Jeffry A, 2018). However, the

project through engineering measures and consultations intends to enforce precautionary measures to avoid impacts on cultural and spiritual sites, and respect communities' ritual practices pre- and during construction stages.

Social identity and exchange patterns are defined through the relationships of Umane (wife giving houses) and Feto-saa(n) (wife taking houses). These two types of kinship structures are seen to play mutually enforcing roles, pledged to provide security and fertility to each other. Generalized exchange characterizes marriage alliances that are contracted between and among houses. Houses are also arranged hierarchically around chiefdoms, thus having a significant role in the local political organization. Individual houses are also the focus of life-cycle rituals and private rites with the presence of both wife-takers and wife-givers, while collective rituals involve the entire community.

Traditional/customary hierarchical local structures are still observed to varying degrees in the proposed Project area. Executive figures, such as kings (rei) or rulers (regulo), are acknowledged by the peoples of those Sucos. *Nai Liurai* (head of the chief) and *Nai Dato* (chief) are commanded under the King (regulo). Another hierarchical local structure identified in the area is *Rai nain* (landlord) or representative of the ancestral. *Rai nain* has significant power over land and decision making at the local level. The *Nai Liurai* and *Nai Dato*, however, had a degree of autonomy and authority to manage their chiefdoms' affairs, particularly in settling internal disputes and matters of inheritance and land.

Cultural Heritage. Traditional culture across the corridor is organized around the Lulik belief system, sacredness governing relationships among people, ancestors and nature, expressed through customary sacred houses, sites and seasonal ritual practice (e.g., Sau Batar, the corn-harvest ceremony). The field observation for the wider corridor documented several cultural heritage assets and landmarks within or adjacent to the project corridor of impact that are part of sensitive receptors summarized in E&S Sensitive Receptors below. The field observation found no community practices tied to a Lulik ritual site directly within the then-assessed road footprint but recommended precautionary avoidance and continued consultation. A dedicated cultural heritage assessment and Chance Find Procedure for the project alignment remain a priority of action.

6.6. Land Tenure and Use

Timorese statutory law distinguishes between the public and private domain of the land under Law No. 1/2003, with public domain land placed under a protective regime ensuring state control, while private domain land functions under the same legal rules as private property. Although national law classifies immovable property as urban or rural, formal nationwide delimitation remains incomplete, and four potential claimant categories exist: traditional customary occupiers, Portuguese title holders, Indonesian title holders, and current possessors.

Most rural land is unregistered, with origin groups exercising authority through customary institutions where families and clans (uma) hold individuated rights over residential plots, gardens, and agricultural land. Along the project corridor of impact, customary governance is shaped by the Mambae uma system and traditional authorities, such as the Rai Nain, Nai Liurai, and Nai Dato, who identify ancestral boundaries and mediate disputes alongside formal Suco leadership, with Tara Bandu regulating natural resource access and local conflicts. Local customary tenure structures predate and survived Portuguese and Indonesian rule, and while paddy fields are absent in the project area, highland shade vegetables and coffee serve as primary household livelihoods. Land formally classified

as state or public domain frequently functions as communal land for grazing, firewood collection, and subsistence farming, meaning formal state ownership does not imply the land is free of customary access rights.

6.7. Indigenous People

Consistent with both the corridor-specific 2019 screening and the Dili–Ainaro precedent, this assessment concludes that Indigenous People standard per ESS7 is not formally triggered for the project road corridor of Aituto-Hautubuilico Junction, as there is no distinct or vulnerable ethnic group within the corridor's area of influence that is set apart from the general population by the ESS7 criteria. Communities in the corridor of Sucos share similar cultural, linguistic and social characteristics with the broader population of Ainaro Municipality and Timor-Leste as a whole. Suco communities, predominantly Mambae-speaking, with Kemak forming a strong minority further west, retain kinship networks and traditional institutions but constitute the dominant regional population group rather than a distinct, geographically bounded minority. Tetum is widely spoken alongside Mambae. This conclusion rests substantially on local recognition and the absence of any officially designated Indigenous territory in the area, an approach comparable to that taken in other recent Timor-Leste infrastructure assessments.

The explanation below evaluates in more detail on the population within the Project Area of Influence (Horai-Quic, Mulo, and Nuno-Mogue Sucos) against each ESS7 criterias, although these are not triggered for the 12 km Aituto – Hatubuilico Junction Road project:

- Self-identification and Recognition: Corridor residents identify primarily as ethnolinguistic Mambae (with Kemak minorities) organized into lineage groups (*uma*). However, they do not identify as a separate, marginalized, or distinct "indigenous minority" vis-à-vis national society. In Timor-Leste's post-colonial nation-building, indigenous identity is shared broadly across the national citizenry rather than claimed by isolated subgroups.
- Collective Attachment to Habitat/Territory: Corridor communities demonstrate deep collective, intergenerational ties to ancestral lands (*Rai Nain* stewardship, sacred natural landmarks, *Uma Lulik*, and seasonal harvest rituals like *Sau Batar*). However, these habitats are not segregated or geographically distinct enclaves set apart from the dominant regional population of Ainaro Municipality.
- Distinct Customary Institutions: Local administration operates an integrated, dual governance system: statutory elected leaders (*Chefe Suco*, Suco Councils under Law No. 9/2016) work directly alongside customary elders and enforce *Tara Bandu* customary agreements. These customary institutions are not isolated from or opposed to mainstream Timorese society, rather, they form the bedrock of mainstream rural governance nationwide and are constitutionally recognized.
- Distinct Language or Dialect: Mambae is the primary mother tongue spoken daily across households along the alignment. While different from official Portuguese, Mambae is one of Timor-Leste's major national languages recognized under the Constitution. Furthermore, official national Tetum (Tetun-Dili) is universally understood and spoken alongside Mambae throughout the Sucos corridor.

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Although ESS7 is not formally triggered and a standalone Indigenous Peoples Plan (IPP) is not required, because the rural population shares customary attributes universally, the Project shall apply the full intent of ESS7 through meaningful community participation through free, prior and informed consultation; culturally appropriate engagement across all corridor Aldeias, utilizing bilingual communication (Tetum and Mambae oral translation) and visual formats tailored to rural literacy levels; protection of sacred and ancestral assets, including enforcing design buffers, avoidance protocols, and Chance Find Procedures around *Uma Lulik*, sacred springs, and the Heluli ancestral site in collaboration with *Rai Nain* custodians.

Adverse impacts on communities avoided, minimized, mitigated or compensated, supported by a grievance mechanism that is rooted in, and builds on, traditional community structures; culturally appropriate benefits that respect local socio-economic conditions, beliefs and traditional practices; and transparent disclosure of key project documents (the ESIA, LARAP, ESMP, SEP) translated into Tetum and communicated through oral, visual and written formats appropriate to the corridor's education and literacy baseline, rather than through written notices alone.

6.8. Disadvantaged and Vulnerable Groups

The baseline demographic and socio-economic dynamics within the project's area of influence closely reflect national vulnerabilities in Timor-Leste, including high youth dependency, geographical isolation in mountainous terrain, scarce formal employment, and vulnerability to climate and economic shocks. The baseline profile and project-specific risks for each primary vulnerable group across the project corridor are outlined below:

- **Women and Female-Headed Households**: Women in the project corridor play central roles in agricultural production and domestic management, yet they systematically face lower formal education levels, lower cash incomes, restricted access to formal employment, and reduced participation in decision-making. Economic dependence on male relatives remains prevalent, and risks associated with SEA/SH persist, particularly with potential labor influxes during construction. Female-headed households are especially vulnerable to economic shocks and temporary land acquisition impacts due to limited labor availability and reliance on subsistence farming.
- **Children and Youth**: Children and youth make up nearly half of the local population across the project corridor. According to the 2022 Census, Ainaro municipality has 36,616 children (ages 0-18), which is 50% of the total population. While strong family and community networks offer social support, many children face health challenges, including risks of malnutrition, stunting, and early school dropout driven by household economic needs. During civil works, children face heightened risks from road traffic hazards, construction equipment, dust emissions, and noise, particularly near school zones and along the high-traffic route leading to the Ramelau Sanctuary.
- **Elderly Persons (Aged 60+)**: Elderly community members represent a smaller proportion of the population and are physically vulnerable due to limited mobility, chronic health conditions, and a lack of specialized rural health care. Based on Census 2022, Ainaro has around 2,86% elderly persons, and most are cared for by family networks or supported by modest government social pensions. However, as working-age adults migrate for employment opportunities, some elderly individuals face social isolation. During project implementation, the elderly face heightened safety risks in built-up sections or steep terrain lacking dedicated sidewalks, wide shoulders, or safe pedestrian crossings, and may struggle to navigate temporary construction detours.

- **Persons with Disabilities:** The 2022 Census recorded 17,061 persons aged 5 and over with a disability nationally (1.4% prevalence under the core census threshold), with rural prevalence (1.7%) more than double urban rates (0.7%). Walking (44.3%), seeing (39.1%), and hearing (37.3%) difficulties are the most prevalent national disability types. Nationally, only 34.3% of working-age persons with disabilities were economically active in 2022, and formal safety net coverage remains low (21.6% receiving disability pensions in 2020), forcing most PwDs to rely entirely on family support. At the local level, inaccessible infrastructure, steep terrain, and limited institutional support constrain mobility and community participation. PwDs face physical safety risks during road construction, risk exclusion from local hiring programs, and require universal access features (such as low-gradient pedestrian ramps and continuous paved shoulders) in final engineering designs.
- **Economically Vulnerable and Near-Subsistence Households**: Given Ainaro Municipality's historically high poverty rates and the seasonal cash-flow gap between coffee harvests, households relying primarily on smallholder farming or informal day labor are highly sensitive to disruptions. Temporary loss of roadside vending spots, minor land acquisition affecting crops or fruit trees, or temporary access blockages to local markets can severely impact household food security and daily income.

Although there are no specific population data on each vulnerable group at the Suco level, Suco-level administrative data record[17] a combined total of 79 vulnerable individuals in Suco Horai-Quic and 13 people in Suco Mulo, consisting of women-headed households, PWDs, and elderly persons. Community planning and Suco council meetings across the corridor shall be inclusive, with women represented on Suco councils and youth engagement encouraged. Any project-related land acquisition, resettlement, or civil works, including temporary access management, worker hiring, and safety planning, must give priority attention to the specific needs of these vulnerable groups to ensure equitable support, non-discrimination, and targeted mitigation measures.

6.9. Socio economic baseline of Project Affected People

The project is expected to be delivered mainly within the existing road reserve/alignment, consistent with the 2019 detailed design approach, which would limit the scale of physical displacement relative to an entirely new alignment; however, this cannot be confirmed until the updated detailed design and DMS are complete.

Based on the 2019 field assessment and the nature of land use along the corridor, the following project-affected party categories are anticipated and should be updated through the LARAP census and asset inventory in October 2026:

- Landowners/customary land holders whose garden, plantation or house-yard land falls within the confirmed right-of-way or ancillary-site footprint (borrow pits, spoil disposal, contractor camps).
- Owners/operators of roadside kiosks, or other small businesses directly adjacent to the existing alignment.

17 The data were collected during interview with Sucos chief during field observation

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- Households with fruit trees, fencing, or other assets (structures, wells) within the right-of-way requiring compensation even absent full land loss.
- Suco/community-collective holders of cultural assets (Uma Lulik, sacred sites) that may require realignment avoidance rather than monetary compensation.

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7. Environmental & Social Sensitive Receptors

7.1. Overview of E&S Screening

A broad screening of the the 12 km Aituto – Hatubuilico Junction Road was undertaken as part of this ESIA, using a combination of desktop review and field verification conducted in September 2026. The screening produced a high-level spatial overview of environmentally and socially sensitive areas and receptors located within or near the project area of influence where project activities may give rise to environmental and social risks or impacts. However, they are indicative in nature and should not be interpreted as an exhaustive or definitive inventory of all sensitive receptors. Accordingly, the maps should be used by the Supervision Consultant during implementation as a practical reference for monitoring and oversight, and by the Contractor as an input for the CESMP. In particular, they provide an initial indication of the density, distribution, and relative proximity of key sensitive receptors, and should be supplemented through consultations, assessment and verification prior to civil works.

Map 8. Environmental and Social Screening



7.2. Water Supply

Four community water taps were identified along the road corridor and are considered sensitive social receptors because they provide access to water for nearby households and road-side users. These facilities may be temporarily affected by construction activities, including access restrictions, accidental damage, dust generation, traffic movement, or disturbance during drainage, earthworks, and road-widening activities. The Contractor shall verify the precise location and functionality of each tap before commencement of works, consult affected users, maintain safe and continuous access wherever practicable, and implement temporary alternative water supply arrangements if service interruption cannot be avoided.

	A springwater source is also located adjacent to the existing road and should be treated as an environmentally and socially sensitive receptor. Prior to construction, the Contractor shall confirm whether the spring is used for domestic, cultural, or other community purposes. Measures shall be included in the CESMP to prevent sedimentation, contamination, physical damage, or obstruction of access, and to ensure that any works near the spring are carried out with appropriate protection, consultation, and monitoring arrangements including requirements for risk-based assessment, community health and safety, and stakeholder engagement.

7.3. Cultural Heritage

The field observation identified at least six cultural heritage receptors within or immediately adjacent to the Section 1 road corridor, comprising sacred and ancestral sites (the Heluli site/Sacred Tree, the Sacred Entrance, Uma Lulik, and Sacred Water), a historically significant horizontal cave, and cemeteries, as summarized in the table below. Several of these sites are located directly within, or within a few metres of, the existing road reserve and are therefore considered highly sensitive social and spiritual receptors, reflecting the Lulik-based belief system described earlier in this chapter. Precise verification of the boundary, custodianship, and current ritual use of each site was constrained by the pace of the September 2026 field screening and should be confirmed through dedicated ground-truthing and community consultation prior to finalization of the detailed design and commencement of civil works.

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7.3.1 Heluli Cultural Heritage Site / Sacred Tree



This sacred tree is located in Horai-Quic Suco, Lauheli Aldeia, at approximately Sta 1+080, about 15 m from the existing road. The tree's prominent canopy and the deliberately built-up mound at its base are consistent with a marked, actively venerated site rather than an incidental roadside tree. Although the site lies outside the immediate carriageway footprint, it falls within the zone potentially affected by drainage works, embankment cutting, vibration from heavy machinery, and dust deposition on the canopy, and any unmanaged clearance or grading nearby could disturb the platform, damage root systems, or be perceived by the community as a desecration of the site regardless of physical distance. The Contractor shall demarcate a minimum buffer zone around the site in consultation with the Suco Council, Rai Nain, and lian-na'in, avoid material stockpiling, machinery parking, or vegetation clearance within the buffer, control dust and vibration from nearby works, and record agreed protective measures in the CESMP.

7.3.2 Sacred Entrance



The Sacred Entrance is a customary gateway marking the entrance to a Lulik compound on the road's left-hand side close to the sacred tree above. The gateway and its stone wall sit close to the road edge and could be directly affected by widening, grading, or drainage works. Removal or disturbance of the gateway would compromise the recognized entrance to the Lulik compound and could be viewed by the community as severing a customary boundary. The Contractor shall avoid encroachment on the gateway and its stone wall and consult the Suco Council and other affected stakeholders on any unavoidable works in the vicinity, recording agreed protective measures in the CESMP.

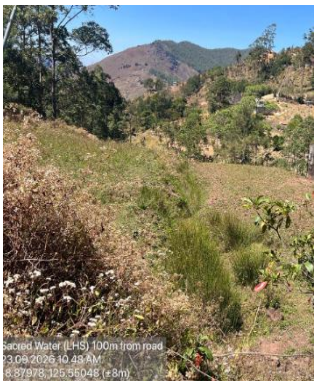
7.3.3 Uma Lulik (customary sacred house)

The Uma Lulik (customary sacred house) is a collectively owned ancestral house, sensitive to slope works and realignment, located in various Aldeias along the corridor, and across from the potential quarry location. Some of the houses are sited on landslide-prone ground that makes them vulnerable both to direct construction disturbance and disruption, as well as to secondary effects of slope-related works elsewhere along the corridor and any visible damage or perceived risk to the structure is likely to generate significant community concern given its status as a sacred house. The Contractor shall commission a slope-stability assessment for the hillside supporting the Uma Lulik prior to construction, consult the responsible Suco/family groups on any activity that could affect the structure or its surrounding land, apply measures to community health and safety, and record agreed protective measures in the CESMP.

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7.3.4 Sacred Water



The Sacred Water site is a natural spring requiring avoidance and a design buffer, located in an adjacent hill complex on the road's left-hand side (LHS), approximately 100 m from the road and was not allowed to be photographed during field observation. Although the site lies outside the immediate road footprint, it could be affected by sedimentation, contamination, or altered surface drainage arising from earthworks, cut-slope drainage, or spoil disposal, and any perceptible change of the spring would be considered a significant impact given its sacred status. The Contractor shall confirm the catchment area draining to the spring and route or attenuate construction drainage, spoil disposal, and stockpiles to avoid sedimentation or contamination, monitor water quality and flow at the site during construction, and consult the Suco Council on any ceremonial or domestic use of the water prior to works upslope, and record agreed protective measures in the CESMP.

7.3.5 Cemeteries

At least two burial grounds were identified along the corridor: one burial ground sits on the upper slope on the road's right-hand side (-8.88313, 125.54381), while the second location is located right on the side of the road across Manumera Primary School (Sta 5+183). Grading, widening, drainage works, or borrow/spoil activity along the road and access tracks could physically encroach on unmarked grave boundaries. Disturbance of a grave, even inadvertently, would constitute a severe cultural and social impact and carry a risk of community grievance. Some family graves are also integrated with houses and may not be visually obvious during field observation. The Contractor shall map the precise boundaries of both cemeteries and any private/family graves prior to earthworks, apply a minimum protective buffer, and implement the Chance-Find Procedure should any previously unrecorded grave or human remains be encountered.






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7.3.6 Horizontal Cave

The Horizontal Cave, identified at Station 3+560 of the 12 km Aituto – Hatubuilico Junction Road, is historically significant for the Horai-Quic Suco. According to local information, was historically used as a secret passage to Maubisse. This cave is considered high risk because it is located directly within the right-of-way of the existing road. This receptor combines an unresolved cultural-heritage sensitivity with a potential geotechnical hazard and should be treated as a priority risk rather than a standard chance-find item. Independent speleological evidence from the same karst belt near Maubisse (Freire et al., 2017[18)], undertaken in partnership with Juventude Hadomi Natureza (JHN), documents the nearby Bakua sink (643 m long, up to 197 m deep, Timor-Leste's longest and deepest recorded cave) and separate horizontal caves along the same escarpment, historically used as refuges during the Indonesian occupation before being choked by collapse, closely corroborating the community's account of this cave and suggesting it may be part of the same regional karst/resurgence system rather than an isolated small void.

If the cave extends significantly beneath or alongside the existing carriageway, the Project would face compounding risks, including a substantial and possibly irreversible cultural-heritage impact given the cave's recognized significance as a historical refuge and secret passage, and a structural risk to the road itself, since unmapped karst voids beneath or adjacent to a carriageway are a recognized as potential cause of pavement subsidence or slope failure, particularly as this cave is located in a landslide-prone area. Prior to finalizing the detailed design in this specific area, the Project shall commission a joint speleological, geotechnical, and cultural investigation to confirm the cave's extent, structural condition, and connectivity to the broader karst system. Pending this investigation, the cave and its immediate surrounds shall be treated as a potential high risk that could require an alternative design rather than standard mitigation measures, and the Chance-Find Procedure shall remain in force.



Given thespiritual, customary, and historic significance of these sites, the Contractor shall avoid direct disturbance to each cultural site identified above wherever technically feasible, applying design buffers and micro-siting adjustments in preference to relocation or removal. Prior to commencing works within the vicinity of any listed site, the Contractor shall consult the relevant Suco Council and

18 https://curis.ku.dk/ws/portalfiles/portal/189733471/Fatuk_Kuak_Hosi_Timor_Lorosa_e.pdf

other affected stakeholders to confirm current use, any required ritual observance, and acceptable mitigation measures, and shall record the outcome in the CESMP. A Chance Find Procedure shall be implemented for the full corridor length, requiring immediate work stoppage, site protection, and notification of the Suco Chief and the relevant cultural heritage authority should any previously unidentified cultural or archaeological material be encountered, particularly during earthworks near the horizontal cave and the landslide-prone Uma Lulik site identified above.

7.4. Community Market Stalls

A periodic community market was identified directly alongside the project's road corridor, comprising open-sided stall shelters and an adjoining open ground used by traders and buyers from Suco Nunumoge and the surrounding Aldeias. Consistent with the baseline description above, the market operates weekly, every Tuesday, and is considered a sensitive social and economic receptor because it draws a concentrated volume of pedestrian traffic, vendors, and parked vehicles directly onto the corridor on its trading day, in addition to more dispersed use of the site on other days of the week. Civil works scheduled on or immediately before a Tuesday trading day could restrict vendor and buyer access, generate dust affecting perishable goods and open-air stalls, and increase traffic-safety risk from the mixing of construction vehicles with market pedestrians and small vendor vehicles.

The Contractor shall confirm the market's weekly trading schedule and site boundary with the Suco Council prior to mobilization, avoid scheduling heavy-vehicle movements and noise-generating activities in the vicinity of the market on Tuesdays wherever practicable, maintain safe pedestrian access and traffic control on trading days, and consult market vendors and the Suco Council on any unavoidable temporary relocation or access restriction with reasonable advance notice.



7.5. Public Schools

Two public schools were identified along the Section 1 road corridor: an Escola Basica Filial (primary school) Quorenema and Manumera. Both schools are considered highly sensitive receptors given the presence of school-age children, particularly with regard to risks associated with construction traffic, dust, noise, and slope or embankment instability near school grounds during earthworks and drainage works. The Contractor shall verify the precise location, boundary, and term-time schedule of each school before commencing works in its vicinity, install temporary fencing, signage, and traffic-calming measures (including reduced speed limits and flag-persons) during school arrival and dismissal times, avoid stockpiling materials or operating heavy equipment immediately adjacent to school compounds,

and coordinate with school administrators and the Suco Council on any activity that may affect safe pedestrian access to either school.





7.6. Health Center

A health facility was identified in the vicinity of the Section 1 road corridor and, at the time of field obaservation, was observed under active construction, consistent with the new health clinic described in baseline above being built in Suco Nunumoge with support from the Government of Japan. As the corridor road provides the main access route to the facility, it is considered a highly sensitive receptor because any obstruction, damage, or unmanaged traffic conflict along the corridor could disrupt both the facility's own construction progress and the community's access to primary health care once the clinic becomes operational.

The Contractor shall verify the facility's location, access requirements, and construction timeline in coordination with the contractor and the Suco Council, maintain unimpeded access for patients, staff, and the clinic's own construction traffic at all times, avoid scheduling conflicting material deliveries or heavy-vehicle movements at the shared access point without prior coordination, and implement dust and traffic-safety controls appropriate to a facility serving vulnerable patients.



7.7. Houses and Kiosk

At least 170 houses are located along the Section 1 road corridor, including a few structures near the existing road edge that may be affected. These houses are considered sensitive to social receptors due to their proximity to construction activities and the potential for temporary impacts such as dust, noise, vibration, traffic disturbance, access restrictions, and accidental damage. In the original 2019

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LARAP, 75 Project Affected Households (PAHs) were identified, including four severely impacted PAHs (one losing a non-permanent kiosk and residence) and two significantly impacted PAHs requiring *in-situ* residential relocation. The latest field observation (September 2026) found that two households with temporary structures on a cliffside along a sharp curve require potential design adjustments or construction-phase relocation.

The updated LARAP report will later provide a detailed description of affected houses and associated land acquisition and resettlement considerations with more detailed measurements. This screening presents representative examples of housing conditions along the roadside and should be used to support site-specific verification, consultation with affected households, and the implementation of appropriate mitigation measures during construction.









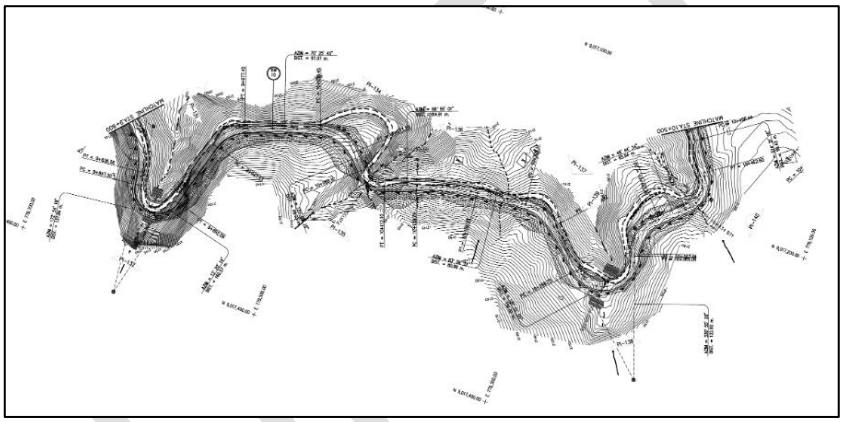




7.8. Slope Stability and Slope Cutting



The photo illustrates typical conditions observed in erosion- and slope-stability-sensitive areas along the project's road corridor, including steep hillside terrain, exposed soil surfaces, mixed vegetation cover, and evidence of recent vegetation clearance or disturbance. Due to the slope gradient and reduced ground cover in some areas, these locations may be susceptible to construction-related impacts associated with earthworks, slope cutting, drainage alteration, spoil placement, and vegetation removal, potentially increasing the risks of erosion, sedimentation, and localized instability if not properly managed during construction.



The 2018 DED includes substantial slope cutting to create shortcuts across steep cross-slope terrain, including sections between existing bends and over higher ground. As illustrated above, these alignments (for example, locations at STA 10+058, STA 10+387 and STA 10+448) of the project's road corridor would traverse steep slopes and may generate larger volumes of spoil, increase the risk of cut-face instability, concentrate runoff and erosion, and extend vegetation clearance beyond the nominal road footprint. The principal impact pathways are a wider permanent and temporary disturbance footprint than that associated with the winding alignment, together with the creation of more direct downslope pathways for runoff, sediment and spoil. Although a shortcut may reduce travel distance, it could result in greater overall land disturbance, erosion and slope-stability risk, and ecological impact, particularly where it crosses previously undisturbed higher ground.

7.9. Vegetation Cover

Field observations indicate that vegetation along the 12 km Aituto – Hatubuilco Junction Road corridor is predominantly composed of modified roadside and secondary vegetation rather than intact natural habitat. The corridor passes through a mountainous rural landscape where vegetation cover has been shaped by existing road access, slope stabilization planting, small-scale agriculture, settlement activity, previous disturbance and natural regeneration. Common species recorded along the road margins include *Ageratina riparia* (mist flower), *Falcataria moluccana*, *Pinus* spp. and other planted or naturally regenerated trees and shrubs. These species occur mainly cut slopes, drainage edges and disturbed verge areas, where they provide localized soil-binding and slope-stabilization functions but also reflect a vegetation community that has been substantially altered from original forest conditions.

The presence of *Ageratina riparia*, an invasive weed species, is particularly relevant for ESIA baseline purposes because vegetation clearance, soil movement and construction traffic could increase the risk of further spread if appropriate spoil management and revegetation measures are not implemented. Figure 6 presents typical roadside vegetation observed along the 12 km road corridor.

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Figure 11. Typical Roadside Vegetation along the 12km Road Corridor



Mist flower (*Ageratina riparia*)

An aggressive, invasive weed found in the mountain areas and highlands of Timor-Leste, where it damages crops, crowds out native plants, and harms local agriculture



Silver wattle (*Acacia montana* / *Acacia mangium*)

IUCN Red List Status: Least Concern (LC)

A. mangium have been strategically planted across these steep, erosion-prone mountain slopes to stabilize the soil along the winding mountain highway.



*Falcataria moluccanna (*Moluccan Albizia*)*

IUCN Red List Status: Least Concern (LC)



Araucaria heterophylla

IUCN Red List Status: Vulnerable (VU)

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8. Assessment of Potential Environmental and Social Impacts

Commented [BS8]: All impact assessment below is good but need to be completed with the inherent risk level (without mitigation) while the residual risk level is already provided in related narratives.

8.1. Overall Impacts

The Project is expected to generate substantial long-term benefits by improving all-season access, road safety, climate resilience, and connectivity between rural communities, agricultural production areas, population centers and tourism destinations. These benefits are likely to include shorter and more reliable travel, lower vehicle operating costs, improved access to markets and basic services (school and health facilities), reduced disruption during heavy rainfall, and safer conditions for road users.

The project is also expected to generate short-term employment and local procurement opportunities for community members. The principal adverse impacts are expected during construction and are associated with extensive earthworks in steep terrain, vegetation and tree removal, generation and disposal of large quantities of surplus soil and rock, erosion and sediment transport, temporary disturbance of watercourses and drainage paths, dust, noise, vibration, traffic disruption, occupational and community safety risks, temporary utility interruptions, land acquisition and the physical or economic displacement of households, crops, trees, and structures along the right-of-way, labour influx and worker–community interactions (SEA/SH risks, social tension over local employment, shared resources), and cultural heritage disruption.

8.2. Pre-Construction Phase

Overview. Pre-construction activities are limited to the census of project-affected persons (PAPs) and their assets; demarcation of the road corridor; land acquisition and in-situ resettlement of PAPs; site clearance, including structural and vegetation removal; digging and excavations; contractor mobilization; and the downstream effects of these activities on local livelihoods and vulnerable groups. This phase also includes design refinement, stakeholder engagement, procurement, utility coordination, and selection of camps, quarries, borrow areas, batching or crushing plants, stockpiles and spoil-disposal sites.

Because the corridor upgrade is expected to occur largely within the existing road corridor and its right-of-way, the scale of displacement is likely to be more limited than for an entirely new alignment. Physical disturbance during pre-construction should therefore generally remain limited; nevertheless, decisions made during this phase will determine the location, scale and manageability of most subsequent environmental and social impacts. Inadequate investigations or premature site access could result in avoidable vegetation loss, unstable cuts and fills, insufficient drainage capacity, damage to community water sources, unplanned displacement, unsafe traffic arrangements, use of unlicensed material sources, or construction at culturally or environmentally sensitive locations.

Pre-construction impacts are therefore principally preventive and procedural, but may become direct where census and asset surveys, corridor demarcation, land acquisition, in-situ resettlement, survey access, vegetation removal, site clearance, temporary markers, excavations or early contractor mobilization disturb land, crops, structures, access routes, community assets, livelihoods or vulnerable groups.

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Readiness criteria. Notice to proceed for major earthworks or any other relevant high-risk activity should be conditional on documented closure of the applicable pre-construction actions:

- Completion of land-access, compensation and livelihood-restoration measures
- Protection or relocation arrangements for utilities and community water sources
- Approval and permitting of ancillary sites
- Completion of priority baseline monitoring
- Pre-clearance surveys and any required building-condition surveys
- Approval of the CESMP and critical method statements
- Completion of cultural heritage clearance (mainly horizontal cave)
- Mobilization of experienced environmental, social, health and safety personnel, and
- Establishment of functioning worker and community grievance mechanisms.

Unresolved land access, an unapproved ancillary or disposal site, an unprotected essential water source, a missing critical permit or an unverified method statement for high-risk work constitutes a hold point. The following sections assess the impacts associated with the pre-construction stage.

8.2.1 Social Disruption from Land Acquisition/Resettlement Process and from Contractor Mobilization of Non-Local Labor

Impact pathway: Pre-construction activities for this corridor, land delineation, asset inventory and valuation negotiations, and the initial mobilization of contractor, supervisory staff, and non-local labor crews into Horai-Quic, Mulo and Nunumoge Sucos, represent the community's first direct contact with the Project and can generate anxiety and social tension if not managed transparently. Household-level uncertainty over land rights, valuation criteria and eligibility for compensation is compounded by the customary and often undocumented nature of land tenure described in the baseline, while the arrival of outside workers unfamiliar with local Tara Bandu norms and Lulik-based customs can create friction with the local community if protocols of introduction and consultation are not observed. Without early, structured communication and a functioning grievance channel, these frictions can escalate into work delays, distrust of the Project, and reduced cooperation during the more consequential land acquisition and construction phases that follow.

Risk management:

- Early, transparent, and inclusive consultation: Communicate survey schedules, land rights and valuation procedures clearly, transparently and early through local leadership, including Suco Councils and Aldeia chiefs, and through inclusive consultation with Project-Affected Parties. Revisit earlier Suco-level consultations to ensure proper engagement with Suco representatives before any construction begins.
- Land acquisition and resettlement: Manage land acquisition and resettlement impacts under the LARAP, drafted in line with ESS5. Carry out surveys and land validation before activities begin to identify all affected persons and the land-based natural resources, infrastructure and services the community will lose. Revisit and validate the inventory of losses through transparent and meaningful consultation with affected communities and negotiate compensation rates for land and assets.
- Contractor mobilization and worker conduct: Before mobilizing to site, the contractor will consult the community in line with the Project's Stakeholder Engagement Plan (SEP). A Worker Code of

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Conduct will be enforced from early mobilization. It will address sexual exploitation, abuse and harassment (SEA/SH) risks and require respect for local cultural norms, including Tara Bandu and Lulik customs.

- Local hiring: The contractor will give priority to local hiring to reduce community discontent over non-local labor.
- Grievance redress: The Project GRM will be operational from the pre-construction stage, with channels accessible at the Suco level, so that concerns about land, compensation or worker conduct can be raised and resolved promptly.

Residual impact/risk: With structured community liaison, early local labor recruitment, and active grievance handling, social tension is expected to remain minor and localized.

8.2.2 Land Acquisition and Impacts on Structures

Impact pathway: Land acquisition for the confirmed right-of-way of Section 1, and for ancillary sites such as borrow pits and spoil disposal areas, may cause physical displacement (loss of dwellings or structures) and economic displacement (loss of agricultural land, coffee trees, or roadside kiosks) across Horai-Quic, Mulo and Nunumoge Sucos.

The 2019 LARAP identified 75 Project Affected Households (PAHs), including four severely impacted PAHs and two requiring in-situ residential relocation. A rapid assessment of 15 PAHs in September 2026 confirmed that all affected land is privately held and that there is no communal land. It also identified three further cases not captured in the 2019 LARAP, two households with temporary structures on a cliffside curve, one PAH whose stone fence may be affected near a sacred tree, while one previously listed PAH has already relocated voluntarily. Because the 2018 census cut-off is now outdated, an updated census and asset inventory with a new eligibility cut-off date that is consistent with ESS5 will be conducted from the third week of October 2026 and will provide input to the updated LARAP that further addresses the impacts associated with land acquisition and the removal of structures.

All affected residential and commercial structures (houses, kiosks, workshops, fences) will be compensated at full replacement cost, with in-situ relocation on clan-owned land, construction assistance (30% of structure value) and transitional assistance where relocation is required. Impacts on livelihoods associated with removal or moving of kiosks and mechanical workshops are expected to be temporary. Owners will be provided with temporary allowance to enable them to rebuild their commercial structures and recover their economic activities. Public facilities, such as four water tanks, water pipes, and electric poles, will also need to be relocated or rebuilt. Such relocation and/or replacement will be coordinated with respective agencies responsible for the maintenance of these utilities/facilities.

Impact and risk management:

- Complete the updated census and asset inventory, and update LARAP based on a complete, detailed measurement survey, applying an entitlement matrix that recognizes customary and use rights as well as formal title, consistent with ESS 5.
- Apply the mitigation hierarchy by minimizing land take through design adjustments (retaining the existing alignment and reserve wherever feasible) before compensating for unavoidable losses at full replacement value.

- Disclose the LARAP and entitlements to affected communities through Suco Councils and Rai Nain, prior to any land acquisition, in Tetum-language and low-literacy-appropriate formats consistent with the education baseline above.
- Provide livelihood restoration support for affected roadside vendors, small businesses, and agricultural/tree-crop cultivators prior to site clearance.
- Conduct periodic stakeholder engagement with PAPs following the Stakeholder Engagement Plan and LARAP recommendations and fully establish and publicize the Grievance Redress Mechanism before land acquisition begins.
- Compensation will be provided for acquired land and assets, and households that lose their housing will be resettled, where possible, on suitable land in situ that retains the same clan ownership.

Residual impact/risk: With the LARAP and GRM consistently and transparently implemented, displacement-related risk is reduced from substantial to moderate, with residual impacts confined to permanent footprint adjustments.

8.2.3 Physical Cultural Resources during Site Clearance

Impact pathway: Initial site clearance and boundary demarcation along the right-of-way and ancillary work areas create risks of disturbing the cultural heritage receptors identified as E&S sensitive receptors, including the Heluli sacred tree, the Sacred Entrance, Uma Lulik structures, sacred water sources, cemeteries, and the historically significant horizontal cave used as a customary passage between Horai-Quic/Mulo Sucos and Maubisse. Several of these sites sit within a few meters of, or directly within, the existing road reserve, meaning even routine clearance and grading works carry a meaningful risk of physical damage or of disturbing previously unrecorded ancestral or archaeological material.

Given the significance of the Lulik-based belief system described in the baseline, any unmanaged disturbance could also generate significant community grievance independent of the physical damage itself. In addition, the horizontal cave presents a distinct and elevated risk profile beyond the standard chance-find pathway applicable to the other five receptors, as the baseline indicates it may connect to a regional karst system, combining an unresolved cultural-heritage sensitivity with a potential geotechnical hazard to the road itself in landslide-prone terrain.

Impact and risk management:

- Conduct pre-clearance joint walkovers with community elders and local authorities to map and demarcate known lulik sites, sacred trees, and graves.
- Adjust design, micro-alignments, camp footprints, and spoil disposal boundaries where feasible to avoid physical intrusion into cultural/sacred sites.
- The contractor shall include th and Chance-Find Procedure in the CESMP.
- Facilitate customary consensus-building and perform required traditional cultural ceremonies, overseen by traditional custodians, if relocating boundary markers is unavoidable.
- For the horizontal cave, commission a joint speleological, geotechnical, and cultural investigation prior to finalizing the detailed design at this chainage, to confirm the cave's extent, structural condition, and connectivity to the broader karst system.

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Residual impact/risk: Rigorous application of the Chance-Find Procedure and active pre-clearance mapping reduces residual cultural risk to low for the Heluli sacred tree, Sacred Entrance, Uma Lulik, sacred water, and cemeteries. For the horizontal cave, residual risk remains Substantial until the joint investigation is complete and re-design measures are adopted.

8.2.4 Disproportionate Impacts on Marginalized and Vulnerable Groups

Impact pathway: Land acquisition and preliminary pre-construction disruptions do not affect all community members equally. The baseline above identifies vulnerable households at the suco level, including women-headed households, elderly residents, and persons with disabilities. These groups, together with landless or informal resource users, face a heightened risk of exclusion from compensation consultations conducted in standard formats, loss of non-formalized or communally-held assets that fall outside conventional entitlement frameworks, and disproportionate hardship during any temporary relocation or livelihood disruption. Women, who play a central role in household agriculture and small-scale trade along the corridor, may also be underrepresented in land negotiations traditionally led by male household heads or customary leaders.

Impact and risk management:

- Screen all Project-Affected Persons (PAPs) during the LARAP verification to identify baseline vulnerability indicators (e.g., gender of household head, age, disability, land tenure insecurity).
- Hold dedicated, culturally accessible focus group discussions in Tetum (or relevant local dialects) with women and vulnerable community members at accessible venues and times.
- Ensure compensation payments and assistance packages include vulnerable-group allowances, legal assistance for land claims, and direct transfer protocols that guarantee women retain control over compensation shares.
- Provide tailored logistical assistance during physical relocation or asset clearance for elderly persons and households headed by persons with disabilities.

Residual impact/risk: Targeted screening and supplemental vulnerability assistance ensure adverse impacts are systematically minimized, leaving a low residual risk.

8.2.5. Baseline Verification and Design Risk Reduction

Impact pathways. Incomplete baseline information or insufficient design verification could lead to poorly informed siting and design decisions, resulting in unstable spoil disposal, impacts on community water sources, unacceptable noise or air-quality effects at sensitive receptors, avoidable biodiversity loss, poorly located temporary construction facilities, or damage to cultural heritage values.

Impact and risk management. The PMU and design team should verify the corridor baseline at locations where impacts could be significant. Verification should include, among others:

- Proposed spoil-disposal sites;
- Upstream and downstream water quality and community water-source use;
- Receptor-specific daytime and, where relevant, night-time noise and air-quality conditions;
- Pre-clearance biodiversity checks;

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- Temporary construction facilities and cultural heritage values identified through consultation and field verification.

Residual risk. Residual risk is expected to be Moderate where baseline verification is completed, and findings are incorporated into design drawings, quantities, specifications and method constraints. Where verification is incomplete or identifies unresolved high-sensitivity receptors, unstable sites or significant biodiversity or cultural heritage values, the risk remains Substantial and the relevant design or activity should not proceed until it is revised or appropriately controlled.

8.2.6. Ancillary Sites, Materials, and Supply Chain Controls

Impact pathway: Selection and use of ancillary sites, quarries, borrow areas, water sources and disposal sites may create land-access, slope-stability, drainage, biodiversity, cultural-heritage, community-safety, water-demand, and pollution. Inadequate capacity planning or unapproved sourcing and disposal may also increase haul-route risks, resource use and rehabilitation liabilities.

Impact and risk management:

- Confirm the location and capacity of all ancillary facilities before approval.
- Screen each site for lawful land access, permits, slope stability, biodiversity and cultural values, proximity to homes and community facilities, haul-route safety, water demand, pollution risk, rehabilitation feasibility and cumulative effects with other projects.
- Favour legally authorized sources and efficient use of water, aggregates, fuel and construction materials.
- Prohibit the use of unapproved quarries, borrow areas, water sources and disposal sites
- Verify supplier licenses and environmental performance; and
- Require weed-free materials, vehicle and equipment cleaning, waste minimization and progressive rehabilitation.

Residual impact/risk: It is expected to be Moderate where sites and supply chains are fully screened, permitted, appropriately located, capacity-verified, and progressively rehabilitated. Any unapproved, inadequately screened or capacity-deficient source or disposal site remains a Substantial to High risk and must not be used until the relevant approvals and controls are in place.

8.2.7. Damage to Existing Utilities and Infrastructure

Impact pathway: Road widening, excavation, drainage works, slope cutting, vegetation clearance and construction access may damage, require relocation of, or interrupt existing electricity, and water-supply. Service disruption could affect households, community facilities and other users, while accidental strikes on buried or roadside utilities could create safety hazards, delays and additional repair costs.

Impact and risk management:

- Before construction, the Contractor and PMU will consult relevant authorities, utility providers and suco representatives; obtain and verify available utility plans; and confirm the location and condition of power, water-supply, telecommunications and irrigation assets through field inspection where records are incomplete.

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- The Contractor will identify services and nearby trees likely to be affected, incorporate utility-protection and relocation measures into the CESMP, coordinate any required removal, temporary support, relocation or reconnection with the responsible providers, and give affected communities advance notice.
- Relocation and reconnection will be completed as early as practicable, service interruptions will be minimized, and compensatory planting will be provided where utility works require tree removal.
- Any accidental damage will be reported immediately to the PMU and the relevant utility authority and repaired promptly at the Contractor's expense.

Residual risk: With pre-construction verification, coordinated relocation, advance notification, prompt reconnection and immediate repair procedures in place, residual impacts are expected to be temporary, localized, and low. Some short-duration disruption or accidental damage may still occur where utility records are incomplete or assets are concealed; this risk will be managed through field verification, close supervision and rapid-response arrangements.

8.2.8. Contractor Mobilization

Impact pathway: Early contractor mobilization may create traffic, worker–community interaction, labor, waste, water-use and safety risks before full construction begins.

Impact and risk management:

- The Contractor must prepare and obtain approval of the CESMP and site-specific plans for erosion and sediment control, spoil and materials management, traffic and road safety, occupational health and safety, emergency response, hazardous materials and spills, waste and wastewater, labor and working conditions, worker accommodation, community health and safety, SEA/SH risk management, security, biodiversity and invasive species, cultural heritage chance finds, and rehabilitation and closure.
- Key environmental, social, health and safety staff must be mobilized before site establishment; workers must be inducted before deployment; and complaint and emergency channels must be tested before activities commence.

Residual impact/risk. Residual risks may remain Substantial if mobilization begins before the CESMP and site-specific plans are approved, experienced personnel are in place, workers are inducted, and complaint and emergency channels are functional. Mobilization should proceed only after these controls have been verified

8.3. Construction Phase

8.3.1. Vegetation Removal and Modified-Habitat Disturbance

Impact pathways: Clearing, grubbing, road widening, slope trimming, drainage installation and temporary access will remove or damage roadside vegetation and disturb fauna using modified habitat along the corridor. The bill of quantities indicates approximately 18.5 ha of clearing and grubbing and removal of 835 small and 30 large trees. Direct effects may include loss of tree and ground cover, fragmentation of remaining vegetation, disturbance or displacement of fauna, accidental injury to fauna, loss of shade and productive trees, and reduced soil protection on steep slopes. Indirect effects may arise from improved access, fire, collection of timber, introduction of invasive plants, and transfer of weed seed in soil, machinery, or revegetation materials.

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Impact and risk management:

- The construction footprint must be surveyed, demarcated, and approved before clearing.
- The Contractor should apply the mitigation hierarchy by (1) avoiding mature, riparian, culturally important and productive trees wherever practicable; (2) restricting clearing to the minimum safe working width; (3) prohibiting unauthorized clearing; (4) undertaking pre-clearance checks.
- Salvageable timber and affected assets should be managed in accordance with agreed ownership and compensation arrangements.
- Topsoil should be stripped separately, protected from erosion and contamination, and reused promptly.
- Progressive stabilization and revegetation should follow earthworks, using verified weed-free and locally suitable species.
- Vetiver and coconet treatments should complement, not replace, engineered drainage and slope protection

Residual impact/risk: It is expected to be Moderate where disturbance remains within modified habitat and rehabilitation succeeds; the rating must be reconsidered if natural or critical habitat is identified.

8.3.2. Slope Instability, Landslide and Erosion

Impact pathway: Excavation, over-steepened cuts, placement of fill, vibration, vegetation removal, concentrated runoff and inadequate temporary support may destabilize already steep or weathered slopes. Failure could occur as shallow erosion, rockfall, debris movement or larger landslides, with consequences including worker or public injury, burial or damage of property and farmland, road closure, blocked drainage, sediment discharge and isolation of communities. Risk is highest at known unstable sections, deep cuts, high fills, retaining structures, spoil areas and outlets, and increases during prolonged or intense rainfall.

Impact and risk management:

- High-risk locations require verified geotechnical investigation before excavation
- Works should use staged cutting, benches where appropriate, temporary support, controlled lift compaction, drainage installed ahead of earthworks, and immediate surface protection.
- The Contractor should define rainfall and movement thresholds for inspection, suspension and evacuation
- Maintain exclusion zones
- Inspect slopes after heavy rain
- Permanent retaining, rockfall, and bioengineering measures must be completed and verified before opening affected areas.

Residual impact/risk: It remains Substantial because of the mountainous setting and potentially severe consequences; any location remaining High is a redesign or no-work condition.

8.3.3. Surplus Material and Spoil Disposal

Impact pathway: The design quantities identify approximately 236,100 m^3 of surplus common excavation, 123,600 m^3 of surplus hard rock and 239,400 m^3 of surplus soft rock. Total rock needed

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for stone masonry, gabion, riprap and concrete as per estimated quantity in BOQ is 112,855 m^3. Surplus from common excavation and soft rock excavation with a total of 475,500 m^3 may require disposal after reuse. Uncontrolled placement may overload slopes, increase erosion and sedimentation, bury productive land or vegetation, and increase downstream landslide risk.

Impact and risk management:

- A reconciled corridor-wide material balance is required before major earthworks
- Suitable material should be reused in approved fills, erosion protection or rehabilitation where technically and environmentally appropriate.
- Each spoil disposal site must have confirmed capacity, lawful land access, community consultation, environmental and social screening, geotechnical stability assessment, and an approved spoil-management and closure plan.
- Spoil must be compacted and profiled to stable slopes, kept out of watercourses and drainage paths, protected from erosion, and progressively rehabilitated.
- Records should track source, volume, and destination.

Residual impact/risk: It remains Substantial until sufficient approved capacity and effective closure are demonstrated.

8.3.4. Surface-Water Quality, Hydrology and Community Water Supply

Impact pathway: Earthworks, stream crossings, culvert replacement, bridge works, concrete handling, spoil placement and fuel use may increase turbidity, release pollutants, alter flow paths or interrupt access to springs, streams, pipes and collection points used by communities. Steep terrain and intense rainfall can rapidly transport sediment and contaminants downstream. Poorly located culvert outlets may also cause scour, erosion, or drying of an existing flow path.

Impact and risk management:

- Priority water sources and upstream and downstream conditions should be verified before works
- Construction must maintain environmental flows and reliable community access, with temporary or replacement supply in place before any essential source is interrupted
- Exposed soil, stockpiles and outlets should be protected with appropriately sized sediment and erosion controls
- Works in flowing water should be isolated and timed for lower-flow conditions where practicable
- Concrete washout, wastewater, fuels, oils and sediment-laden water must not be discharged to watercourses
- Monitoring should be intensified during rainfall, at crossings and following complaints or incidents.

Residual impact/risk: Residual impacts should be Moderate where controls are installed before disturbance and maintained. Inability to protect an essential source requires avoidance or redesign.

8.3.5. Dust, Combustion Emissions and Nuisance

Impact pathway: Excavation, grading, exposed soil, vehicle movements, unloading, and diesel-powered plant will generate dust and combustion emissions. Nuisance may include reduced visibility, soiling of houses and crops, odor and smoke, while fine particulate matter and exhaust may aggravate

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respiratory conditions. Houses, schools, health clinic, markets, and outdoor workers are particularly sensitive, especially during dry and windy weather.

Impact and risk management:

- A dust and emissions control procedure should identify sensitive receptors, trigger conditions and responsible personnel
- Controls should include water application using sustainable sources, reduced speeds, covered and non-overloaded trucks, prompt stabilization of exposed ground, protected stockpiles, wheel and road cleaning where tracking occurs, and suspension or modification of high-dust work during strong winds near receptors.
- Plant should be well maintained, idling minimized, and open burning prohibited.
- Visual inspection, complaint records, and targeted particulate monitoring should be used to verify performance.

Residual impact/risk: It is expected to be Moderate but may remain elevated close to active works if water supply or supervision is inadequate.

8.3.6. Haulage, Unsealed Surfaces, Stockpiles, Crushing and Batching Plants

Impact pathway: Repeated heavy-vehicle movements and operation of stockpiles, crushers and batching plants may expose nearby communities to concentrated dust, noise, vibration, vehicle conflict, falling material, moving machinery, reduced visibility and unauthorized access. Risks are greater where facilities or haul routes are close to homes, schools, markets, health facilities, pedestrian routes or community water sources, and where unsealed roads are narrow or steep.

Impact and risk management:

- Facility siting must be based on site-specific receptor mapping, prevailing wind, drainage, access and cumulative exposure, and should apply the project separation requirements or greater distances where screening indicates
- Sites require secure fencing, controlled entry, warning signs, safe internal traffic flow, guarded machinery, stable stockpile geometry, dust suppression, and emergency arrangements
- Haul routes, delivery hours and vehicle speeds should be agreed to avoid peak community activity
- The Contractor should provide advance notice and accessible complaint channels and undertake joint inspections where nuisance persists.

Residual impact/risk: It is expected to be Moderate only where separation and operational controls are demonstrably effective.

8.3.7. Noise and Vibration

Impact pathway: Excavators, breakers, compactors, crushers, batching equipment, generators, trucks, and construction works may increase noise and ground vibration. Effects may include disturbance of sleep, teaching, communication and business activity; stress to livestock. The indicative daytime baseline of 52–57 dB(A) is already close to or above relevant daytime values for some sensitive land uses, leaving limited headroom for additional noise.

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Impact and risk management:

- A receptor-specific plan should select quieter equipment and methods, maintain silencers and enclosures, fit temporary barriers where practical, locate stationary plant away from receptors, and restrict high-noise work to agreed daytime periods.
- Communities should receive advance notice of unusually noisy or vibration-generating work.
- Monitoring should apply the more conservative of applicable absolute criteria or a 3 dB(A) increase above an established background at sensitive receptors.

Residual impact/risk: Moderate with effective scheduling and response to complaints.

8.3.8. Waste, Hazardous Materials and Spills

Impact pathway: Construction will generate concrete and demolition debris, scrap, packaging, vegetation, domestic waste, sewage, used oil, oily rags, filters, batteries, chemicals and concrete washout. Poor storage, handling or disposal may contaminate soil and water, attract pests, create fire or injury risks, block drainage and expose workers or the public to hazardous substances. A significant fuel, bitumen or chemical release could have severe consequences at water crossings or near community sources.

Impact and risk management:

- The Contractor should maintain a waste and hazardous-material inventory and apply avoidance, reduction, reuse and recycling before disposal.
- Waste streams must be segregated, labelled, secured and removed by approved carriers to authorized facilities; open dumping and burning are prohibited.
- Fuel and chemicals require compatible containers, secondary containment, controlled dispensing, safety information, inspection and separation from drainage and ignition sources.
- Refueling and maintenance should occur on protected surfaces with spill kits immediately available
- Spill procedures must define containment, recovery, notification, contaminated soil management, and investigation.

Residual impact/risk: Moderate where controls are consistently enforced.

8.3.9. Borrow Areas, Quarries and Temporary Facilities

Impact pathway: Borrow pits, quarries, crushers, batching plants, camps, laydown areas, workshops, stockpiles and access tracks may extend the disturbance footprint beyond the road reserve and create land, biodiversity, erosion, drainage, pollution, traffic, and community-safety impacts. The identified potential aggregate source at KM 1+680 has an estimated available quantity of 22,500 m^3, below the approximately 33,950 m^3 combined sub-base and base-course demand, so supplementary sources may be required.

Impact and risk management:

- No ancillary site should be used until site-specific environmental and social screening; land-access due diligence, consultation and applicable permits are complete.
- Selection should avoid watercourses, unstable slopes, productive land, sensitive habitat, cultural sites and densely occupied areas

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- Each site requires an approved layout and management plan covering drainage, erosion, noise, dust, traffic, hazardous materials, worker welfare, security, progressive rehabilitation and closure

Residual impact/risk: Moderate where sites are screened, permitted, appropriately located and managed under approved rehabilitation plans; unscreened or non-compliant sites remain Substantial to High and must not be used.

8.3.10. Construction Traffic and Community Road Safety

Impact pathway: Heavy haulage, slow plant, temporary diversions and active work zones on narrow, steep and winding roads will increase collision risk, delay emergency and public transport, damage local access routes and create conflict with pedestrians, schoolchildren, roadside vendors, livestock and motorcycles. Reversing vehicles, blind bends, reduced visibility from dust, unstable road edges and movement through settlements or markets present risks.

Impact and risk management:

- An approved traffic and road-safety management plan should define haul routes, delivery windows, speed limits, vehicle and driver standards, fatigue controls, communications, breakdown and emergency procedures, safe work-zone layouts, barriers, signs, flaggers and temporary pedestrian routes.
- School, market and community-event periods require specific controls and advance notification.
- Drivers must be licensed, trained and subject to a code of conduct; seat belts, reversing alarms and daily vehicle checks should be mandatory
- Complaints, near misses, crashes and road damage should be investigated and used to revise control measures.

Residual impact/risk: It remains Substantial because a single failure may cause fatal or serious injury and continuous supervision is required.

8.3.11. Occupational Health and Safety

Impact pathway: Workers may be exposed to live traffic, mobile plant, unstable slopes, rockfall, excavations, lifting operations, work at height, hot work, bitumen and cement, silica-containing dust, noise, vibration, electricity, manual handling, heat, and severe weather. Contractors, subcontractors, visitors, and informal workers may have different levels of competence and vulnerability. Potential outcomes include serious injury, fatality, occupational illness, gender based violence, and delayed emergency response in remote work areas.

Impact and risk management:

- The Contractor must implement a documented OHS management system consistent with ESMP and demonstrate properly resources and a qualified Health and Safety Officer with knowledge of gender-based violence.
- It should include supervision, induction and refresher training, task-specific risk assessments, verified method statements, permits for critical work, plant-pedestrian separation, excavation and lifting controls, fall prevention, fit-for-purpose PPE, welfare and first aid, emergency communications, rescue arrangements, incident reporting and worker stop-work authority without retaliation.
- High-risk work must not begin until controls are inspected and authorized

- Repeated non-compliance should trigger suspension.
- Access for workers with disabilities to facilities should be envisaged, in dialogue with a Disabled Persons Organization (DPO) present in the area.

Residual impact/risk: It remains Substantial because of the range, duration and severity of hazards

8.3.12. Labor Influx Impacts: Utilities, Conflict, Child Labor, Community Heath and Safety

Impact pathway: An influx of non-local workers into the rural Sucos of Horai-Quic, Mulo, and Nunumoge can strain the limited potable water and medical supplies documented in the baseline, drive up local food and rental prices, provoke social friction with host communities, and accelerate transmission of communicable diseases, including sexually transmitted infections. The corridor's small resident population and limited services, a single health facility still under construction near the corridor, mean the relative scale of any labor influx, even a modest one, could be significant in proportion to existing capacity. The arrival of construction crews and associated informal market activity (roadside vending, petty errands) creates opportunities that can draw school-age children away from the two schools identified in the corridor, whether through informal hiring by subcontractors or family decisions to prioritize short-term household income over school attendance.

Impact and risk management:

- Adequate housing for all workers at construction/worker camps, and require contractor work camps to provide temporary basic services independently (power generation, water supply, sanitation, wastewater treatment, and medical care). Hygiene and sanitation facilities in accordance with local regulations to prevent hazards to public health or contamination of land, surface or groundwater. Facilities must be separated by gender and include reasonable accommodation for persons with disabilities. Worker camp location and facilities should be located at least 500 m from settlements, agreed with local communities and approved by PMU.
- Implement pre-employment medical screenings and ongoing communicable disease awareness programs (including HIV-STI) for workers and host communities.
- Coordinate with Suco authorities to monitor local market prices and establish dispute resolution mechanisms for host-worker community friction.
- Maximize the recruitment of local labor to reduce the required size of the influx workforce.
- Strictly enforce a minimum working age of 18 for all hazardous construction activities, verified via formal national identity cards or birth certificates.
- Conduct regular unannounced labor inspections of work fronts, sub-contractors, and supply chains.

Residual impact/risk: Self-sufficient worker camps, health outreach, systematic age-verification audits and strict vendor corridor management together limit pressure on local services, disease transmission and child labour risks, reducing overall labour influx impacts to a moderate.

8.3.13. Gender Based Violence (GBV) - Sexual Exploitation, Abuse, and Harrasment (SEA/SH)

Impact pathway: Influx of male-dominated, cash-earning non-local labor into low-income, rural communities of the kind documented in the corridor's baseline significantly elevates the risk of GBV and Sexual Exploitation and Abuse (SEA), Sexual Harassment (SH), and intimate partner violence. Women's comparatively limited economic independence and decision-making power in the corridor

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communities may increase vulnerability to exploitation and reduce willingness to report incidents through informal channels.

Impact and risk management:

- Include and implement SEA/SH Prevention and Risk Management Plan (SEA/SH Action Plan) in ESMP and CSEMP
- Require all project personnel, managers, contractors and subcontractors to sign a binding Worker Code of Conduct with explicit prohibitions on SEA/SH.
- Provide continuous, mandatory SEA/SH sensitization and induction training in Tetum for workers and local communities
- Establish a confidential, survivor-centered GRM reporting channel partnered with existing local SEA/SH service providers.
- Restrict unauthorized worker movement into adjacent village residential zones after working hours.

Residual impact/risk: Given the inherent vulnerabilities in rural settings, the limited enforcement and survivor-centred services along the corridor, and the PMU's existing system for preventing and addressing SEA/SH, the residual risk is moderate.

8.3.14. Livelihoods and Access Restriction

Impact pathway: Construction activity may temporarily restrict access to basic services, gardens, agricultural plots, and roadside trading locations beyond the land-acquisition footprint addressed above, particularly where works require full or partial road closure or diversion. Because the corridor is the primary access route for all affected Sucos, including to primary schools, the periodic market, and the health facility under construction in Nunumoge Suco, even short-duration closures can have an outsized effect on households and services with no practical alternative route. Coffee cultivation, the corridor's dominant livelihood activity, is also highly seasonal, making the timing of disruptive works as important as their duration.

Impact and risk management:

- Maintain at least single-lane traffic and pedestrian access at all times during construction, with flag-persons/traffic controllers at active work fronts.
- Apply an approved traffic and road-safety management plan
- Provide advance notice (minimum 7 days) of planned access restrictions or diversions via Suco/Aldeia notice boards and community meetings.
- Construct temporary access tracks to gardens/coffee plots severed by works, in consultation with affected households.
- Schedule the most disruptive works (major cut/fill sections) outside the June–August coffee harvest window where feasible.
- Compensate for temporary loss of livelihood or trading income under the project LARAP if access cannot be maintained.

Residual impact/risk: With maintained single-lane access, advance notice of diversions, temporary access tracks, harvest-window scheduling and compensation under the LARAP where access cannot

be maintained, residual disruption to livelihoods and access is reduced from substantial to medium and is expected to remain transient and localized to active work fronts

8.3.15. Local Economic Development and Employment Opportunities

Impact pathway: The construction of the project road will generate demand for unskilled and semi-skilled labor, local materials and services (accommodation, food, transportation), and opportunities to channel benefits to vulnerable and female-headed households identified in the baseline data. The remaining risk is that these benefits may not be distributed equitably, or will accrue disproportionately to better-connected households, larger landowners, or residents of settlements closer to the more accessible end of the Maubisse corridor, at the expense of remote villages and women, who have significantly lower participation rates in the formal wage economy than men.

Impact and risk management:

- Set local-hiring targets and quotas for women and vulnerable groups in the contractor's labor recruitment plan.
- Publicize employment and local-procurement opportunities transparently through Suco Councils and community meetings, in Tetum and low-literacy-appropriate formats.
- Prioritize local sourcing of construction materials and services where feasible, to maximize local economic multiplier effects.

Residual impact/risk: With enforced local-hiring quotas, transparent advertisement of opportunities through Suco Councils, and prioritized local sourcing of materials and services, the residual risk of inequitable distribution of construction phase economic benefits is reduced to low.

8.3.16. Impacts on Cultural Heritage/ Sacred Sites

Impact pathway: Excavation and heavy machinery movements along the corridor can accidentally damage the cultural heritage receptors (sacred trees, Uma Lulik, sacred water, cemeteries and the horizontal cave), as well as community water distribution networks and drainage structures running parallel to the roadway. Because several of these assets sit within or immediately adjacent to the existing road reserve, standard construction activities carry an inherent risk of contact even where damage is unintended. Heavy machinery operation, vibration, or excavation near the horizontal cave carries additional risk beyond accidental contact. Given the cave's possible connectivity to a regional karst system in landslide-prone terrain, uncontrolled nearby construction activity could aggravate an unmapped geotechnical hazard and damage the cultural asset itself.

Impact and risk management:

- Mark and physically barrier-fence all previously identified lulik sites and graves prior to heavy machine deployment in consultation with the local and customary authorities.
- Require immediate, mandatory contractor repair or replacement within 24 hours of any accidentally severed community water pipes or utility links
- Maintain the Chance-Find Procedure during construction. Immediately cease excavation works if potential cultural resources are unearthed, notify relevant authorities, and secure the perimeter. Activities shall not be recommended until the authorities have signed off that the sites/resources have been dealt with appropriately and that work may continue. Fund the necessary customary reconciliation rituals if an accidental intrusion occurs.

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- Before heavy machinery, blasting, or deep excavation is mobilized within the vicinity of the horizontal cave, confirm that the joint speleological/geotechnical investigation required under pre-construction above has been completed and implement any resulting exclusion zone, vibration limits, structural monitoring, or engineered support before works proceed at this chainage.

Residual impact/risk: Pre-construction pegging, utility mapping, and rapid-repair protocols ensure residual impacts on community infrastructure and sacred assets remain low. This conclusion depends on completing the Section pre-construction horizontal cave investigation and implementing the resulting measures before construction. Until then, residual risk at that location remains unresolved rather than low.

8.4. Post-Construction Phase

8.4.1. Decommission

Impact pathway: Decommissioning and closure of temporary construction facilities—including worker camps, batching and crushing plants, storage areas, workshops, borrow areas, quarries, spoil sites and access tracks—may create impacts if structures, equipment, wastes, hazardous materials or contaminated soil are left in place. In the steep terrain and high-rainfall conditions, exposed or poorly graded surfaces and blocked or altered drainage can accelerate runoff, erosion, slope instability and sediment transport to streams, springs, agricultural land and downstream communities. Unsecured sites may also present safety hazards, restrict customary land use and generate disputes where landowner commitments, permits or grievances remain unresolved. Conversely, orderly closure, restoration of drainage, stabilisation of slopes and successful revegetation will reduce these pathways and support the safe return of land to agreed post-construction uses.

Impact and risk management:

- The Contractor will implement approved, site-specific decommissioning plans before demobilisation.
- All temporary structures, equipment, general waste and hazardous materials will be removed to authorised reuse, recycling, treatment or disposal locations, and any contaminated soil will be identified and remediated.
- Land will be regraded to stable contours, drainage lines and cross-drainage paths will be reinstated without concentrating flows onto unstable slopes, and erosion-control measures will be installed where required.
- Disturbed areas will be covered with suitable topsoil and revegetated using locally appropriate species, with particular attention to steep cut-and-fill areas, spoil sites, borrow areas and access tracks.
- Closure will be verified at handover by the PMU and Supervision Consultant with landowners and relevant environmental and local authorities.
- Acceptance records, permits and outstanding grievances will be closed out, and rehabilitation survival and erosion stability will be inspected quarterly during the defects-liability period and again after the first wet season, with corrective works undertaken where performance criteria are not met.

Residual impact/risk: With the specified closure, remediation, drainage restoration and rehabilitation measures fully implemented, residual impacts are expected to be localised and generally low. The

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principal remaining risks are failure of vegetation establishment, erosion or small-scale slope instability during intense wet-season rainfall, delayed discovery of contaminated soil or buried waste, and unresolved land-use concerns. These risks may be higher at steep spoil sites, quarries, borrow areas and access tracks, particularly where access for maintenance is difficult. Monitoring through the defects-liability period and after the first wet season, together with prompt reseeding, slope stabilisation, additional clean-up or grievance resolution, should reduce residual risk to an acceptable level. Any site that remains unstable, contaminated or unaccepted by the landowner should not be considered closed until corrective action has been completed and verified.

8.4.2. Air Quality

Impact pathway: During operation, road traffic will emit nitrogen oxides (NOx), hydrocarbons, carbon monoxide, sulfur dioxide (SO_2) and particulate matter. Dust and fumes may also arise from vehicle movements and nearby domestic fuel burning. However, the improved asphalt surface is expected to reduce road dust compared with existing conditions.

Impact and risk management:

- Forecast traffic volumes are expected to remain well below the road's design capacity. Available network capacity should limit congestion and concentrated emissions, while the separation between the road and sensitive receivers should allow adequate atmospheric dispersion.
- Routine road maintenance will preserve the sealed surface and minimize dust generation.

Residual impact/risk: Vehicle emissions will continue throughout operation, but the expected traffic volumes, low congestion and distance to sensitive receivers make a measurable deterioration in ambient air quality unlikely. Accumulation of toxic residues near the road is also unlikely. The residual air-quality risk is therefore low, and no additional mitigation is anticipated beyond routine operation and maintenance.

8.4.3. Water Quality

Impact pathway: During periods of significant rainfall, improved drainage may mobilize sediment from the road and adjacent land. Accidental spills during operation could also affect receiving waters. In dry periods, accumulated vegetation and other dry matter could obstruct drains and increase the likelihood of polluted runoff when rainfall resumes.

Impact and risk management:

- Routine operation and maintenance should include regular inspection and clearance of culverts, drains and outlets
- Prompt removal of accumulated sediment, vegetation and waste
- Maintenance of erosion protection and revegetated areas; and
- Timely repair of scour, blockages or damaged drainage structures.
- Spill-response procedures and materials should be available for operational incidents, and receiving waters and community water sources should be inspected following major rainfall, reported pollution events or evidence of drainage failure.

Residual impact/risk: Minor, short-term increases in sediment may occur during heavy rainfall, and accidental spills remain possible. However, the project will not materially increase the impervious area, so any increase in runoff should be negligible. With functioning drainage, sediment controls,

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revegetation and spill response, adverse effects on water quality or water available for domestic and agricultural use are unlikely. The residual risk is low, and slight long-term improvements in water quality may occur, although they may be difficult to detect because rainfall is infrequent.

8.4.4. Access, Flora and Fauna

Impact pathway: Improved road condition could increase movement through the project area and, in principle, may induce access to timber, flora or fauna. However, the project rehabilitates an existing road and does not create new access into previously inaccessible forest areas. Commercial logging access is separately licensed and supported by logging-company roads, while limited selective logging for traditional or cultural purposes is already permitted.

Impact and risk management:

- Road operation and maintenance will remain within the existing corridor.
- Project activities will not establish new forest access routes or authorize resource extraction.
- Any observed access-related pressure on adjacent habitat should be addressed through routine environmental monitoring and coordination with the relevant regulatory authorities.

Residual risk: Because the project does not extend access into intact forest, project-attributable deforestation or material effects on flora, fauna or conservation areas are unlikely. The assessment identifies no rare or endangered species expected to be affected by operation of the rehabilitated road. The residual risk to biodiversity from improved access is therefore low.

8.4.5. Operational Road Safety

Impact pathway: Although the upgraded road should improve access, pavement condition and resilience, smoother surfaces may increase vehicle speeds and traffic volumes. This can raise the severity of crashes involving pedestrians, motorcycles, livestock and roadside activity, particularly in settlements and near schools, market, junctions and public transport stopping points. Better access may also encourage informal stopping or parking, roadside trading, encroachment into drainage, and land conversion.

Impact and risk management:

- Road safety audits should be completed before opening and after initial operation.
- Crash and near-miss patterns should be monitored with relevant authorities and communities, and corrective measures prioritized at emerging hotspots.
- Drainage, slopes, vegetation, and safety of assets require routine inspection and maintenance. Induced development should be addressed through coordinated land-use, access, and roadside-management measures that protect safety without unnecessarily restricting existing community access.

Residual impact/risk: It is expected to be Moderate where audits, maintenance and enforcement are sustained.

8.4.6. Improved Access and Connectivity for Vulnerable Groups

Impact pathway: The corridor upgrade is expected to meaningfully improve women's and girls' safe mobility, secondary-school continuation for the two schools documented in project corridor, access to health services, and access to SEA/SH service providers. The residual risk addressed here is that

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design features fail to carry these benefits through to the most vulnerable, for example, absence of pedestrian infrastructure near schools and the market, inadequate lighting, or no accessibility features for persons with disabilities and the elderly.

Impact and risk management:

- Incorporate sidewalks/shoulders, signage, lighting at settlement/school/market sections, and accessibility ramps at intersections into the final detailed design.
- Monitor socioeconomic and vulnerability conditions in the Sucos corridor for post-completion as an indicator of realised access benefits, disaggregated by gender.

Residual impact/risk: With inclusive design features and post-completion monitoring, the residual risk of the Project failing to deliver connectivity benefits to vulnerable groups is low.

8.4.7. Employment, Business and Tourism Opportunities

Impact pathway: Once operational, the upgraded corridor is expected to generate sustained positive impacts, such as reduced travel time and vehicle operating cost supporting expanded produce trading, growth of community-based tourism along the route toward Maubisse and Hatubuilico Junction and improved reliability of the small enterprises. This residual risk addressed here is that these benefits become concentrated among better-connected households and businesses near the road rather than reaching more remote Aldeias along the corridor.

Impact and risk management:

- Support community-based enterprise development along the corridor, in coordination with the relevant government, so that benefit is not confined to operators immediately at Maubisse town or Hatubuilico Junction alone.
- Ensure feeder-track and footpath connections from outlying Aldeias to the upgraded road are considered in complementary local infrastructure planning, so remote communities can access the improved corridor.

Residual impact/risk: With impact and risk management, the residual risk of inequitable sharing of operation-phase economic benefits is low.

8.5 Unanticipated Impacts and Adaptive Management

Additional or unanticipated E&S impacts should be expected as implementation proceeds. Consistent with the ESF's adaptive management approach, the Project will treat the ESMP/CESMP, SEP and GRM as living instruments, monitored, reviewed, and updated as new impacts or risks emerge, rather than fixed at the project preparation stage. Experience from other road projects in Timor-Leste confirms the value of this approach, as the most significant E&S risks in practice often arise from issues not fully anticipated at appraisal.

Existing PMU capacity will need to be strengthened accordingly, through:

- Dedicated safeguards/E&S risk management capacities: Additional PMU personnel for safeguards/E&S risk management and community engagement, commensurate with the scale of concurrent works.

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- Stronger monitoring and oversight: More systematic E&S compliance checks by the PMU and Supervision Consultant, and a clear escalation pathway for unresolved issues up to PMU management and, where required under the project Environmental and Social Commitment Plan.
- A more accessible, responsive GRM: strengthened uptake channels and tailored referral pathways for issues such as GBV/SEA/SH, consistent with the confidential pathway already established.
- Periodic social auditing: a structured process to understand stakeholders' perceptions of Project impacts and benefits, reaching groups who may not otherwise come forward through the GRM.

8.6. Cumulative Impacts

Cumulative effects may become significant where TLBRP2 activities overlap spatially or temporally with other road investments, local extraction, settlement growth, agricultural expansion, or tourism development. Although the effects of individual activities may be assessed as localized or moderate, their combined, successive or interacting effects may exceed the capacity of affected communities, infrastructure and environmental receptors to absorb disturbance or recover between events. The following impact pathways may arise during civil works:

- Additional quarrying where the potential aggregate source at KM 1+680 provides an estimated 22,500 m³ against approximately 33,950 m³ of combined sub-base and base-course demand; and disposal capacity arising from approximately 200,000-300,000 m³ of identified surplus common, hard-rock and soft-rock excavation. If these activities coincide, heavy-vehicle movements, road closures and work zones could compound congestion, collision exposure, dust and noise at roadside houses, schools, health facilities, churches, markets and businesses, while concurrent water abstraction, crushing, batching and dust suppression could place additional pressure on community water sources.
- Combined vegetation clearing, slope trimming, drainage modification and spoil placement could also amplify erosion, sediment transport, blocked drainage and instability beyond the effect of any single work front. For example, TLBRP2 clearing of approximately 18.5 ha and removal of 865 trees, when added to disturbance from adjoining road works, borrow areas, access tracks and disposal sites, could reduce slope cover and increase connected areas of exposed soil.
- Sediment released from several active cut slopes, culvert outlets or spoil sites during the same rainfall event could affect downstream water quality and community supplies, while spoil placed in flow paths could interact with undersized or blocked drainage to increase scour or slope failure.
- Cumulative biodiversity effects include the introduction, establishment and corridor-wide spread of invasive alien species through vehicles, machinery, soil, spoil, aggregate, topsoil and planting materials transferred among work fronts, the KM 1+680 source, any additional quarries or borrow areas, and approved spoil sites. For example, an excavator, grader or haul truck moved from a weed-infested borrow area to project site without cleaning could transport seed or contaminated soil to newly exposed cut slopes, culvert outlets or the proposed vetiver and coconet bioengineering areas. Repeated disturbance, vegetation clearing, exposed ground, altered drainage and improved access may create connected dispersal pathways that allow invasive species to establish faster and over a wider area than would result from TLBRP2 alone. This could displace native vegetation, degrade habitat and ecosystem function, undermine revegetation and

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bioengineering, increase erosion or fire risk, and create long-term maintenance and control obligations.

- Sequential or overlapping road-construction projects in the same rural communities over several years increase cumulative exposure to worker-influx-related GBV/SEA risk beyond what this corridor assessment alone would suggest. This reinforces the priority given to a corridor-wide (rather than subcomponent-only) GBV Action Plan and confidential reporting pathway.

The PMU and Supervision Consultant should assess cumulative effects at corridor scale rather than as isolated site impacts and maintain an up-to-date register of current and reasonably foreseeable activities, shared receptors and combined pressures. Before approving overlapping works or common ancillary sites, the PMU and Supervision Consultant should coordinate schedules, haul routes, water abstraction, material sources, spoil capacity, work-front sequencing and monitoring with relevant authorities and adjoining projects. Coordination should specifically address use of the KM 1+680 source and any supplementary sources, the timing of major cut-and-fill and culvert works, allocation of approved spoil capacity, haulage through settlements and near schools or markets, and protection of shared water sources and downstream drainage paths.

Contractors should use verified weed-free topsoil, aggregate and revegetation materials; inspect and clean vehicles and equipment before mobilization and transfer between work fronts and ancillary sites; contain contaminated soil or plant material; avoid disposal in drainage lines or undisturbed habitat; and monitor disturbed areas, watercourses, borrow areas, spoil sites and access routes through establishment and early operation. New infestations should trigger prompt containment, removal or treatment using methods appropriate to the affected habitat, followed by verification of effectiveness.

8.7. Impact Significance Rating

Level of significance is determined qualitatively based on methodology outlined in Chapter 4. Where ancillary-site locations and final design details remain unconfirmed, the assessment adopts a precautionary approach and requires site-specific screening and approval through the CESMP. The following table presents impact significance ratings are based on the current design, project activities, baseline information, and results from E&S sensitive receptors screening. The ratings must be updated during CESMP preparation where site-specific information changes the assessed magnitude and likelihood or effectiveness of mitigation.

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Table 18. Impact Significance Rating

Impact	Magnitude	Likelihood	Significance of Risk	High Level Mitigation Measures	Residual Risk
Pre-Construction					
Social disruption from land acquisition procedures and early labor influx	Extensive	Very Likely	Substantial	Early transparent communication, Worker Code of Conduct, local-hiring priority, GRM operational prior to mobilization	Low
Physical/economic displacement due to land acquisition	Extensive	Very Likely	Substantial	Updated LARAP with entitlement matrix, mitigation hierarchy, disclosure, livelihood restoration support	Moderate
Damage or disturbance to physical cultural resources and sacred sites	Extreme	Low Likelihood	Substantial	Pre-clearance walkovers with community/ elders, design adjustment, mandatory Chance-Find Procedure, facilitate required traditional ceremonies prior construction if any, commission a joint investigation prior to finalizing the detailed design at horizontal cave area.	Substantial (Low for five receptors; elevated pending horizontal cave investigation)
Disproportionate adverse impacts on vulnerable and marginalized groups	Extensive	Very Likely	Substantial	Vulnerability screening during LARAP verification, accessible focus group discussions, vulnerable-group compensation allowances	Low
Baseline verification and design risk reduction.	Extensive	Very Likely	Substantial	The PMU and design team should verify the corridor baseline at locations where impacts could be significant	Moderate
Ancillary sites, materials and supply-chain controls.	Intermediate	Expected	Substantial	Screen sites, Use only approved, licensed sources and sites, with verified environmental performance, weed-prevention measures, waste minimization and progressive rehabilitation	Moderate
Contractor mobilization	Extensive	Very Likely	Substantial	CESMP Prepared and approved, E&S and OHS are mobilized before site establishment	Substantial
Potential damage to existing utilities and infrastructure	Intermediate	Moderately Likely	Moderate	Pre-construction verification, coordinated relocation, advance notification, prompt reconnection and immediate repair procedures in place	Low
Construction Phase					
Vegetation removal and modified habitat disturbance	Extensive	Very Likely	Substantial	Footprint control, avoidance of mature and riparian trees, asset compensation, topsoil conservation, progressive revegetation	Moderate Note: The rating must be revisited if

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Impact	Magnitude	Likelihood	Significance of Risk	High Level Mitigation Measures	Residual Risk
					natural or critical habitat is identified
Slope Instability, Landslide and Erosion	Extensive	Very Likely	Substantial	Stabilize, drain and protect slopes. Set action thresholds. Maintain exclusion zones. Inspect after heavy rain.	Substantial Note: It remains Substantial because of the mountainous setting and potentially severe consequences.
Surplus Material and Spoil Disposal	Extensive	Very Likely	Substantial	Maximize suitable material reuse, use only approved and stable spoil sites, compact and rehabilitate spoil away from waterways and drainage paths	Substantial Note: It remains Substantial until sufficient approved capacity and effective closure are demonstrated.
Surface-Water Quality, Hydrology and Community Water Supply	Intermediate	Expected	Substantial	Verify priority water sources before works, maintain flows and community water access, Control erosion and sediment, isolate in-stream works during low flows, Prevent polluted discharges to waterways	Moderate
Dust, Combustion Emissions and Nuisance	Intermediate	Expected	Substantial	Water surfaces, slow and cover trucks, stabilize ground, and pause dusty work in strong winds. Maintain plant, minimize idling and prohibit burning	Moderate
Haulage, Unsealed Surfaces, Stockpiles, Crushing and Batching Plants	Intermediate	Expected	Substantial	Site facilities safely., Secure sites and control hazards, Manage routes, timing and speeds.	Moderate
Noise and Vibration	Intermediate	Expected	Substantial	Use quieter equipment, barriers and daytime scheduling. Notify communities before noisy work. Monitor against limits or a 3 dB(A) increase.	Moderate
Waste, Hazardous Materials and Spills	Intermediate	Expected	Substantial	Track and minimize waste. Segregate and dispose safely.	Moderate

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Impact	Magnitude	Likelihood	Significance of Risk	High Level Mitigation Measures	Residual Risk
				Store fuels and chemicals safely. Refuel on protected surfaces.	
Borrow Areas, Quarries and Temporary Facilities	Extensive	Very Likely	Substantial	Screen and approve sites. Avoid sensitive areas. Manage and rehabilitate.	Moderate
Construction Traffic and Community Road Safety	Extensive	Very Likely	Substantial	Approve a traffic plan. Protect schools and markets. Enforce driver and vehicle safety	Substantial Note: It remains Substantial due to potentially fatal failures; continuous supervision is required
Occupational Health and Safety	Extensive	Very Likely	Substantial	Implement OHS controls. Supervise, train and equip workers. Suspend repeated non-compliance Inclusive access	Substantial. Note: It remains Substantial because of the range, duration and severity of hazards.
Labor influx: Strain on local services, utilities, community conflict, and community health and safety	Extensive	Very Likely	Substantial	Self-sufficient, hygienic, and inclusive work camps; health screening/awareness programs; price monitoring; maximising local labour; worker age verification.	Moderate
Gender-based violence, sexual exploitation, and abuse involving project workers	Extensive	Very Likely	Substantial	Worker Code of Conduct, mandatory SEA/SH training, confidential survivor-centered GRM, movement restrictions	Moderate
Temporary access restriction to basic services, farmland, gardens and roadside trading points	Extensive	Very Likely	Substantial	Maintained single-lane access, advance notice, temporary access tracks, harvest-window scheduling, compensation	Moderate
Inequitable distribution of construction employment/business benefits	Minor	Very Likely	Moderate	Local-hiring quotas for women/vulnerable households, transparent publicity, local sourcing of materials/services	Low

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Impact	Magnitude	Likelihood	Significance of Risk	High Level Mitigation Measures	Residual Risk
Physical damage to sacred sites, cemeteries, communal water lines, and utilities	Extensive	Moderately Likely	Substantial	Marking/fencing of sacred sites and utilities before works, rapid-repair protocol, Chance-Find Procedure Implementation of any design/construction controls resulting from the horizontal cave investigation (e.g., exclusion zone, vibration monitoring, engineered support) before heavy machinery operates near the site.	Low, contingent on the horizontal cave investigation being completed and its measures implemented before works horizontal cave area
Post-Construction Phase					
Decommissioning and closure of temporary construction facilities	Intermediate	Moderately likely	Moderate	Implement approved Decommissioning Mangement Plan (part of CESMP) before demobilization	Low
Air Quality	Intermediate	Moderately likely	Moderate	Limit emissions, minimize dust	Low
Water Quality	Intermediate	Moderately likely	Moderate	Clear drains, remove debris, control erosion, repair damage. respond to spills.	Low
Access, Flora and Fauna	Intermediate	Moderately likely	Moderate	Stay within the existing corridor, no new forest access or extraction, monitor and address habitat pressure	Low
Design fails to secure access/safety benefits for vulnerable road users	Intermediate	Moderately Likely	Moderate	Inclusive design features (sidewalks, lighting, accessibility ramps), post-completion access monitoring	Low
Unequal distribution of operation-phase economic benefits	Intermediate	Moderately Likely	Moderate	Community-based development support, feeder-track connections from outlying Aldeias	Low

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9. Stakeholder Engagement and Information Disclosure

9.1 Consultation with Stakeholders

Stakeholder engagement to date has mainly occurred as part of the broader Gleno-Maubisse corridor. A project-awareness-level series of consultations was held across 11 sucos in 2018 along the full Gleno–Maubisse corridor, including Horai-Quic, Mulo and Nunumoge. The stakeholders consulted for the Project included project-affected parties (PAPs) such as communities, local authorities, suco leaders, customary leaders, national authorities, agricultural and forest institutions, educational institutions, and other interest groups. The resettlement team also conducted ad hoc consultations, focus group discussions, and meetings with potentially affected parties before conducting the Land Acquisition and Resettlement (LAR) impacts assessment. Another suco-level consultation was held in August 2022 to disclose and discuss the LARAP, ESIA, and GBV mitigation measures for the broader Gleno-Maubisse corridor. The consultation involved local authorities and community representatives in several Sucos, including Suco Nunumoge and Suco Mulo in Section 1, with the main agenda being to disclose and discuss the resettlement/land-acquisition process and compensation, environmental mitigation measures, GBV/SEA risks, the Code of Conduct, local GBV service providers, and how to access the GRM.

A specific round of engagement for this ESIA was carried out in September 2026 alongside the field observation, but was limited to introductory awareness, gathering assessment information from Suco authorities in the affected Sucos, a field observation along the corridor, and a sample census with affected parties to provide input for LARAP. Based on this round of engagement, the Suco authorities welcomed and supported the project and expressed no concerns, noting that the community has waited many years for this road and that they had already heard about the project in 2019.

9.2 Future Engagement and Information Disclosure

Stakeholder engagement for the remainder of the Project cycle will be carried out under the Project's Stakeholder Engagement Plan (SEP), prepared in accordance with ESS10. Guided by principles of early and continuous engagement, transparency, inclusiveness, and meaningful two-way dialogue, consultations will involve affected parties, other interested parties, and disadvantaged/vulnerable groups. The PMU will validate baseline data, conduct land verification, and disclose ESIA/LARAP findings before appraisal. It will do this through suco-level meetings, sex-disaggregated focus-group discussions, and interviews with customary leaders. Prior to and during construction, the Contractor and PMU will hold information sessions, post notices, and meet regularly with Suco chiefs. These activities will communicate the works schedule, local recruitment, the worker Code of Conduct, and GRM access, and will monitor labor-influx and GBV-related effects. DedThe team will consult with customary/religious leaders before work reachese horizontal cave and other sacred sites. A post-completion feedback session will address road-safety and service-delivery outcomes and close out residual issues.

Project information, including ESIA/ESMP/LARAP findings, the works schedule, and GRM access points, will be disclosed in Tetum. Formats will suit variable literacy and limited internet access, such as suco-level meetings, printed summaries at suco/municipal offices, notice boards, and broadcasts to remote sucos. The PMU will also disclose full technical documents in English on its website. Further

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detail on stakeholder analysis, engagement methods and timing, disclosure, and monitoring/reporting is provided in the ESMP and standalone SEP.

9.3. Grievance Redress Mechanism

At community level, capacity to engage with the GRM rests substantially on Suco Councils, Aldeia chiefs, and customary Rai Nain and chiefly structures. These structures already resolve local land-use, boundary and neighbourly disputes through Tara Bandu and related mechanisms, and they provide a legitimate foundation for the Project GRM. Under Timorese law, SEA/SH and violence against children are public crimes that fall outside customary jurisdiction and must be referred to formal legal, medical and psychosocial pathways. Because women and vulnerable groups are often under-represented in customary structures, use of customary resolution should be voluntary and must not prevent access to the Project GRM or formal remedies. Community awareness of the GRM needs to be assessed and strengthened during project implementation and reinforced through refresher disclosure at the start of pre-construction, using village notice boards, Suco and municipal offices, and community meetings.

The GRM for this corridor will adopt and apply the existing PMU GRM for other TLBRP road sections of the broader Gleno-Maubisse corridor. The GRM provides an accessible, free-of-charge channel for any stakeholder, project-affected person or worker to raise concerns, complaints, or grievances related to Project activities. Grievances may be submitted through several channels, at the complainant's choice: suco-level complaint/suggestion boxes checked weekly, a personal visit to the Section-level or PMU-level GRC, the TLBRP GRM hotline, WhatsApp, a written petition, or email (TLBRP.complaints@mpw.gov.tl). All channels accept grievances in Tetum, Portuguese, or Bahasa Indonesia. Anonymous grievances are accepted at every channel, and a complainant may bypass a channel perceived as unresponsive or biased.

There is a two-tier Grievance Redress Mechanism (GRM), established and operated by the PMU. The first tier (Section/Site level) is chaired by the Section/Site Engineer (PMU or Supervision Consultant), with the Contractor's Community Liaison focal point and Suco representatives as members; the Section-level Grievance Redress Committee (GRC) covering this Subcomponent aims to resolve grievances within 10 working days. Unresolved or serious grievances escalate to tier 2 (PMU level), chaired by the PMU Project Manager, with the Social and Environmental Safeguards/GRM Specialist, the Gender Specialist and Project GRM Focal Point, and a Technical Engineer as members, which aims to resolve within 15 working days. Every grievance is acknowledged within 3 working days of receipt and closed – resolved, withdrawn, or escalated – within 60 days. The process follows six steps: uptake; sorting and processing; acknowledgement and follow-up; verification, investigation, action, and documentation; monitoring, evaluation, and reporting; and providing feedback to the complainant, including escalation options if the complainant remains unsatisfied with the resolution.

A separate, confidential pathway applies to reports of gender-based violence, sexual exploitation and abuse, or sexual harassment (GBV/SEA/SH). Any uptake channel may receive such a report, which is handled through a survivor-centred approach: recorded without judgement, with the survivor's informed consent sought before any action, and with confidentiality protected at every stage. Cases linked to a Project worker are reported to MPW's Ethics and Integrity focal point; the completed Incident Report is sealed and sent directly to the Gender Specialist/GRM Focal Point, who, with the survivor's consent, links them to the local GBV Working Group/service providers and a Victim/Survivor Support Officer for a safety assessment and referral to health, psychosocial, legal and shelter services

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as needed; community GBV not linked to a Project worker is referred to the local GBV Sub-Cluster/Working Group for survivor support rather than to MPW. The PMU notifies the World Bank of any GBV/SEA/SH incident within 48 hours of becoming aware of it and provides an investigation report within 45 days, in accordance with the Project's ESCP.

A separate workers' GRM, established under the Labour Management Procedures (LMP) prior to mobilization, addresses workplace concerns raised by Contractor and Consultant personnel, operating independently, without retribution, and in a language workers understand. The PMU Project Manager monitors GRM performance (registration books/spreadsheet checked at least every two months, with periodic verification calls to complainants) and produce quarterly report disaggregated by sex, including grievance categories, volumes by section, and resolution status. Where engaged, a Third-Party Monitoring Agent independently reviews GRM implementation. Complainants who remain unsatisfied may also approach the World Bank's Grievance Redress Service (grievances@worldbank.org) or Inspection Panel at any time.

Full procedures, standard registration and reporting formats, contact details, and the GRM budget are set out in the SEP and the Project's GRM Manual.

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10. Environmental and Social Mitigation and Monitoring Measures

Annex 2 contains the recommended mitigation measures for the TLBRP2 Section1 investments for design, construction and operational phases. The tables for each phase include details of the mitigation measures required, the cost allocation, responsible entity and the applicable project phase.

Monitoring measures are also provided Annex 3. The tables are divided into four sections: (i) design phase checklist; (ii) one-off preconstruction checklist; (iii) weekly checklist for the construction phase; and, (iv) supervision checklist for the operational phase of the investments.

The mitigation and monitoring plans in Annexes 2 and 3 form the basis of the TLBRP2 Section 1 Environmental and Social Management Plan (ESMP). The ESMP will be included in bid documentation for project implementation. As well as detailing the required measures, the ESMP also include instructions for ESMP implementation highlighting safeguard roles and responsibilities during project implementation, institutional capacity development and training requirements for project implementation and projected budget for this. The ESMP also contains instructions for integration of safeguards into the bid and contract documents.

The PMU carries overall responsibility for E&S risk management supervision during design and implementation phase of the project and is responsible for incorporating the operational phase supervision requirements into their annual work plans and budgets.

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11. Institutional Arrangements, Monitoring and Capacity Building

11.1. Institutional Arrangements and Responsibilities

TLBRP2 will maintain the same implementing arrangements as TLBRP. The Administrative Council of the Infrastructure Fund and the Ministry of Finance will provide overall oversight of project implementation, and MPW will be the Implementing Agency. The proposed project will be prepared and implemented by the existing Road Sector PMU within MPW that is managing externally supported major road upgrading projects. The PMU will be responsible for day-to-day management of the project, including E&S risk management. The PMU is currently implementing TLBRP and two ADB-funded road projects. With the GFPP resources, it will be augmented with additional staff to manage the growing number of the projects.

Overall implementation responsibility. The PMU will retain overall accountability for implementation of ESIA and ESMP, including environmental and social screening, preparation and clearance of site-specific instruments, stakeholder engagement, grievance management, land and livelihood impact management, contractor supervision, incident reporting, quarterly reporting to the World Bank, and corrective action follow-up. The PMU will ensure that all E&S obligations are integrated into engineering design, bidding documents, contract conditions, method statements, work programs, payment certificates, and maintenance arrangements.

Core institutional roles. ***The PMU*** will be supported by qualified environmental, social, occupational health and safety, land/resettlement, and stakeholder engagement specialists, and Gender/SEA/SH specialists, either as direct staff or through dedicated consultant support. ***The Supervision Consultant*** will provide day-to-day verification of contractor compliance, review the CESMP and supporting plans, issue non-conformance notices, verify corrective actions, and advise the PMU when works should be suspended because of serious or repeated non-compliance. ***The Contractor*** will be responsible for implementing all measures in the ESMP, CESMP and its sub-plans (e.g., traffic management plan, OHS plan, labor management procedures, code of conduct, grievance procedures, cultural heritage chance-find procedure, spoil management plan, water quality monitoring protocol, and site restoration. The PMU must approve the CESMP before any works start, and contractor mitigation costs form part of the construction contract.

Minimum E&S staffing requirements. Before the commencement of civil works, the PMU will confirm that the following functions are in place and adequately resourced: Environmental and Social Specialist(s); an OHS Specialist or focal point; a GRM and Stakeholder Engagement Specialist or focal point; a Land Acquisition/Resettlement Specialist; a Gender/SEA/SH Specialist or focal point; and monitoring and reporting support. At a minimum, the Contractor will appoint a full-time, locally based National Environmental Specialist (NES); a full-time, locally based OHS Officer or focal point; a National Social Specialist (NSS)/Community Liaison Officer; a GRM/GBV/SEA/SH focal point; and trained traffic and safety personnel commensurate with the number and risk profile of active work fronts. The Contractor will also have access to intermittent support from an international E&S specialist. These personnel will be authorized to stop unsafe or non-compliant work, require immediate corrective action, and escalate serious issues to the Supervision Consultant and the PMU.

Institutional responsibility matrix. The table below summarizes the minimum division of responsibilities for ESMP implementation. Detailed task allocation will be confirmed in the Project Operations Manual, site-specific ESMP, CESMP, and civil works contract.

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Table 19. Institutional and Implementation Arrangements

Institutions	Functions	Key Deliverables	E&S staffing requirements
Project Management Unit (PMU)	Provide overall ESMP governance and accountability; coordinate with the World Bank; maintain adequately resourced environmental, social, OHS, grievance, stakeholder engagement, land acquisition/resettlement, gender and SEA/SH functions; lead E&S risk management and updates to safeguard instruments; oversee stakeholder engagement and the grievance redress mechanism; track incidents and corrective actions; and manage E&S requirements during the maintenance period.	Approved E&S work plan; cleared and disclosed ESIA, ESMP, LARAP, SEP and LMP; cultural heritage and disclosure records; quarterly E&S reports; incident notifications; corrective-action tracker; stakeholder and grievance records; World Bank review-response records; and semi-annual E&S reports.	✓ Environmental and Social Specialist(s): International (Part time - PT) and National (Full time - FT) ✓ OHS Specialist or focal point; ✓ GRM and Stakeholder Engagement Specialist or focal point ✓ National Land Acquisition/Resettlement Specialist (FT) ✓ Gender/SEA/SH Specialist or focal point.
Supervision Consultant	Independently supervise and verify contractor compliance with the ESMP, CESMP and applicable E&S requirements; conduct site inspections and performance monitoring; identify non-conformances and recommend stop-work action where warranted; verify corrective-action closure; support instrument updates and stakeholder engagement; and advise the PMU on compliance and payment implications.	Site inspection reports; non-conformance notices; stop-work recommendations; verified corrective-action closure records; monthly E&S performance summaries; inputs to updated E&S instruments; stakeholder and grievance monitoring records; and payment-related compliance advice.	✓ International Environmental Consultant (IEC) – PT ✓ International Social and Resettlement Consultant (ISRC) – PT ✓ National Environmental Consultant (NEC) & OHS - FT ✓ National Social Safeguards Consultant (NSSC) & Resettlement - FT ✓ GRM and Stakeholder Engagement Specialist or focal point ✓ Gender/SEA/SH Specialist or focal point.
Contractors	Prepare and implement the CESMP and supporting plans; deploy qualified environmental, social, OHS, community liaison, GRM/GBV/SEA/SH, traffic and safety personnel; undertake daily risk controls and inspections; train and induct workers; engage communities and operate the site-level grievance mechanism; report incidents and non-compliances; implement corrective actions; and stop unsafe or non-compliant work.	Approved CESMP and supporting plans; daily inspection and monitoring records; induction and toolbox-talk records; signed codes of conduct; traffic-control logs; spill records; waste manifests; stakeholder engagement and grievance logs; incident and non-compliance reports; and evidence of completed corrective actions.	✓ International E&S Specialist - PT ✓ National Environmental Specialist (NES) - FT ✓ OHS Officer – FT ✓ National Social Specialist (NSS) & Community Liaison Officer (CLO) - FT ✓ GRM/GBV/SEA/SH focal point

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11.2. Institutional Capacity Assessment

Institutional responsibility for the road sector, including E&S management, rests with the Directorate General for Roads, Bridges and Flood Prevention and Control (DGRBFPC) under MPW, supported by the PMU. The MPW has gained substantial experience in managing World Bank-financed road projects, including TLRCRP and TLBRP. This experience encompasses ESMP and LARAP implementation, contractor E&S oversight, grievance redress mechanism (GRM) operation, gender-based violence and sexual exploitation and abuse/sexual harassment (GBV/SEA/SH) risk management, stakeholder engagement, and reporting.

E&S capacity has strengthened since the 2019 ESIA, when only two staff members were assigned E&S responsibilities. The current team comprises a Safeguards Coordinator, a National Environmental Officer, an Environmental Assistant, a Social Specialist, a Gender Specialist, and two Field Enumerators. Under TLBRP, the PMU has also advanced GRM and SEA/SH prevention and risk management through the preparation and implementation of a SEA/SH Action Plan and a GRM Manual. These instruments have been applied in practice and provide a sound basis for adaptation to the proposed Project, as appropriate. Overall, the institutional and procedural framework for E&S management and grievance handling is reasonably well established. At the same time, much of the relevant expertise remains concentrated in project-funded positions, and further strengthening of MPW's institutional capacity would be beneficial, particularly in relation to the E&S dimensions of operation and maintenance.

Experience from TLRCRP and TLBRP also points to several areas where institutional arrangements could be further reinforced. Safeguards implementation has, at times, been affected by specialist turnover. The departure of experienced resettlement personnel contributed to delays in consultations, validation of asset inventories, and compensation negotiations. Experience also indicated that combining environmental and resettlement responsibilities within a single position did not provide sufficient coverage; the current team does not include a dedicated resettlement specialist. In addition, occasional delays in annual contract renewals have affected the continuity of fieldwork, baseline studies, and LARAP updates. The PMU has drawn on external expertise for specialized assignments, while internal approval processes for travel and logistics have sometimes constrained the frequency of site supervision.

Contractor E&S capacity has not always developed at the same pace as contractual requirements. In some instances, the appointment of E&S and GRM focal points has been delayed, workplace signage and suggestion boxes have not been consistently available, and oversight of subcontractors and primary suppliers has required further attention. Effective day-to-day compliance will therefore depend on a suitably resourced Supervision Consultant, timely mobilizations of qualified contractor personnel, and clear incorporation and enforcement of E&S obligations in procurement and contract documents.

Under the proposed Project, the PMU will be further strengthened through the engagement of additional international and national specialists, including a dedicated, full-time national resettlement specialist. Measures to promote continuity will include renewing contracts sufficiently in advance of expiry, establishing clear handover arrangements, streamlining field-travel procedures, and providing a dedicated budget for supervision. Targeted training on the World Bank ESSs will also be provided to relevant MPW counterparts, the PMU, the Supervision Consultant, and contractors. Together, these

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measures are expected to consolidate existing capacity, address identified implementation constraints, and support consistent E&S performance throughout the Project cycle.

11.3. Monitoring and Reporting

Monitoring system. Monitoring will combine contractor self-monitoring, Supervision Consultant verification, PMU oversight, community feedback, grievance analysis, and periodic World Bank implementation support. Monitoring will be risk-based and intensified during high-risk activities, including slope cutting, culvert works, blasting or rock breaking if used, operation of asphalt or batching facilities, works near water sources, works near sacred or culturally important sites, traffic diversions, land access activities, and construction during or immediately after heavy rainfall. Monitoring results will be used to determine whether mitigation measures remain adequate or require revision under adaptive management.

Reporting requirements. The Contractor will submit weekly site E&S reports to the Supervision Consultant and monthly consolidated E&S reports to the PMU through the Resident Engineer. The Supervision Consultant will provide monthly compliance verification reports, including non-conformance status, incident follow-up, and recommendations for payment certification or withholding where contractual E&S obligations are not met. The PMU will submit quarterly E&S monitoring reports to the World Bank and will immediately notify the Bank of any serious incident or accident in accordance with project incident reporting procedures. Reports will include data, analysis, photographs where appropriate, consultation and GRM summaries, corrective action status, and lessons learned.

11.4. Capacity Building Approach

Capacity building will be treated as a continuous implementation function rather than a one-off training event. The program will combine awareness raising, role-specific technical training, contractor induction, field coaching, refresher training, and learning from incidents, grievances, audits, and World Bank review comments. Training will be delivered before mobilization and updated when monitoring identifies performance gaps. Records will document topic, trainer, participants, sex-disaggregated attendance where appropriate, learning materials, competency checks, and follow-up actions.

Table 20. Capacity Building Approach

Training topic	Target participants	Timing / frequency	Key content
World Bank ESF, ESS requirements	PMU, Supervision Consultant, Contractor management	Before procurement and refreshed annually or when instruments are updated	Risk-based screening, ESMP/CESMP hierarchy, disclosure, documentation, reporting, and adaptive management.
OHS and emergency preparedness for mountainous road works	Contractor supervisors, operators, workers, flaggers, first-aid personnel	Before mobilization, before high-risk works, and monthly toolbox refreshers	Steep-slope work, machinery safety, traffic interfaces, emergency evacuation, incident reporting, PPE, and stop-work authority.

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Training topic	Target participants	Timing / frequency	Key content
Slope stability, erosion control, drainage, and spoil management	Contractor engineers, Environmental Site Officer, Supervision Consultant, equipment operators	Before earthworks and before each rainy season	Sediment controls, temporary stabilization, bioengineering, drainage maintenance, spoil disposal, prohibition of uncontrolled side-casting, and rainfall-triggered inspections.
Stakeholder engagement, GRM, SEA/SH-sensitive referral, and worker conduct	PMU social team, Contractor Community Liaison Officer, supervisors, workers, local focal points	Before mobilization and refreshed every six months or after serious complaints	Meaningful consultation, disclosure, grievance intake and closure, confidentiality, survivor-centered referral pathways, code of conduct, and retaliation prevention.
Land access, livelihood impacts, and cultural heritage chance finds	PMU safeguards team, Contractor, Supervision Consultant, local authorities, customary leaders where appropriate	Before site clearance and repeated before works in sensitive areas	Asset verification, compensation-before-impact principle, temporary access management, sacred-site avoidance, chance-find stop-work requirements, and documentation.

Adaptive management and corrective action. If monitoring, grievances, incidents, design changes, cultural heritage findings, or World Bank review identify new or greater risks, the PMU will require timely revision of the ESMP and CESMP. Corrective actions will specify the issue, required action, responsible party, deadline, verification method, and consequence for non-compliance. Where risks cannot be adequately controlled, the Supervision Consultant/Engineer and PMU will have authority to suspend the relevant activity until corrective measures are implemented and verified.

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Annex 1. Environmental and Social Sensitive Receptors

The maps presented below identify the key E&S receptors along the Section 1 road corridor. These receptors underpin the baseline analysis and provide the basis for assessing potential Project-related impacts, determining receptor sensitivity, and developing appropriate mitigation and management measures in the ESIA.

Sta. 00+800 to Sta. 01+400



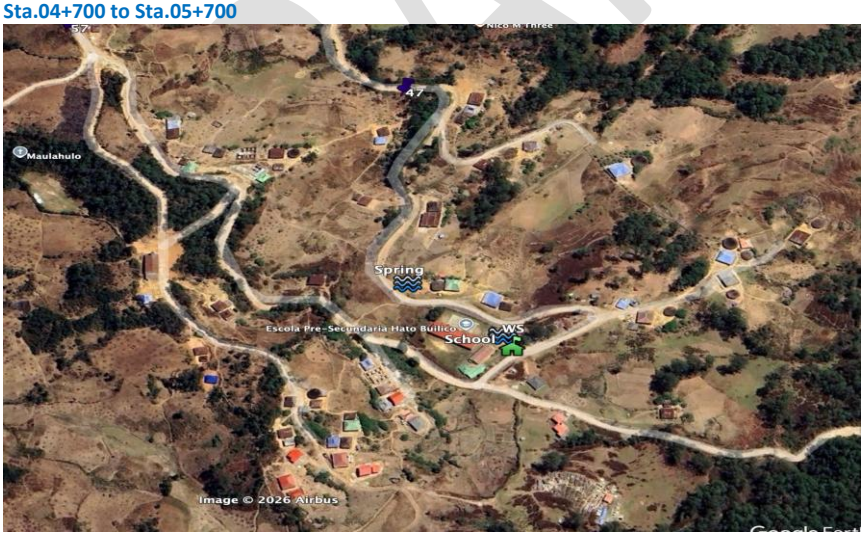
Sta. 01+400 to 01+700



Sta. 03+300 to Sta.03+500



Sta.04+700 to Sta.05+700



Sta.06+600 to Sta.07+300



Sta. 07+800 to Sta. 08+00



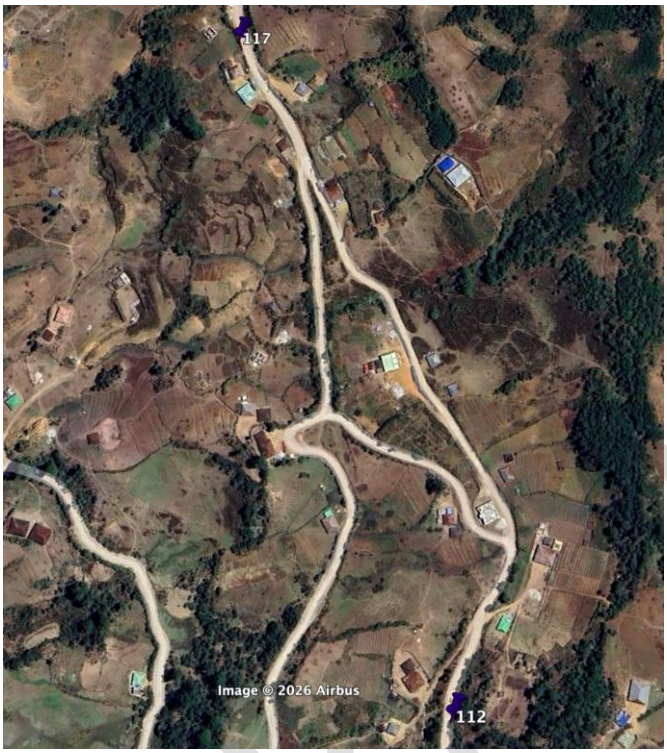
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Annex 2. Environmental and Social Mitigation Measures

Potential Impacts	Addressed In:	E&S Mitigation Measures	Estimated Mitigation Costs	Responsible Party	Supervising Party
Pre-Construction Phase					
Social disruption from land acquisition procedures and early labor influx	SEP, LMP, CESMP, GRM Manual	• Communicate survey schedules, land rights, and valuation procedures clearly and early through local authorities and consult with affected communities • Revisit earlier Suco-level consultations to confirm proper engagement with Suco representatives before construction begins • Contractor to arrange inclusive consultation with Project-Affected Parties per the SEP prior mobilizing to site • Enforce a Worker Code of Conduct from early mobilization, addressing SEA/SH risks and requiring respect for local customs, including Tara Bandu and Lulik • Prioritize local hiring and promote equal access to work opportunities to reduce community discontent over non-local labour and to avoid excluding vulnerable groups. • Keep the Project GRM operational from pre-construction, with channels accessible at Suco	Part of PMU operational and SEP budget	PMU, Contractor	PMU, Supervision Consultant

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Potential Impacts	Addressed In:	E&S Mitigation Measures	Estimated Mitigation Costs	Responsible Party	Supervising Party
		level to raise and resolve concerns on land, compensation or worker conduct			
Physical/economic displacement due to land acquisition for the confirmed right-of-way and ancillary sites (borrow pits, spoil disposal, laydown areas)	LARAP, ESIA	• Update a standalone LARAP based on a complete detailed measurement survey, applying an entitlement matrix that recognizes customary and use rights as well as formal title, consistent with ESS5 • Apply the mitigation hierarchy: minimize land take through design adjustments (retaining the existing alignment and reserve wherever feasible) before compensating unavoidable losses at full replacement value • Disclose the LARAP and entitlements to affected communities, through Suco Councils and Rai Nain, prior to any land acquisition, in Tetum-language and low-literacy-appropriate formats • Provide livelihood restoration support for affected roadside	Include in LARAP compensation budget (full replacement cost and livelihood restoration allowances)	PMU (Social/Resettlement Specialist)	PMU

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Potential Impacts	Addressed In:	E&S Mitigation Measures	Estimated Mitigation Costs	Responsible Party	Supervising Party
		vendors, small businesses, and agricultural/tree-crop cultivators prior to site clearance • Conduct periodic stakeholder engagement with PAPs following the SEP and LARAP recommendations, and fully establish and publicize the GRM before land acquisition begins • Compensate for acquired land and assets, and resettle displaced households, where possible, on suitable land in situ that retains the same clan ownership			
Damage or disturbance to physical cultural resources and sacred sites identified in the ESIA	DED/ Road Design, CHMP and CFP, CESMP	• Conduct pre-clearance joint walkovers with community elders and local authorities to map and demarcate known lulik sites, sacred trees, and graves • Adjust design and boundaries where feasible to avoid physical intrusion into cultural/sacred sites	Included in Contractor's CESMP provisional sum (CHMP/CFP implementation)	PMU, Contractor.	PMU, Supervision Consultant, responsible cultural-heritage authority

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Potential Impacts	Addressed In:	E&S Mitigation Measures	Estimated Mitigation Costs	Responsible Party	Supervising Party
		• Include the CHMP and CFP in the Contractor's CESMP • Facilitate customary consensus-building and required traditional ceremonies, overseen by traditional custodians, if relocating boundary markers is unavoidable • For the horizontal cave, commission a joint speleological, geotechnical and cultural investigation prior to finalizing the detailed design, to confirm the cave's extent, structural condition and connectivity to the broader karst system			
Disproportionate adverse impacts on vulnerable and marginalized groups from land acquisition and construction activities	LARAP, SEP	• Screen all Project-Affected Persons during LARAP verification to identify baseline vulnerability indicators (gender of household head, age, disability, land tenure insecurity) • Hold dedicated, culturally accessible focus group discussions in Tetum	Included in LARAP and SEP budget	PMU Social Safeguards/Gender Specialist	PMU

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Potential Impacts	Addressed In:	E&S Mitigation Measures	Estimated Mitigation Costs	Responsible Party	Supervising Party
		(or relevant local dialects) with women and vulnerable community members at accessible venues and times • Ensure compensation and assistance packages include vulnerable-group considerations and protocols guaranteeing women retain control over compensation shares • Provide tailored logistical assistance during physical relocation or asset clearance for elderly persons and households headed by persons with disabilities			
Incomplete baseline information and insufficient design verification	ESIA, DED	Verify spoil sites, water sources, noise and air receptors, biodiversity, temporary facilities and cultural values; incorporate findings into drawings, quantities, specifications and method constraints; apply hold points where unresolved.	Included in investigation and design costs	PMU and Design Team	Supervision Consultant
Ancillary-site, materials and supply-chain risks	DED, Procurement, CESMP, Permits	Confirm locations and capacity; screen land access, permits, stability, biodiversity, heritage, safety, water demand and pollution; use authorized sources; verify suppliers; require weed controls	Included in procurement, permitting and contractor costs	Contractor	PMU and Supervision Consultant

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Potential Impacts	Addressed In:	E&S Mitigation Measures	Estimated Mitigation Costs	Responsible Party	Supervising Party
		and progressive rehabilitation.			
Damage to or interruption of utilities and community infrastructure	DED, CESMP	Consult providers and communities; verify plans and field locations; protect, relocate and reconnect services; notify users; minimize interruptions; repair accidental damage promptly at Contractor expense.	Included in utility relocation and Contractor costs	Contractor and utility providers	PMU and Supervision Consultant
Early contractor mobilization risks	Procurement, CESMP	Approve CESMP and site-specific plans before works; mobilize experienced ESHS personnel; induct workers; test grievance and emergency channels; do not proceed until readiness controls are verified.	Included in Contractor mobilization and CESMP costs	Contractor	PMU and Supervision Consultant
Construction Phase					
Vegetation removal and modified-habitat disturbance	CESMP	Survey and approve footprint; avoid important trees; minimize clearing; prohibit unauthorized clearing; conduct pre-clearance checks; manage timber and topsoil; progressively stabilize and revegetate with weed-free local species.	Included in earthworks and rehabilitation costs.	Contractor	PMU and Supervision Consultant
Slope instability, landslide, rockfall and erosion	DED, Procurement, CESMP	Verify geotechnical conditions; use staged cutting, benches, temporary support, controlled fills and drainage; set rainfall/movement thresholds; maintain exclusion zones; inspect after rain; verify permanent protection before opening.	Included in geotechnical, earthworks and slope-protection costs.	Contractor and Design Team	PMU and Supervision Consultant
Surplus material and spoil disposal	CESMP	Prepare a corridor-wide material balance; maximize suitable reuse; approve only sites with lawful access, capacity and stability; compact and profile spoil; protect drainage; rehabilitate	Included in material management and disposal costs	Contractor	PMU and Supervision Consultant

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Potential Impacts	Addressed In:	E&S Mitigation Measures	Estimated Mitigation Costs	Responsible Party	Supervising Party
		progressively; track source, volume and destination.			
Surface-water quality, hydrology and community water supply	CESMP	Verify priority sources; maintain flows and access; provide replacement supply before interruption; install erosion and sediment controls; isolate in-stream works; prohibit pollutant discharges; intensify monitoring during rain and incidents.	Included in drainage, monitoring and pollution-control costs	Contractor	PMU, Supervision Consultant and water authorities
Dust, emissions, haulage, stockpiles, crushing and batching nuisance and community safety	CESMP	Map receptors; control dust with sustainable water, speeds, truck covers and stabilization; maintain plant and prohibit burning; site facilities with adequate separation; fence sites, control access and traffic, stabilize stockpiles and maintain complaint channels.	Included in plant operation, traffic and environmental-control costs	Contractor	PMU and Supervision Consultant
Noise and vibration	CESMP	Use quieter equipment and methods; maintain silencers; install barriers where practical; locate stationary plant away from receptors; restrict high-noise work; notify communities; monitor against conservative criteria.	Included in equipment, monitoring and noise-control costs	Contractor	PMU and Supervision Consultant
Waste, hazardous materials, spills, borrow areas, quarries and temporary facilities	CESMP	Maintain inventories; segregate and label waste; use approved carriers and facilities; provide secondary containment and spill kits; prohibit dumping/burning; screen and permit ancillary sites; implement approved layouts, management, rehabilitation and closure plans.	Included in waste, hazardous-material and ancillary-site costs.	Contractor	PMU, Supervision Consultant and permitting authorities
Construction traffic, road safety, livelihoods	CESMP, LARAP	Implement approved traffic plan; define routes, speeds, delivery windows,	Included in traffic management and LARAP costs.	Contractor	PMU, Supervision Consultant, road

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Potential Impacts	Addressed In:	E&S Mitigation Measures	Estimated Mitigation Costs	Responsible Party	Supervising Party
and access restriction		barriers, flaggers and pedestrian paths; maintain single-lane access; give at least seven days' notice of restrictions; provide temporary access and compensation where required.			authorities and Suco authorities
Occupational health and safety	CESMP	Implement a resourced OHS system; provide supervision, training, risk assessments, method statements, permits, separation, PPE, welfare, first aid and rescue; authorize high-risk work; suspend repeated non-compliance; provide reasonable accessibility.	Included in Contractor OHS costs.	Contractor	PMU and Supervision Consultant
Labor influx: strain on local services, utilities, community conflict, and community health and safety	LMP; Guidelines on Worker Camps/Accommodation	• Provide adequate housing and independent basic services (power, water, sanitation, wastewater treatment, medical care) at worker camps, gender-separated and disability-accessible, and agreed with local communities • Implement pre-employment medical screening and ongoing communicable-disease awareness programs (including HIV-STI) for workers and host communities • Coordinate with Suco authorities to monitor local market prices and establish dispute-resolution mechanisms for	Included in Contractor's camp establishment/operation budget (CESMP/BoQ)	Contractor	PMU; Supervision Consultant

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Potential Impacts	Addressed In:	E&S Mitigation Measures	Estimated Mitigation Costs	Responsible Party	Supervising Party
		host-worker friction • Maximize local labor recruitment to reduce the required size of the influx workforce • Strictly enforce a minimum working age of 18, verified via national ID or birth certificate • Conduct regular unannounced labor inspections of work fronts, subcontractors and supply chains			
Gender-based violence, sexual exploitation and abuse involving project workers	SEA/SH Action Plan; LMP; Worker Code of Conduct	• Implement the SEA/SH Action Plan (Annex 10) and include it in the CSEMP • Require all project personnel, managers, contractors, and subcontractors to sign a Worker Code of Conduct with explicit prohibitions on SEA/SH • Provide continuous, mandatory SEA/SH sensitization and induction training in Tetum for workers and local communities • Establish a confidential, survivor-centred GRM channel partnered with existing local SEA/SH service providers. • Restrict unauthorized worker movement into adjacent suco residential zones after working hours	Included in Contractor's CESMP provisional sum. PMU GRM operational budget and SEA/SH Action Plan budget.	Contractor; PMU Gender Specialist/ GRM Focal Point	PMU
Temporary access restriction to	LARAP; TMP	• Maintain at least single-lane traffic and pedestrian	Included in Contractor's CESMP budget (temporary	Contractor; PMU	Supervision Consultant

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Potential Impacts	Addressed In:	E&S Mitigation Measures	Estimated Mitigation Costs	Responsible Party	Supervising Party
basic services, farmland, gardens and roadside trading points during construction		access at all times during construction, with flag-persons/traffic controllers at active work fronts • Implement traffic and road safety management plan • Provide advance notice (minimum 7 days) of planned access restrictions or diversions via Suco/Aldeia notice boards and community meetings • Construct temporary access tracks to gardens/coffee plots severed by works, in consultation with affected households • Schedule the most disruptive works outside the June–August coffee harvest window where feasible • Compensate temporary loss of livelihood or trading income under the LARAP if access cannot be maintained	access tracks) and LARAP budget (access-disruption compensation)		
Inequitable distribution of construction employment and business benefits	LMP; SEP	• Set local-hiring targets and quotas for women and vulnerable groups in the contractor's labor recruitment plan • Publicize employment and local-procurement opportunities transparently through Suco Councils and community meetings, in Tetum and low-literacy-appropriate formats • Prioritize local sourcing of construction materials and services where feasible	No material additional cost; managed through recruitment/procurement procedures (LMP/CESMP)	Contractor; PMU	Supervision Consultant

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Potential Impacts	Addressed In:	E&S Mitigation Measures	Estimated Mitigation Costs	Responsible Party	Supervising Party
Physical damage to sacred sites, cemeteries, communal water lines and utilities during clearance and construction	DED/ Road Design; CHMP; CFP	• Mark and physically barrier-fence all previously identified lulik sites and graves prior to heavy machine deployment, in consultation with local and customary authorities • Require immediate, mandatory contractor repair or replacement within 24 hours of any accidentally severed community water pipes or utility links • Implement CHMP and maintain the Chance-Find Procedure during construction • Before heavy machinery, blasting or deep excavation near the horizontal cave, confirm the joint speleological/geotechnical investigation is complete and implement any resulting exclusion zone, vibration limits, structural monitoring or engineered support	Included in Contractor's CESMP budget (marking/fencing, utility-repair provisional sum)	Contractor	Supervision Consultant
Grievances arising from E&S impacts not addressed in a timely manner	SEP, GRM Manual; LARAP	• Maintain the GRM during construction, with channels accessible at Suco level for land, labor and cultural-heritage concerns • Prioritize and track resolution of grievances from severely impacted and vulnerable households • Conduct periodic stakeholder engagement per the SEP and LARAP to surface emerging concerns early	Included in GRM operating budget	Contractors; Supervision Consultant	PMU
Post-Construction Phase					

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Potential Impacts	Addressed In:	E&S Mitigation Measures	Estimated Mitigation Costs	Responsible Party	Supervising Party
Decommissioning and closure of temporary construction facilities	CESMP	Implement approved Decommissioning Management Plan (part of CESMP) before demobilization.	Included in Contractor budget	Contractors; Supervision Consultant	PMU
Operational air quality and road dust	MPW/PMU Road Maintenance Program/Manual	Maintain sealed surface and road condition; rely on available road capacity and receptor separation to limit congestion and concentrated emissions.	Included in routine road operation and maintenance.	Road Authority	PMU/relevant transport and environmental authorities
Operational water quality, sediment and spills	MPW/PMU Maintenance Program/Manual	Inspect and clear culverts, drains and outlets; remove sediment, vegetation and waste; maintain erosion protection and revegetation; repair scour and blockages; retain spill-response capacity and inspect after major rainfall or incidents.	Included in routine maintenance and emergency-response costs.	Road Authority	Relevant environmental and water authorities
Improved access pressure on flora and fauna	MPW/PMU Maintenance Program/Manual	Keep operation and maintenance within the existing corridor; do not create forest-access routes or authorize extraction; monitor access-related pressure and coordinate with regulators.	Included in routine environmental monitoring;	Road Authority	Relevant environmental and forestry authorities
Operational road safety and induced roadside development	Road Safety & Maintenance Program	Complete road-safety audits before opening and after initial operation; monitor crashes and near misses; correct hotspots; maintain drainage, slopes, vegetation and safety assets; coordinate land-use and roadside management.	Included in road-safety and maintenance budgets.	Road Authority	Transport, traffic and local authorities
Design fails to secure access/safety benefits for vulnerable road users	ESMP; Detailed Design	• Incorporate sidewalks/shoulders, signage, lighting at settlement/school/market sections, and accessibility ramps at intersections into the final detailed design • Monitor socioeconomic and vulnerability	Included in detailed design/civil works BoQ (universal-access features)	PMU; Design Consultant	PMU; Supervision Consultant

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Potential Impacts	Addressed In:	E&S Mitigation Measures	Estimated Mitigation Costs	Responsible Party	Supervising Party
		condition in the corridor Sucos post-completion as an indicator of realized access benefits, disaggregated by gender			
Unequal distribution of operation-phase economic benefits across sucos along the corridor	SEP; municipal development planning	• Support community-based enterprise development along the corridor, in coordination with relevant government • Ensure feeder-track and footpath connections from outlying Aldeias to the upgraded road are considered in complementary local infrastructure planning	To be programmed under PMU/Municipality post-completion community development budget	PMU; Municipality	PMU

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Annex 3. Environmental and Social Monitoring Plan

TLBRP2 Pre-Construction Monitoring Plan

Impact Area	Monitoring Parameters	Frequency/Responsibility
Social disruption from land acquisition procedures and early labor influx	• GRM records • Community/Suco-level consultation materials, minutes, and feedback • Labor influx monitoring, including local & vulnerable group hire ratio	✓ Prior to and during the labor influx, land verification and land acquisition process ✓ Supervision Consultant/PMU
Physical/economic displacement	• LARAP/compensation completion reports; community/Suco-level consultation materials, minutes, and feedback	✓ Prior to civil works ✓ Supervision Consultant/PMU
Cultural heritage and sacred sites	• Investigation reports; updated design that considers mitigation measures; minutes of stakeholder consultation; clearance from relevant authorities; Chance-Find records; walkover sign-off records	✓ Before detailed-design approval and relevant high-risk activity and ongoing during clearance ✓ Supervision Consultant/PMU
Disproportionate adverse impacts on vulnerable and marginalized groups	• LARAP with vulnerability data; community/Suco-level consultation materials, minutes, and feedback that accommodate vulnerable group needs; Vulnerability screening register	✓ Prior to DMS/LARAP finalization ✓ PMU Social Safeguards/Gender Specialist
Baseline verification and design risk reduction	• Verification completed for spoil sites, water sources, noise/air receptors, biodiversity, temporary facilities and cultural values; • Findings incorporated into drawings, quantities, specifications and method constraints; • Unresolved hold points recorded.	✓ Before detailed-design approval and relevant high-risk activity ✓ PMU and Design Team, verified by Supervision Consultant.
Ancillary sites, materials and supply chain	• Sites and suppliers approved and licensed; • Lawful land access and capacity confirmed; • Stability, biodiversity, heritage, water demand, pollution and haul-route risks screened; • Weed controls and rehabilitation plans in place.	✓ Before approval or use, then monthly ✓ Contractor, verified by PMU and Supervision Consultant.
Utilities and community infrastructure	• Utility plans and field locations verified • Protection/relocation plans approved • Users notified • Number and duration of interruptions • Accidental strikes, response time and restoration status.	✓ Before excavation and weekly during affected works ✓ Contractor and utility providers, supervised by PMU and Supervision Consultant.
Contractor mobilization readiness	• CESMP and site-specific plans approved • Experienced ESHS staff mobilized • Worker inductions complete • Grievance and emergency channels tested • Permits and readiness hold points closed.	✓ Once before site establishment and before each high-risk activity ✓ Contractor, verified by PMU and Supervision Consultant.

TLBRP2 Construction Monitoring Plan

Impact Area	Monitoring Parameters	Frequency/Responsibility
Vegetation removal and modified habitat	• Approved clearing footprint • Area cleared • Small and large trees removed • Unauthorized clearing incidents • Pre-clearance checks	✓ Before clearing, daily during clearing and monthly during rehabilitation ✓ Contractor, supervised by PMU and Supervision Consultant.

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Impact Area	Monitoring Parameters	Frequency/Responsibility
	• Topsoil salvage; area stabilized/revegetated and survival of plantings • Invasive species observations.	
Slope instability, landslide, rockfall and erosion	• Geotechnical verification • Compliance with staged cutting, support, compaction and drainage • Rainfall/movement thresholds • Slope condition, cracks and erosion • Post-rain inspections • Exclusion zones and permanent protection completed.	✓ Daily at active slopes, after heavy rain and before opening; ✓ Contractor geotechnical/OHS staff, verified by Design Team and Supervision Consultant.
Surplus material and spoil disposal	• Material balance updated • Volumes generated, reused and disposed • Approved site capacity • Source-to-destination records • Compaction, stable profiling, drainage protection, erosion condition and progressive rehabilitation.	✓ Weekly during earthworks and monthly until closure ✓ Contractor, verified by PMU and Supervision Consultant.
Surface-water quality, hydrology and community water supply	• Turbidity and visible pollution upstream/downstream • pH and hydrocarbons where relevant • Sediment-control condition • Flow-path changes • Continuity of community supply • Complaints, incidents and corrective actions.	✓ (a) Baseline before works; (b) weekly at active crossings; (c) during/after significant rain and (d) after incidents ✓ Contractor, supervised by PMU, Supervision Consultant and water authorities.
Dust and combustion emissions	• Visible dust at sensitive receptors • Water application, truck covering and speed compliance • Plant maintenance and idling • Open-burning incidents • Complaints and targeted particulate results where triggered.	✓ Daily visual checks, weekly records review and monitoring during dry/windy conditions or complaints ✓ Contractor, verified by Supervision Consultant.
Haulage, stockpiles, crushing and batching—community safety	• Approved siting and separation • Fencing and access control • Warning signs • Internal traffic controls • Stockpile stability • Dust/noise controls • Haul-route and delivery-hour compliance • Community complaints and joint inspections.	✓ Before commissioning, then daily operational checks and monthly audits ✓ Contractor, supervised by PMU and Supervision Consultant.
Noise and vibration	• Work hours and advance notices • Equipment silencers/barriers • Noise at sensitive receptors against applicable limits or 3 dB(A) above background • Vibration observations • Complaints and corrective actions.	✓ Baseline before works; during high-noise activities and following complaints; ✓ Contractor, verified by Supervision Consultant.
Waste, hazardous materials and spills	• Waste and hazardous-material inventories • Segregation, labels and secure storage • Authorised transport/disposal records • Secondary containment and spill-kit condition • Spills, response time, contaminated soil management and close-out.	✓ Weekly inspections and immediately after any spill ✓ Contractor, verified by PMU and Supervision Consultant.
Borrow areas, quarries and temporary facilities	• Site screening, land access and permits • Approved layout • Drainage, erosion, dust, noise, traffic, hazardous-material, worker-welfare and security controls • Extraction/use within approved bounds • Rehabilitation and closure progress.	✓ Before use, monthly during operation and at closure ✓ Contractor, verified by PMU, Supervision Consultant and permitting authorities.

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Impact Area	Monitoring Parameters	Frequency/Responsibility
Construction traffic and community road safety	• Approved routes, delivery windows and speed compliance • Signs, barriers, flaggers and pedestrian routes • Driver licences and vehicle checks • School/market controls; crashes, near misses, complaints and road damage.	✓ Daily at active work zones, weekly route inspections and after incidents ✓ Contractor, supervised by PMU, Supervision Consultant and road/Suco authorities.
Occupational health and safety	• Inductions and competency records • Task risk assessments, permits and method statements • PPE and plant–pedestrian separation • Welfare, first aid and rescue readiness • Inspections, stop-work actions, incidents, lost-time injuries and corrective-action closure.	✓ Daily supervision, weekly formal inspection and immediate incident reporting ✓ Contractor OHS team, verified by PMU and Supervision Consultant.
Labor influx and community health/safety	• Camp and labor inspection reports • Worker accommodation/welfare conditions reports • OHS incidents/accident notifications and reports (per LMP) • Minutes and documentation of communicable disease awareness and prevention programs related • GRM community feedback	✓ Daily supervision, weekly/ monthly formal inspection and immediate incident reporting ✓ Contractor supervised by Supervision Consultant, PMU
Gender-based violence/ SEA/SH	• Implementation status of the GBV/SEA/SH Action Plan • #SEA/SH training courses delivered and their documentation • percentage of workers who have signed and attended CoC training • #SEA/SH grievances referred to Service Providers and time taken to resolve.	✓ Daily supervision, weekly/ monthly formal report and immediate incident reporting ✓ Contractor, Supervision Consultant, PMU Gender Specialist/GRM Focal Point
Temporary access restriction to basic services, farmland, gardens, and roadside trading points	• GRM access-related complaints • Minutes of stakeholder consultation • Communication materials and disclosure documentation of advance notice • Access-track completion	✓ Throughout construction process, monthly formal report ✓ Contractor, Supervision Consultant, PMU
Inequitable distribution of construction employment/business benefits	• Local and vulnerable group-hire ratio • Recruitment records disaggregated by sex and Suco • Number and type of workers employed (local vs. non-local), per LMP reporting	✓ During recruitment process, monthly formal report ✓ Contractor, supervised by Supervision Consultant, PMU
Physical damage to sacred sites, cemeteries, communal water lines, and utilities	• Chance-Find records • Minutes of stakeholder consultation • Clearance from relevant authorities • Utility-repair turnaround time	✓ Throughout construction process, monthly formal report ✓ Contractor, supervised by Supervision Consultant, PMU
Grievance redress	• GRM case log (Section-level logbooks and central grievance spreadsheet) • Resolution against GRM timelines • Grievance nature, type and status per the grievances track sheet and reporting template in the GRM Manual.	✓ Monthly GRM data collation; quarterly ESMP implementation progress report ✓ Contractor, PMU GRM Focal Point/Supervision Consultant

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TLBRP2 Post-Construction Monitoring Plan

Impact Area	Monitoring Parameters	Frequency/Responsibility
Decommissioning and closure of temporary construction facilities	• Worker camps, batching and crushing plants, storage areas, workshops, borrow areas, quarries, spoil sites and access tracks closed in accordance with approved decommissioning plans • Structures, equipment, waste and hazardous materials removed • Contaminated soil remediated • Drainage restored • Disturbed land regraded and revegetated • Landowner acceptance, permits and outstanding grievances closed • Rehabilitation survival and erosion stability verified.	✓ Before demobilisation, at handover, quarterly during the defects-liability period and after the first wet season ✓ Contractor, verified by PMU and Supervision Consultant with landowners and relevant environmental/local authorities.
Operational air quality and road dust	• Sealed-surface condition • Visible dust • Traffic congestion at sensitive locations • Air-quality complaints • Targeted particulate or emissions checks where deterioration is suspected.	• Quarterly in the first year, then during routine maintenance and after complaints • Road Authority, overseen by relevant transport/environmental authorities.
Operational water quality, sediment and spills	• Culvert, drain and outlet condition • Sediment, vegetation and waste accumulation • Scour and erosion • Revegetation condition • Spill-response readiness • Receiving-water/community-source condition after major rain or incidents.	✓ Before and after each wet season, after major rainfall and after incidents ✓ Road Authority, overseen by environmental and water authorities.
Access-related pressure on flora and fauna	• Operation/maintenance remains within corridor • Unauthorised access tracks or extraction • Vegetation loss, fauna incidents and invasive species; referrals and regulatory follow-up.	✓ Six-monthly and during maintenance inspections ✓ Road Authority, overseen by environmental and forestry authorities.
Operational road safety and induced roadside development	• Pre-opening and post-opening audit actions • Crashes, near misses and hotspots • Speed and pedestrian risks near schools, markets and settlements • Safety-asset, drainage, slope and vegetation condition • Unsafe stopping, trading or encroachment.	✓ Before opening, at 3 and 12 months, then annually and after serious incidents ✓ Road Authority with transport, traffic and local authorities.
Design fails to secure access/safety benefits for vulnerable road users	• Presence and condition of pedestrian infrastructure, signage, lighting and accessibility ramps at school, market and settlement sections • Documentation of improvement in socioeconomic or vulnerable groups'condition post-construction • Post-completion community feedback session	✓ Post-opening design/accessibility audit ✓ Contractor, Road Authority/PMU, PMU Social Safeguards/Gender Specialist
Unequal distribution of operation-phase economic benefits across Sucos along the corridor	• Status of feeder-track and footpath connections from outlying Aldeias to the upgraded road • Community-based development post-construction (if any) • Post-completion community feedback session	✓ Annually for the first years post-opening, then as part of routine socioeconomic monitoring ✓ PMU/Supervision Consultant, coordinating with relevant government agencies

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Annex 4. Water Quality Baseline

[To be completed by PMU once Water Quality Analysis is received from the lab]

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Annex 5. Environmental License

Vice-Premeiro Ministro
Ministério do Turismo e Ambiente
IX GOVERNO CONSTITUCIONAL

Autoridade Nacional de
Licenciamento Ambiental,
Instituto Público, (ANLA, I.P)

Renewal License No.: 045 / Cat. B / ANLA, I.P. / MTA / V / 2025

According to paragraph e) of article 1º, 2º and number 1º of article 23 Decree-Law No. 39/2022, on June 8, first amendment to Decree-Law No. 5/2011, on February 9, Environmental Licensing, in conjunction with paragraph b) article 5 Decree-Law No. 78/2023, on October 11, Organic Law of the Ministry of Tourism and Environment.

THIS LICENSE IS ISSUED

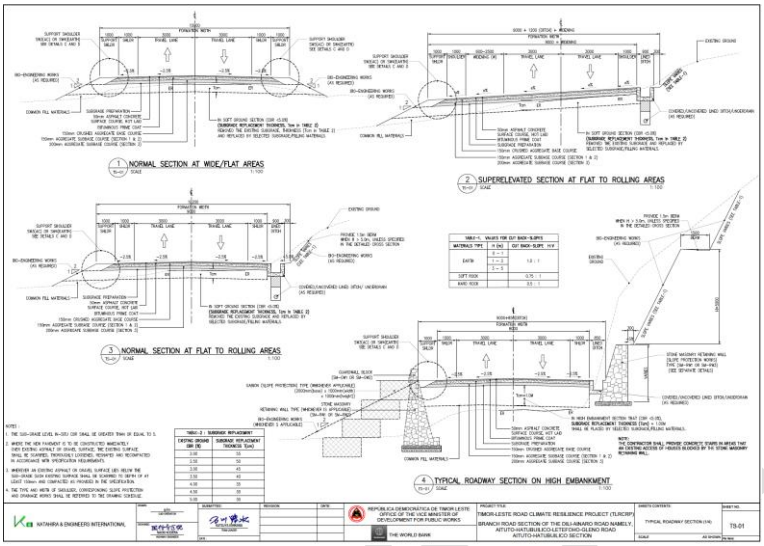
Proponent of the project	:	General Directorate for Roads, Bridges, Prevention and Flood Control – Ministry of Public Works (MOP)
Name of the proponent	:	Mr. Nene Lobato
Application number	:	58 / ANLA-SEA / III / 2020
Sector	:	Transportation
Activity	:	Timor-Leste Branch Road Project (TLBRP) from Aituto – Hatubuilico – Letefoho – Gleno
Scale of the project	:	60 Km
Category of the project	:	B
Location	:	Aituto – Hatubuilico Administrative Post, Ainaro Municipality and Letefoho – Gleno Administrative Post, Ermera Municipality
Date of issued	:	May 30th, 2025
Date of expire	:	May 30th, 2027

The Environmental License is granted in accordance with the conditions attached

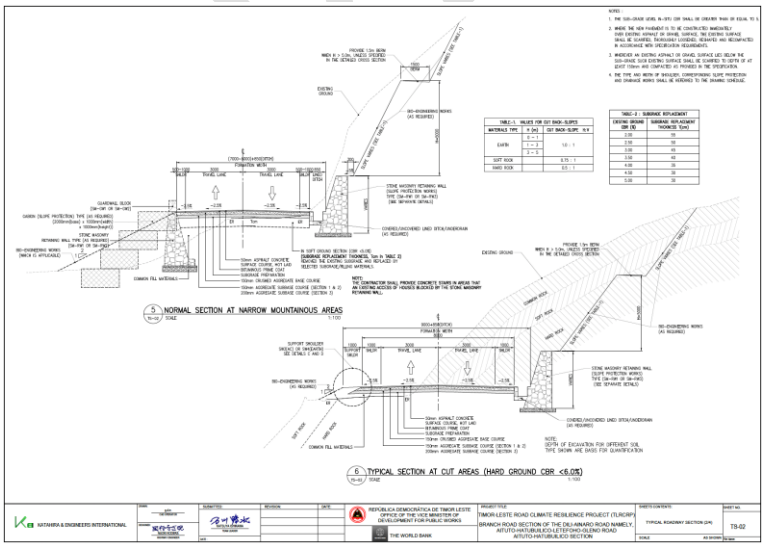
Francisco Kalbuadi Lay
Vice Prime-Minister
Ministry Coordinator for Economic Affairs and Minister of
Tourism and Environment

Annex 6. DED Technical Drawing Related to E&S Aspects

1. Typical Road Section on High Embankment

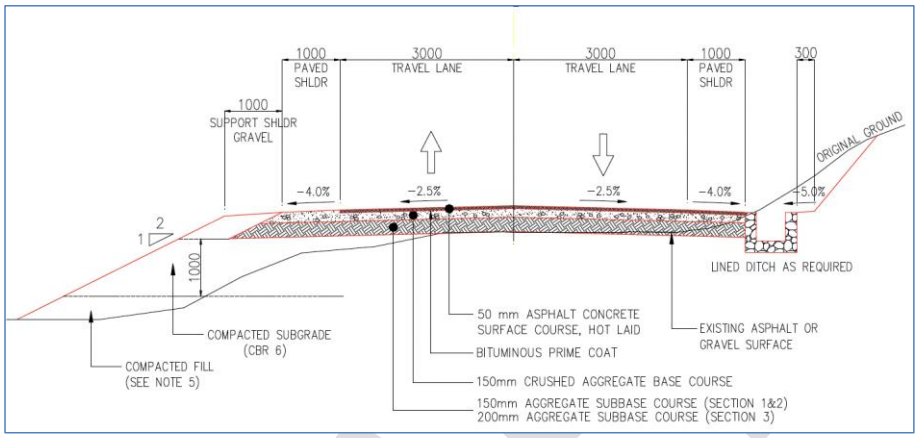


2. Typical Road Section at Cut Areas

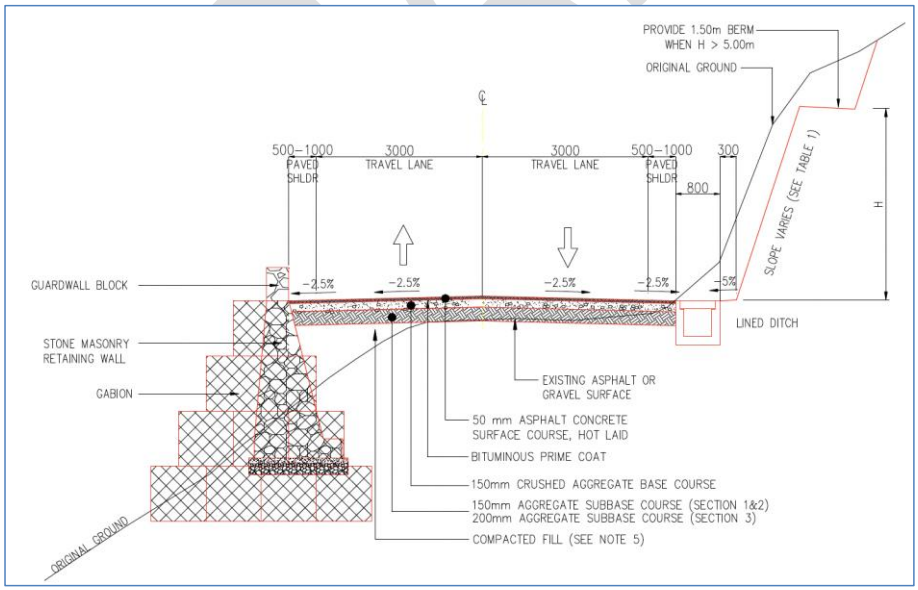


3. Typical Cross Section Types

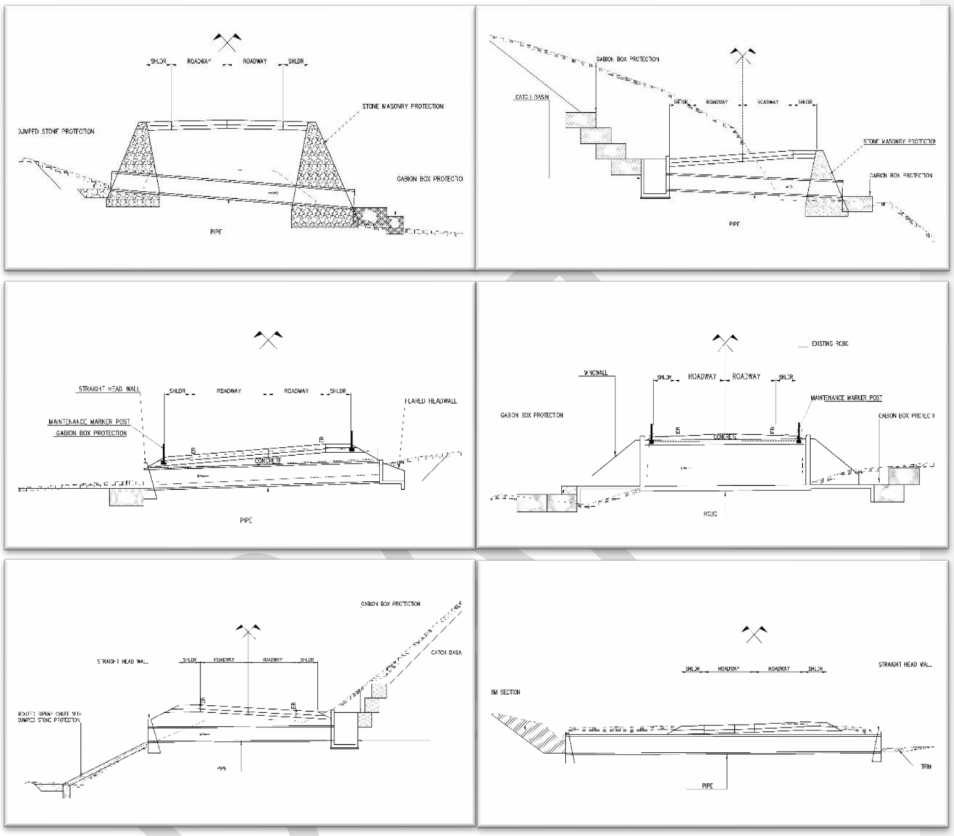
Typical cross section of low embankment sections:



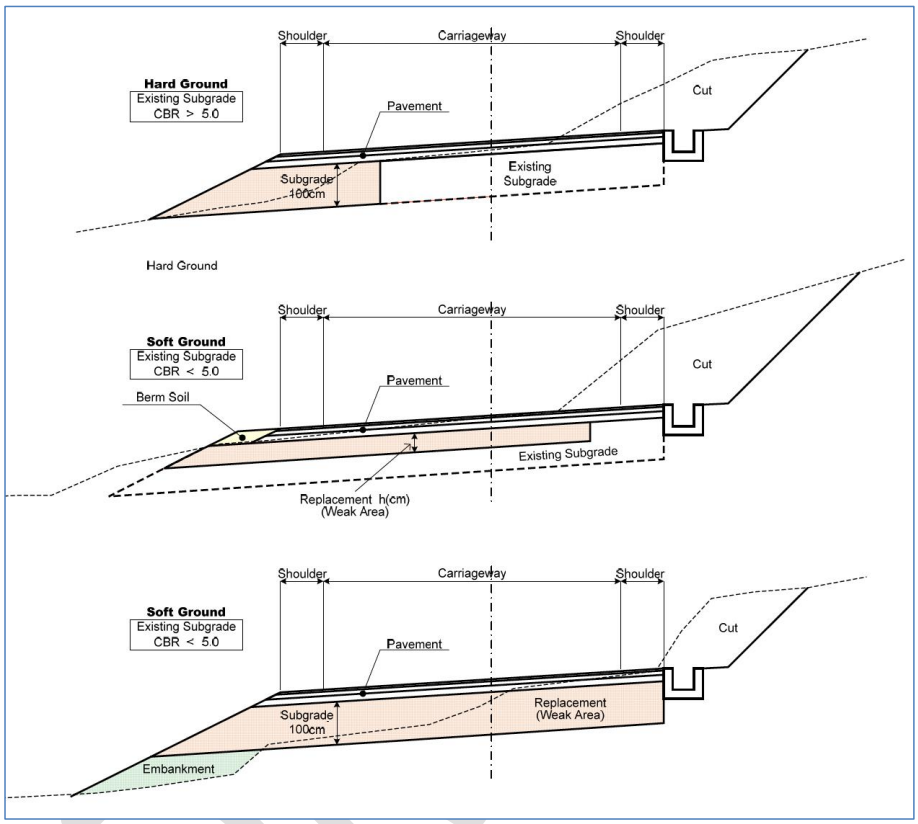
Typical cross section of high embankment sections:



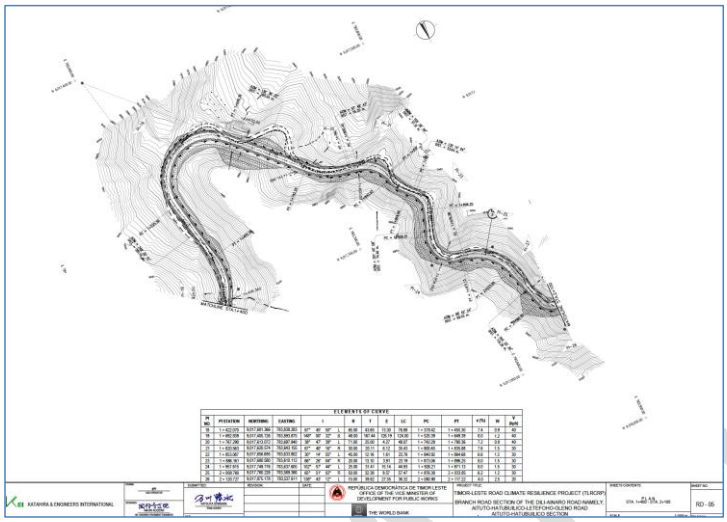
4. Typical Drainage Structure



5. Typical Cross Section for Each Pavement Segment



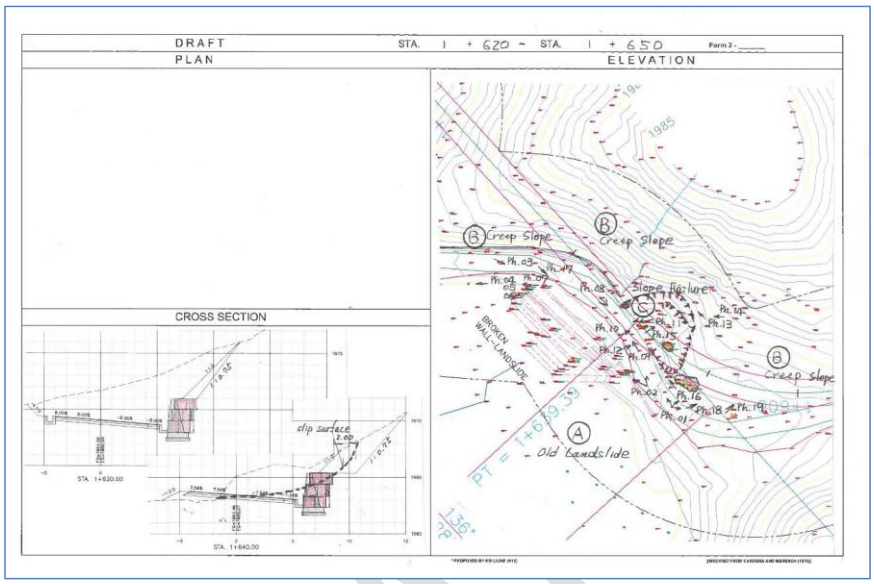
6. Critical Site 1 (STA. 1+620– STA.1+640)



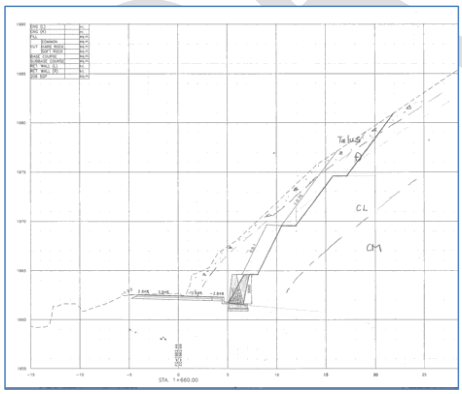


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Geotechnical map and proposed countermeasure:

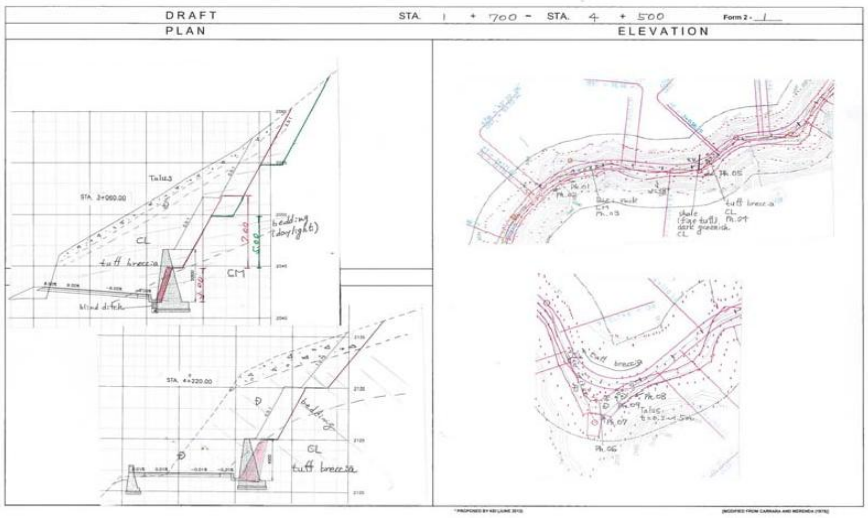


The cut work design of Ⓑ slope at STA.1+660 on the geotechnical section

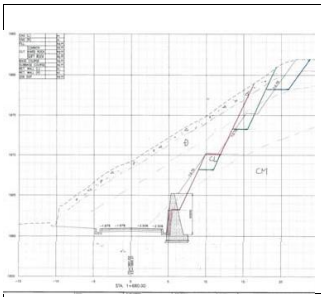
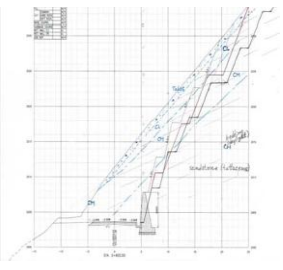
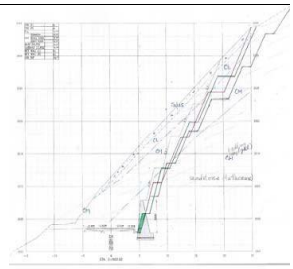


7. Critical Site 2 (STA. 1+700– STA.4+500).

In this section, the slope incline of the top and bottom direction of the road is hard with 45°from 35°. The area is underlain by the Maubisse Limestone mainly composed of alternated layer with limestone, tuff, tuff breccia, sandstone and shale etc. These rocks are overlain by Talus with thickness of 1 to 1.5 meters. The most of outcrop are classified into CM to CH, but sandwich D- and CL-rock mass here and there. The slopes are not stable as shown by the existence of some slope failures and creeping.



The cut slope having more than 21 meters in height are to be designed reluctantly. We called it generally "long cut slope" for which the design must carry out carefully on the basis of adequate investigation because of big disaster due to sudden collapse. It is necessary to construct the berm of 3 meters in width every 21 meters in height. In this case, we must construct the cut slope having the berm every 7 meters height for decreasing the cut volume and leaning wall must be installed at the slope bent where an internal stress is concentrated, and the rock exfoliate due to releasing stress. On the basis of above mentioned, the various cut slope design is proposed as shown in figure below.

		
Comparison 7 meters height every berm and 5 meters height every berm	Long cut slope. Comparison 7 meters height every berm and 5 meters height every berm.	Long cut slope. Comparison 7 meters height every berm and 5 meters height every berm

8. Slope Protection

The slope protection which covers the surface of slope keep the stability of cut slope, perform the maintenance and conserve the landscape. The slope protection is divided into the work using the plantation (hereafter referred to as "sodding planting") and the work using the structure as shown in Table below.

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classification	work item		purpose
sodding planting	seeding	(1) seed spraying (2) borrow spraying (3) vegetation base (4) vegetation sheet works (5) vegetation mat works spraying	- Prevention of erosion - Control of the earth fall caused by frost heaving - Full-scale coating due to the early vegetation
		(6) simple terracing works	- Prevention of erosion due to vegetation established into stripe sape on the fill - Promotion of an invation, the fixation of the vegetation
		(7) vegetation sand bag works (8) vegetation base grouting	
	sodding	(9) sodding	- Prevention of erosion due to the full-scale pasting of the turf - Control of the earth fall caused by frost heaving - Full-scale coating due to the early vegetation
		(10) sod strips works	- Early growth vegetation due to the establishment of vegetation base - Keeping an long-term stability of thick growth base
		(11) painting treatment	- establishment of good scene due to vegetation
	(12) shotcrete with nursery stock setting		- early full-scale covering - establishment of good scene due to the growth tree
structure	(13) steel wire-netting pitchng works (14) fiber-netting pitching works		- keeping the raising base - for preventing the surface failure due to the flow of ground water
	(15) hurdle works (16) gabion works		- control of erosion of slope surface and sediment outflow
	(17) precast clibworks		- holding a fill - prevention of erosion of slope surface
	(18) mortar or concrete spraying (19) stone pitching works (20) block pitching works		- prevention of weathering, soil erosion and seepage of surface water
	(21) concrete pitching works (22) spraying shotcrete cribwork (23) castin-place concrete crib work		- prevention of slope surface failure - earth-retaining structure at the portion of receiving amall earth pressure - prevention of the rockmass exfoliation
	(24) stone masonry & concrete block retaining wall (25) wire-cage works (26) lattice wall (27) concrete retaining wall (28) continuous filament reinforced earth method		- preventing slope failure against earth pressure of some size
	(29) ground reinforced earth method (30) ground anchor works (31) pile works		- preventing slope failure against sliding forece of landslide mass

The sodding planting is most superior in the slope protection because of most economical cost and superior landscape. When the inclination of cut slope will keep enough one, which is shown in Figure below, against weathering advances of the soft rock, the sodding planting is the best countermeasure. On the other hand, when the inclination of cut slope will keep round critical inclination, the closed slope protection, which is (18), (20), (21) and (23) presented in the Table above, is the most suitable countermeasure to resist the weathering advances of its rock because of shuttering the precipitation.

When the inclination of cut slope will keep the middle of both state above, it is desirable to select the open slope protection which is (16), (17) and (22) in table 4. When the inclination of cut slope will keep not enough one, the countermeasure, which is (21)～(31) of "structure" in Table 4, against earth pressure/moving mass contribute to keep the stability of slope.

Bio-Engineering Measures

Based on field assessments of environmental and geotechnical aspects, priority areas for application of bio-engineering solutions have been initially identified. The specific locations, area sizes for treatment, and proposed type of bio-engineering application will be re-identified and confirmed during the detailed design phase of the project.

Soil bio-engineering measures are not simply "greening" techniques. They involve far more than simple application of a green vegetative cover to the degraded slopes. They integrate proven engineering practices with ecological principles, to provide mechanical, hydrological and environmental benefits. Hence, effective application of these measures requires careful planning and design, taking into account the specific characteristics of each site. Factors such as the geology, soils, slope angle, hydrology, existing vegetation cover, etc., should be assessed before appropriate soil bioengineering measures can be prescribed.

Several potential environmental benefits can be achieved by using soil bio-engineering measures, compared to conventional engineering practices. Notably, they usually require only minimal access provisions for equipment, materials and workers; and typically, create only minor disturbance to the site and the environs during installation. In environmentally sensitive locations, where preservation of scenery or wildlife habitats may be critical, soil bio-engineering measures can usually offer more environmentally compatible solutions. For sensitive or remote sites, these do not require long-term maintenance, thereby creating fewer disturbances.

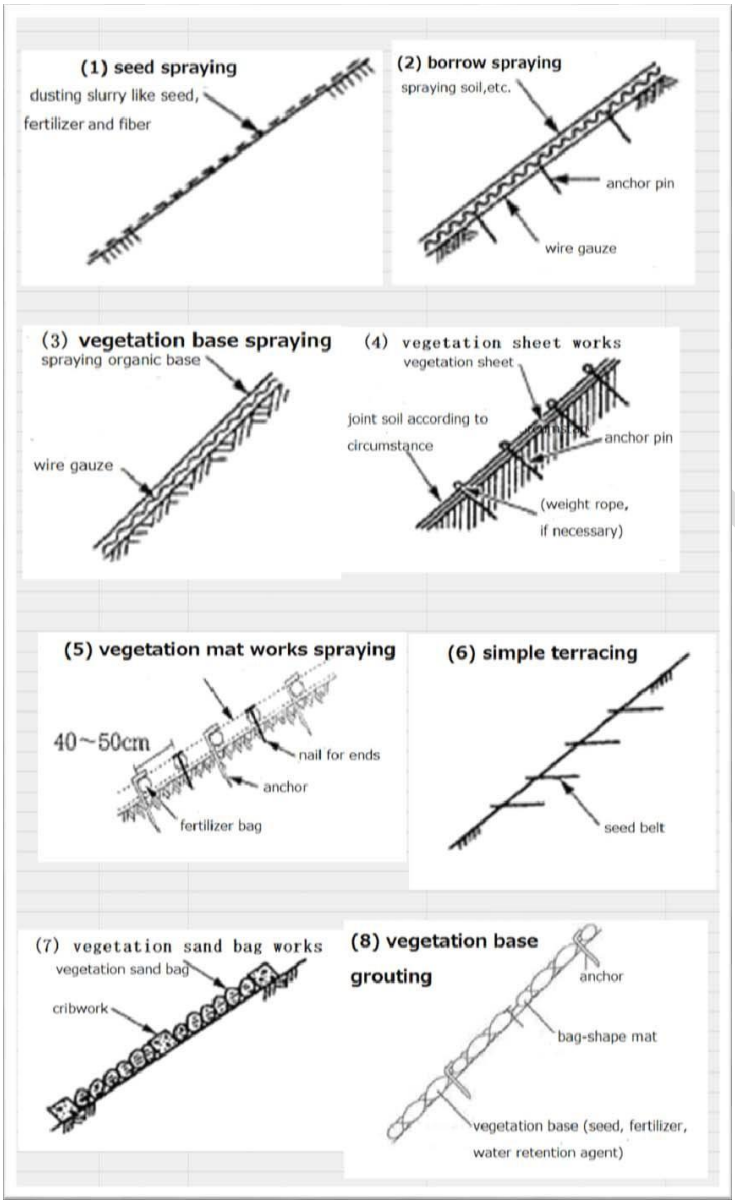
Bio-engineering for slope protection and erosion prevention is comparatively cheaper than conventional systems, such as concrete or masonry protection works. In addition, it is a labor-intensive approach, which benefits local residents, who are commonly familiar in the production of slope protection materials and plants, and whose skills in agriculture is of great advantage during installation.

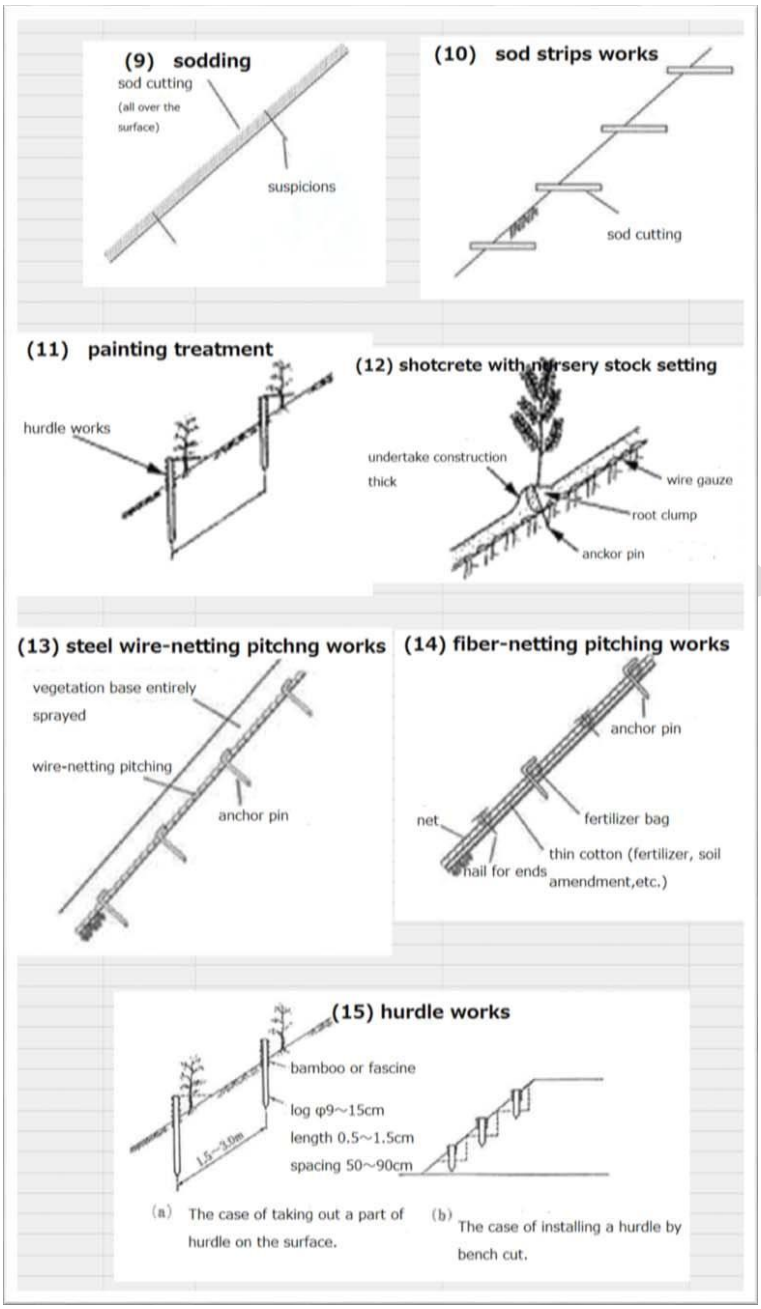
The recommended techniques for use in the project are as follows:

- Live Stake – an appropriate means 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.
- Coconet – made from coir fiber twine woven into high strength nets for extreme slope stabilization and protection for stream/river banks and channels.

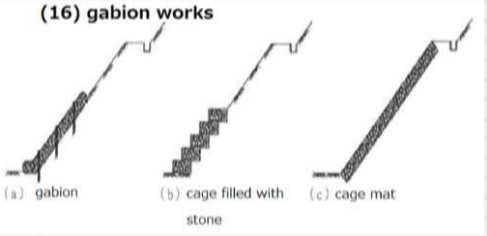
The aforementioned bio-engineering proposals will be defined in details during the detailed design phase of the project roads.

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(1) seed spraying
dusting slurry like seed, fertilizer and fiber
(2) borrow spraying
spraying soil,etc.
anchor pin
wire gauze
(3) vegetation base spraying
spraying organic base
wire gauze
(4) vegetation sheet works
vegetation sheet
joint soil according to circumstance
anchor pin
(weight rope, if necessary)
(5) vegetation mat works spraying
40~50cm
nail for ends
anchor
fertilizer bag
(6) simple terracing
seed belt
(7) vegetation sand bag works
vegetation sand bag
cribwork
(8) vegetation base grouting
anchor
bag-shape mat
vegetation base (seed, fertilizer, water retention agent)

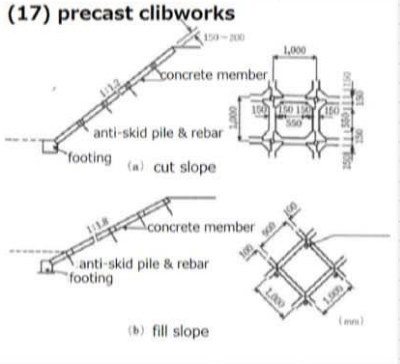

(9) sodding
sod cutting
(all over the surface)
suspicions
(10) sod strips works
sod cutting
(11) painting treatment
hurdle works
(12) shotcrete with nursery stock setting
undertake construction
thick
wire gauze
root clump
anckor pin
(13) steel wire-netting pitchng works
vegetation base entirely sprayed
wire-netting pitching
anchor pin
(14) fiber-netting pitching works
anchor pin
net
fertilizer bag
thin cotton (fertilizer, soil amendment,etc.)
nail for ends
(15) hurdle works
bamboo or fascine
log φ9~15cm
length 0.5~1.5cm
spacing 50~90cm
1.5~3.0m
(a) The case of taking out a part of hurdle on the surface.
(b) The case of installing a hurdle by bench cut.

(16) gabion works

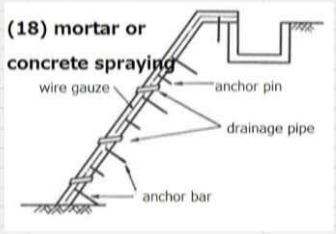


(a) gabion (b) cage filled with stone (c) cage mat

(17) precast clibworks

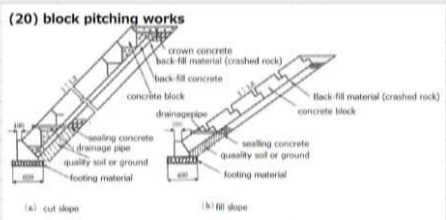


(18) mortar or concrete spraying

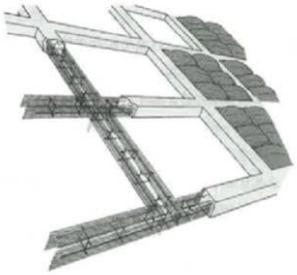


(19) stone pitching works

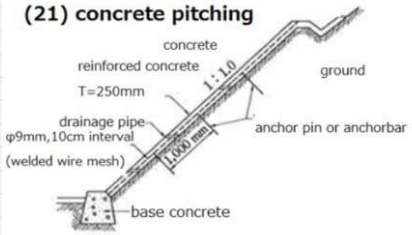
(20) block pitching works



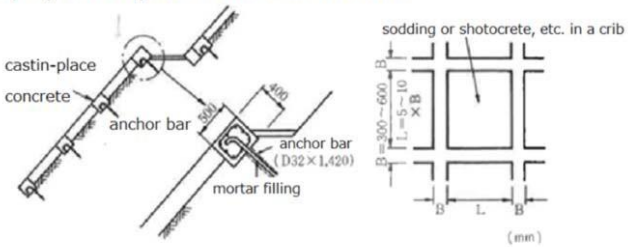
(22) spraying shotcrete cribwork



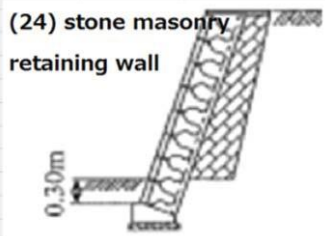
(21) concrete pitching



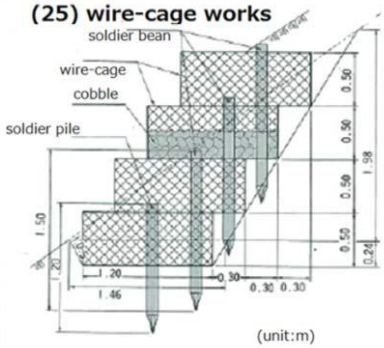
(23) castin-place concrete crib work



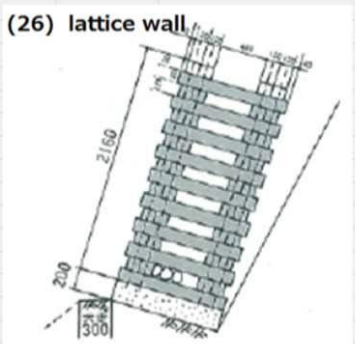
(24) stone masonry retaining wall



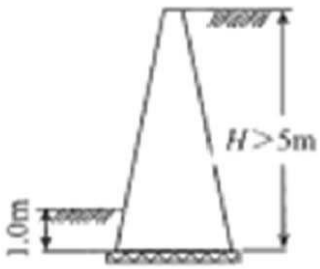
(25) wire-cage works



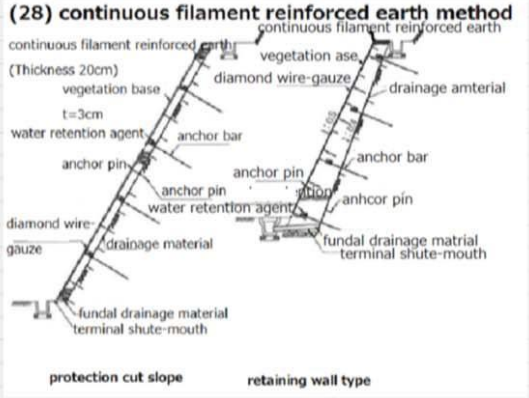
(26) lattice wall



(27) concrete retaining wall

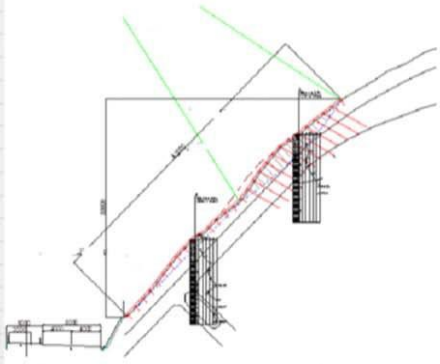


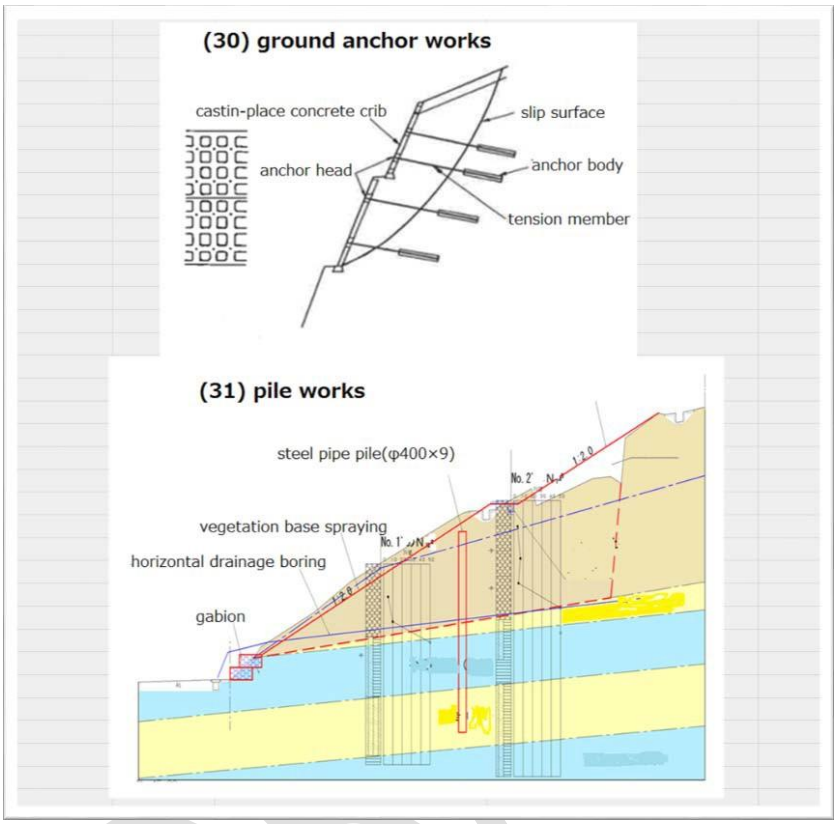
(28) continuous filament reinforced earth method



protection cut slope retaining wall type

(29) ground reinforced earth method




(30) ground anchor works
castin-place concrete crib
slip surface
anchor head
anchor body
tension member
(31) pile works
steel pipe pile(φ400×9)
vegetation base spraying
horizontal drainage boring
gabion

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Annex 7. Species Profiles and Relevance to TLBRP2

Species Name/Common Name	Taxonomy & Biome	IUCN	Species Highlights *Source: IBAT Proximity Report)*	Relevance to TLBRP2
Acerodon mackloti *(*Sunda Fruit Bat)	- Mammalia - Terrestrial	VU	**Habitat:** It is a coastal species occurring from sea level up to 450 m asl, and roosts in colonies of 300-500 individuals. It has been observed roosting in a mango tree together with *Pteropus vampiris* and is most often caught in gardens and secondary forests	*Acerodon mackloti* is considered to have a **low likelihood of occurrence** within the mountainous Ainaro road-upgrade corridor. Although the species is native to Timor, it is predominantly associated with coastal and lowland habitats from sea level to approximately 450 m elevation, whereas the project corridor is largely situated at substantially higher elevations. Resident colonies or regular habitat use are therefore unlikely. Presence should only be considered potentially plausible where the alignment descends below approximately 450 m and intersects mature lowland forest, large fruiting trees, riparian vegetation, orchards or known flying-fox roosts. **Project relevance: Low**
Macaca fascicularis *(*Long-tailed Macaque)	- Mammalia - Terrestrial	EN	This site and buffer contain 0.0% of the estimated Area of Habitat for Macaca fascicularis. This mammal species accounts for 0.6% of the estimated START score within the site and buffer **Habitat:** The species is a generalist and opportunist and has adapted to living in a wide range of habitats, including forests, coasts, hills, and mountains. They occur in mangroves and swamp forests, particularly in riverine habitats; in lowland forests and in human-altered habitats, which include temples, roadsides, agricultural areas, and rural/urban settlements. Anthropogenic ecologies are an important aspect of their natural ecology and should be considered as such when considering their habitat types. **Upper elevation limit:** 2,250 meters	*Macaca fascicularis* is considered to have a **low to moderate likelihood of occurrence** within the mountainous Ainaro road-upgrade corridor. The species is an introduced, uncommon resident in Timor-Leste and is ecologically adaptable, occurring in forest, riverine, agricultural, roadside and settlement habitats up to about 2,250 m elevation. Accordingly, suitable habitat may occur along parts of the alignment, particularly near villages, gardens, fruiting trees, riparian vegetation and secondary forest. ***However, the IBAT site and buffer contain 0.0% of its modelled Area of Habitat, and no project-area record is presented, so regular presence should not be assumed.*** **Project relevance: Low to Moderate.** Vegetation clearing, earthworks, traffic and worker activity could disturb occasional animals or increase human–wildlife interactions where suitable habitat occurs. Targeted interviews and pre-construction checks for animals, calls, feeding signs and local reports are recommended in suitable habitat.
Pteropus griseus *(*Gray Flying Fox)	- Mammalia - Terrestrial	VU	This site and buffer contain 0.01% of the estimated Area of Habitat for *Pteropus griseus.* This mammal species accounts for 3.5% of the estimated START score within the site and buffer. The species is hunted for bushmeat in Sulawesi, along with other co-occurring flying fox species. Habitat quality is declining, as logging is a threat both in the Lesser Sundas and Sulawesi. Logging of forests leads to high levels of erosion, resulting in silt and rock discharge from rivers into coastal wetlands, thus negatively impacting them by depositing too much material at once. In Timor, there is both slash-and-burn agriculture and timber harvesting. There is also unregulated manganese mining, which can negatively impact the watershed and result in further erosion and logging	*Pteropus griseus* is considered to have a **low likelihood of regular occurrence** within the mountainous Ainaro road-upgrade corridor. The species is native to Timor, so occasional presence cannot be excluded; however, available ecological information associates it mainly with primary and secondary lowland forest, coastal forest and mangroves, with published habitat records generally from sea level to about 190 m. This contrasts with the predominantly montane project setting. The small modelled Area of Habitat overlap (0.01%) indicates only limited potential habitat within the site and buffer. Occurrence would be most plausible where lower-elevation sections contain mature fruiting trees, figs, secondary lowland forest, riparian vegetation or roost trees. **Project relevance: Low to moderate.** Vegetation clearing, night works, noise, lighting and increased traffic could disturb

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Species Name/Common Name	Taxonomy & Biome	IUCN	Species Highlights *Source: IBAT Proximity Report)*	Relevance to TLBRP2
				occasional foraging bats or roosts where suitable lower-elevation habitat occurs, but significant effects are unlikely across the predominantly montane corridor. Targeted dusk or dawn surveys, searches for roosts and feeding signs, and local interviews are recommended before vegetation clearing in such areas; confirmed roost trees and important feeding trees should be avoided where practicable.
*Ducula Cineracea (*Timor Imperial Pegeon)	- Aves - Terrestrial	NT	This site and buffer contains 0.6% of the estimated Area of Habitat for Ducula cineracea. The species occurs commonly down to the lowlands, thus its habitat is threatened by the expansion of mining activities and agricultural expansion, particularly driven by the cultivation of cash crops	*Ducula cineracea* is considered to have a **moderate to high likelihood of occurrence** within the mountainous Ainaro road-upgrade corridor where suitable forest or wooded habitat remains. The species is endemic to Timor and Wetar and inhabits the canopy of forest and woodland in foothills and mountains; it is also reported from secondary habitat and coffee plantations with retained trees. The project's montane setting therefore falls within its ecological niche, and the IBAT site and buffer contain 0.6% of its estimated Area of Habitat. However, occurrence is likely to be patchy and dependent on the presence of mature fruiting trees, connected forest, wooded gullies or well-treed coffee agroforest; heavily cleared road sections are less suitable. Pre-construction dawn surveys using visual observations and call playback/listening, supplemented by local interviews, are recommended in suitable habitat, with particular attention to nesting or feeding trees before clearing. **Project relevance: High.** Road widening, vegetation clearing, earthworks, spoil placement, noise and increased traffic could remove or degrade feeding and nesting habitat, disturb birds, and reduce connectivity between forest patches. The project should prioritize avoidance of mature fruiting and nesting trees, minimize clearing in connected forest and wooded gullies, schedule works to avoid active nests where identified, and implement habitat restoration where impacts cannot be avoided.
*Numenius madagascariensis (*Far Eastern Curlew)	- Aves - Marine, Freshwater, Terrestrial	EN	**Habitat:** The species breeds on open mossy or transitional bogs, moss-lichen bogs and wet meadows, and on the swampy shores of small lakes; in the non-breeding season it is essentially coastal, occurring at estuaries, mangrove swamps, saltmarshes and intertidal flats, particularly those with extensive seagrass meadows. It often roosts in salt-marshes, behind mangroves, or on sandy beaches. Its diet on breeding grounds includes insects, such as larvae of beetles and flies, and amphipods. Berries are also consumed during the autumn migration. In non-breeding areas it feeds on marine invertebrates, preferentially taking crabs and small molluscs but also feeding on other crustaceans and polychaete worms. This migratory wader nests from early May to late June, often in small colonies of 2-3 pairs, with an average clutch	*Numenius madagascariensis* is a long-distance migratory shorebird whose non-breeding habitat is overwhelmingly coastal, including estuaries, mangroves, saltmarshes, intertidal mudflats and sandy beaches. These habitats are absent from the inland mountainous Ainaro road section, and the species does not breed in Timor-Leste. Transient overflight cannot be excluded, but regular use of the project area for feeding, roosting or nesting is highly unlikely. The road upgrade is therefore unlikely to cause direct or material impacts on the species. No species-specific mitigation is required for the mountainous section beyond good-practice erosion, sediment, drainage and pollution controls that protect downstream aquatic environments. This assessment should be revisited if associated works, spoil disposal, access routes or drainage outfalls extend to coastal wetlands, estuaries or tidal river mouths; in that case, targeted shorebird surveys should be undertaken during the non-breeding migration period.

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Species Name/Common Name	Taxonomy & Biome	IUCN	Species Highlights *Source: IBAT Proximity Report)*	Relevance to TLBRP2
			size of four eggs. It probably delays maturity longer than most shorebirds, perhaps not breeding until 3-4 years old (del Hoyo et al. 1996, Rogers 2006). **Breeding:** Forest **Movement patterns:** Full Migrant	**Project relevance: Low**
Calidris tenuirostris (Great Knot)	- Aves - Marine, Freshwater, Terrestrial	EN	**Habitat:** The species breeds on gravelly areas covered with lichen and patches of herbs, heather, or alternatively on areas with a continuous layer of lichen and scattered stunted larch Larix spp. or dwarf pine Pinus pumila. It occurs on plateaus or gentle slopes with montane tundra in the subarctic at heights of 300-1,600 m. In its wintering range the species occurs in sheltered coastal habitats such as inlets, bays, harbours, estuaries and lagoons with large intertidal mud and sandflats, oceanic sandy beaches with nearby mudflats, sandy spits and islets, muddy shorelines with mangroves and occasionally exposed reefs or rock platforms. It roosts in refuges such as shallow water in sheltered sites, on coastal dunes or on saltflats amongst mangroves. **On passage** the species stages in estuaries and on intertidal mudflats. The adult breeding diet consists predominantly of plant material such as berries. Small chicks feed exclusively on insects (e.g. larval Diptera and Coleoptera) and spiders. During the winter and on passage the species takes bivalves up to 36 mm long from intertidal mudflats as well as gastropods, crustaceans. This species is a long-distance migrant that largely travels along the coast making few stopovers (del Hoyo et al. 1996) but utilising different routes in the autumn and the spring (del Hoyo et al. 1996, Higgins and Davies 1996). It breeds from late-May to late-June, departing the breeding grounds in July and arriving on the wintering grounds between August and October (del Hoyo et al. 1996). The return migration to the breeding grounds takes place from March to April although juvenile non-breeders often remain in the tropical parts of the wintering range for the breeding season. **Breeding**: Grassland during breeding season **Upper elevation limit:** 1,600 m	*Calidris tenuirostris* is considered to have a **very low likelihood of occurrence** within the mountainous Ainaro road-upgrade corridor. It is a long-distance migratory shorebird that breeds in subarctic montane tundra and, in its tropical non-breeding range, depends mainly on sheltered coastal habitats with extensive intertidal mudflats, including estuaries, lagoons, bays and mangrove-fringed shores. Although its breeding range reaches elevations up to about 1,600 m, those breeding habitats occur far outside Timor-Leste and do not indicate suitability of Ainaro's montane landscape. The species migrates largely along coasts and stages at estuaries and tidal flats; therefore, regular feeding, roosting or stopover use of the inland road corridor is highly unlikely. Transient overflight cannot be excluded. **Project relevance: Low**
Calidris ferruginea (Curlew Sandpiper)	- Aves	VU	**Habitat:** This species breeds on slightly elevated areas in the lowlands of the high Arctic especially	*Calidris ferruginea* is considered to have a **very low likelihood of occurrence** within the mountainous Ainaro road-upgrade

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Species Name/Common Name	Taxonomy & Biome	IUCN	Species Highlights *Source: IBAT Proximity Report)*	Relevance to TLBRP2
	- Marine, Freshwater, Terrestrial		on southward-facing slopes, as well as along the coast and islands of the Arctic Ocean. It shows a preference for open tundra with marshy, boggy depressions and pools from melting permafrost and snow. The nest is a cup positioned on the margins of marshes or pools, on the slopes of hummock tundra, or on dry patches in Polygonum tundra. Breeding success can vary year to year, with prime years yielding a higher number of juveniles. The Victorian Wader Study Group and Australasian Wader Studies Group for example recorded a higher percentage of juveniles (c. 48%) during 2016-2017. Abnormal rainfall in inland sites may additionally create temporary wetlands that provide additional suitable habitat. **Behavior:** It is a full migrant, moving long distances by well-travelled routes. **Habitat:** Grassland during breeding season **Upper elevation limit:** 2,000 m	corridor. It is a long-distance migratory shorebird that breeds in the high Arctic and, in its tropical non-breeding range, mainly uses coastal and low-lying wetlands such as intertidal mudflats, estuaries, lagoons, saltmarshes, saltpans and shallow freshwater or brackish wetlands. Although temporary inland wetlands may occasionally be used during migration, the montane road corridor does not provide its typical feeding or roosting habitat, and the stated upper elevation limit does not indicate suitability because it relates principally to habitats outside Timor-Leste. Transient overflight or exceptional use of flooded fields, shallow reservoirs or temporary wetlands cannot be excluded, but regular occurrence is highly unlikely. **Project relevance: Low**
Calidris falcinellus (Broad-billed Sandpiper)	- Aves - Marine, Freshwater, Terrestrial	VU	**Behaviour** This species is a full migrant, and migrates on a broad front by making short flights between a series of stop-over sites. Adults breeding in Fennoscandia leave the breeding grounds in July (juveniles departing in August), and stop-over in substantial numbers in Sivash, southern Ukraine, on the Middle Eastern coasts, Caspian Sea and Bulgarian seaboard, before arriving in wintering grounds in Africa, Pakistan and south India between August and early-October. Eastern breeding populations migrate on a broad front across the taiga, or along the eastern edge of the continent between September and October, and return in April-May. **Habitat** Breeding This species breeds in the wettest parts of bogs and on open peatland. Non-breeding On migration this species shows a preference for muddy and boggy areas on the shores of ponds and lakes, but it is also found on shallow freshwater, brackish and saline (sometimes hyper-saline) lagoons, temporary swamps, flooded rice-fields, overgrazed wet meadows, inlets of fjords. The species mainly overwinters on large, soft intertidal mudflats, in brackish lagoons, on saltpans (del Hoyo et al.1996), sewage farms and saltmarshes (Snow and Perrins 1998).	*Calidris falcinellus* is considered to have a **very low likelihood of occurrence** within the mountainous Ainaro road-upgrade corridor. It is a fully migratory shorebird that breeds in northern peatlands and, during migration and the non-breeding season, mainly uses intertidal mudflats, brackish lagoons, saltpans, saltmarshes and shallow muddy wetlands. Although it can occur at inland ponds, lakes, temporary swamps and flooded rice fields while on passage, the steep montane road corridor is unlikely to provide regular feeding or roosting habitat. Occasional transient overflight or brief use of suitable shallow wetlands cannot be excluded, but regular occurrence is highly unlikely. **Project relevance: Low**

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Species Name/Common Name	Taxonomy & Biome	IUCN	Species Highlights *Source: IBAT Proximity Report)*	Relevance to TLBRP2
			Breeding site. The nest is a cup on top of a wet sedge or moss cushion, well raised above the water level.	
Pluvialis squatarola (Grey Plover)	- Aves - Marine, Freshwater, Terrestrial	VU	**Behaviour** This species is fully migratory. It departs its breeding grounds from late-July to September (southward movements continuing into November) and returns from late-May to June. It breeds from May to August in solitary well-dispersed pairs and forages alone or in small loose flocks of up to 30 individuals. It is gregarious during the winter however, often roosting in large flocks containing up to several thousand individuals (del Hoyo et al. 1996). **Habitat** Breeding The species nests in the high Arctic in both upland and valley locations between the treeline and the coast, utilizing dry stony tundra with sedge, moss, lichen, grass or dwarf birch, peat ridges in tundra marshes, dry exposed ridges, riverbanks, raised sand or gravel beaches, and rocky slopes, on-breeding Outside of the breeding season the species frequents intertidal mudflats, saltmarshes, sandflats and beaches of oceanic coastlines, bays and estuaries. During migration it may also be found inland on lakes, pools or grasslands. **Breeding site.** The nest is a shallow scrape on dry ground in exposed, stony sites, neighboring nests not less than 400 m apart.	*Pluvialis squatarola* is considered to have a **very low likelihood of occurrence** within the mountainous Ainaro road-upgrade corridor. It is a fully migratory shorebird that breeds in the high Arctic and, during migration and the non-breeding season, occurs mainly on coastal intertidal mudflats, sandflats, beaches, saltmarshes, bays and estuaries. Although it may occasionally use inland lakes, pools or grasslands while on passage, the steep inland montane corridor does not provide its typical feeding or roosting habitat, and it does not breed in Timor-Leste. Transient overflight or exceptional short-term use of a suitable shallow wetland cannot be excluded, but regular occurrence is highly unlikely. **Project relevance: Low**
Eucalyptus urophylla (Timor White Gum)	- Magnoliopsida - Terrestrial	EN	*Eucalyptus urophylla* is a large tree that normally reaches 30–40 m in height and 60–80 cm in diameter, but it has been found greater than 50 m in height and 2 m in diameter. It is pollinated by small bees and other insects. Pollen transfer and gene flow is influenced by wind speed and direction and cyclonic events could promote long distance gene flow within and among islands. The fruits ripen mid-June and July in Indonesia. This tree naturally occurs on volcanic slopes on advanced secondary mountain forest. **Upper Elevation Limit:** 3,000 m	*Eucalyptus urophylla* is native to Timor-Leste and is characteristic of open or secondary montane forest on mountain slopes and in valleys, commonly from about 500 m to 3,000 m elevation. The mountainous Ainaro road corridor therefore falls within the species' potential ecological and elevational range, particularly where volcanic or metamorphic soils support remnant forest, wooded slopes, gullies or mature roadside trees. Occurrence is likely to be patchy and should not be assumed in heavily cleared agricultural or settlement areas. **Project relevance: High**. Cut-and-fill works, spoil disposal could remove mature trees, affect regeneration or fragment remaining stands. Pre-construction botanical surveys should map and confirm individuals or stands within the works footprint and nearby impact area. Where present, the project should prioritise avoidance and design refinement, establish clearly marked no-go areas, minimise root-zone disturbance, control erosion and sediment, and implement locally sourced seed collection, restoration or offset measures where impacts cannot be avoided.

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SUMMARY:

A total of **10 species** were assessed as part of this preliminary assessment. These species were identified through the IBAT Proximity Report using a 1 km buffer around the road corridor. Of the species assessed, two were determined to be of **high relevance** to the Project:

- *Ducula cineracea* (Timor Imperial Pigeon), listed as **Near Threatened (NT)** on the IUCN Red List. The Timor Imperial Pigeon is considered to have a moderate to high likelihood of occurrence within suitable montane forest, woodland, wooded gullies and coffee agroforestry containing retained trees. Potential Project impacts include the loss or disturbance of mature fruiting and nesting trees, displacement of individuals and reduced connectivity between habitat patches.
- *Eucalyptus urophylla* (Timor White Gum), listed as **Endangered (EN)**. Timor White Gum is native to Timor-Leste and occurs in montane forest at elevations of approximately 500–3,000 m; consequently, the road corridor lies within its potential ecological and elevational range. Cut-and-fill activities (especially the high ground slope/short cuts), spoil disposal, vegetation clearing and disturbance within root zones may result in the removal of mature trees, reduced natural regeneration and fragmentation of remaining stands. Accordingly, pre-construction flora/botanical surveys should be undertaken with the Department of Forestry to identify *E. urophylla* stands within the Project's area of influence. Where practicable, impacts should be avoided through design refinement and the establishment of clearly demarcated no-go areas. Where avoidance is not feasible, clearing and root-zone disturbance should be minimized, habitat connectivity and wooded gullies should be protected, erosion and sediment controls should be implemented, and restoration or offset measures should use locally sourced biological material.

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Annex 8. Public Consultation Meeting Summary

Annex 8A – Public Consultation Meeting Summary August 2022

MINUTES OF MEETING

Project	**Timor Leste Branch Road Project:** **Aituto-Hatubuilico-Letefoho-Gleno**
Date	**01 - 06 August 2022**
Completed by	**Carlos Alberto de Deus** **Jose Paulo Pinto** **Angelina de Araujo** **Jesenia Nadia A. V. Ribeiro** **Liliana Reis** **Aleixo dos Santos** **Rosito Baptista** **Enos Meus**

DETAILS OF THE ACTIVITIES (Only that related to Section 1)

Date	**Activity**	**Remarks**
04 August 2022	Overnight Stay at Hatubuilico	
	Morning (Suco Nunumoge and Suco Mulo) Present and disclose the Resettlement, Environmental and Gender Assessment	
	Resettlement Issue Provide Project scope Status of the project procurement process Discuss information on the Social Assessment, updating of LARAP. Protection and Mitigation Plan for the Mount Ramelau Protected Area. Installation limits of road to identify affected assets. The team will conduct a survey of SES and the affected assets, after the installation of stakes for road limits. Explain about the payment process for affected person. Provide information to canalize the complaint during the implementation of the project through Grievance Redress Mechanism. Local Authorities and Community Representatives will support the Project implementation. **Environment Issue** Provide Project scope and scale and discuss information on the Environmental Assessment, Potential Environmental Impacts, Mitigation Plan in the SEIS Inform the status of the Application for Environmental License Provide information on mitigation measures to control negative environmental impacts from construction activity.	

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	Dust nuisance, noise and water pollution will be controlled with mitigation measures in the Environmental Management Plan such as, schedule of road watering, night work with authority permission, oil waste dumping at Tibar landfill facility only. Provide work opportunity for the local, influx issue; the foreign workers and will be informed to respect community culture and code of conduct. Community can request for spoil material to flatten their land/yard but should sign the waiver with local authority consent and engineer approval. At Suco Haupu specifically at Letefoho Church Service Road and Shifting of the road at Urbo Cultural Site are part of the Environmental Assessment. Protection and Mitigation Plan for the Mount Ramelau Protected Area, no quarry and spoil disposal will be allowed in Ramelau Protected Area. Contractor Basecamp will not be located in the Protected Area. Provide information to canalize the complaint during the implementation of the project through Grievance Redress Mechanism. Local Authorities and Community Representatives should actively involve to support the Project implementation. **Gender Base Violence Issue** Total participant 62 F=7 M= 9%% are women in this sucos consultation Consultation meeting was done, explain about Potential risks and impacts on local communities, and related to GBV: The labor influx implications; GBV, particularly SEA, risks that may be associated with the project; The Employer's (i.e. Government) ESHS Policy as required in the ADB's Standard Procurement Documents (SPDs); The CoC standards to be used in the project (e.g. from the SPDs); and, Who the local GBV Services Providers are, how to contact them, and the support services offered. The proposed stakeholder engagement process and how stakeholders can provide feedback on the project; and, the channels available to lodge complaints through the Grievance Redress Mechanism (GRM) and how they will be addressed.

Photographs of the activities



Annex 8B – Summary of Meeting with Sucos Authorities - September 2026

Project	**Timor Leste Branch Road Project: Aituto-Hatubuilico (Section 1)**	
Date	**22 September 2026**	
Completed by	**Prepared by:** Liliana dos Reis Neto Reviewed By: Angelina de Araujo **Team members:** Afonso Mendonça Adelia Maria Moniz Bareto Angelina de Araujo Aleixo dos Santos Adelina do Rego Soares Liliana Reis	
DETAILS OF THE ACTIVITIES		
Date	**Activity**	**Remarks**
22 September 2026	**MEETING AT HATUBUILICO POST (cover Suco Nunumoge and Suco Mulo)**	
	The MC opened the meeting. The Administrator of Hatubuilico Post opened the meeting and delivered a welcome address. Opening prayer. The World Bank Coordinator introduced herself and explained the Aitutu–Hatubuilico Road, Section 1: The data previously collected in 2019 will be reviewed and updated. The project is funded by a World Bank loan. The project must comply with the Bank's requirements, particularly the social, environmental and gender safeguards. The road has two segments: 12 km from Fleixa to Hatubuilico, and 5.4 km to the Ramelau Sanctuary. Maun Afonso, PMU Engineer, introduced himself and presented the DED. Dr. Adelia introduced herself as Head of the Safeguards Team (Social and Environmental issues). Angelina, Gender Specialist, introduced herself and spoke about the project's Gender-Based Violence (GBV) requirements under the Bank's standards. Adelina introduced herself as Environmental Officer, whose responsibilities include: Sacred sites Landslide-prone and critical areas Environmental licensing Dust control (watering of dusty areas) Worker safety Identifying sites for the disposal of excavated soil (spoil) Maun Aleixo introduced himself as Head of the Social Team. He focuses mainly on compensation for trees, houses and other social matters.	

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	Liliana introduced herself as Field Surveyor: When the project begins, the team will set out stakes and collect data on structures, take photographs and carry out calculations in accordance with the ADN 2022 standard, as previously done for Sections 2 and 3. Structures will be classified by type: permanent, semi-permanent and temporary. Three World Bank consultants introduced themselves: Ms. Febriana, LARAP Specialist Ms. Sandra, Social Specialist Ms. Fify, Environmental Specialist The three consultants will support the Section 1 road project on behalf of the World Bank. The Chief of Suco Mulo and the Chief of Suco Nunu-Mouge delivered remarks: They welcomed and supported the project, expressed no concerns, and confirmed they are ready to accompany the survey team in collecting data in the field, since they had already heard about the project in 2019. On compensation for trees, they had previously heard that payment would be made based on economic value. For houses, payment would be made according to house type: permanent, semi-permanent or temporary. The authorities guaranteed that no new construction or activity would take place in the affected areas, and that they would always accompany the team and ensure everything proceeds smoothly. The community has waited many years for this road. The Administrator of Hatubuilico closed the meeting and thanked the Government and the World Bank. Closing prayer.

Photographs of the Activities





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