REPÚBLICA DEMOCRÁTICA DE TIMOR-LESTE

Ministério dos Transportes e Comunicações

Economic Growth

Sustainable Future

Mode of Choice

Livable Cities

Access for All

Timor-Leste Public Transport Facilities Feasibility Study Report 2024

Acknowledgements

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We also acknowledge the significant contributions made by Arup Australia Pty Ltd in various areas, including consultation with the government agencies, analysis of the current public transport system, field surveys, development of a bus facility assessment toolkit, proposals for future bus facility schemes/design, economic and financial analysis of public transport investments, safeguard, and capacity building of the government agencies.

Finally, we would also like to thank the Asian Development Bank (ADB) for providing the resources to develop this feasibility study report and for advising the government agencies – building on the previous efforts undertaken for finalization of the Public Transport Master Plan in May/June 2024.

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Rationale/Objectives of the Study

Since achieving independence in 2002, Timor-Leste has made significant progress in state building and economic growth. The government's Strategic Development Plan (SDP) 2011-2030 is an instrument envisioning an extensive network of quality and well-maintained roads to connect communities, promote rural development, industry and tourism, and provide access to markets.[1] To transform the vision/goals in the SDP into reality, the government has also formulated the Program of the IX Constitutional Government with key focuses/priorities on land transport to develop and expand a quality public transport system for the Timorese.[2] ADB has been supporting such pursuit of economic growth, inclusive development, and climate resilience through several strategic documents including ADB Country Operations Business Plan 2021–2023 and ADB Country Partnership Strategy 2023-2027.[3]

Against this backdrop, the ADB is funding a multi-faceted study to support the Government of Timor-Leste's planned public transport reforms and improve public transport services and facilities in Timor-Leste by building on the findings and analysis from the 2022 Timor-Leste Public Transport Master Plan (PTMP) Update (hereinafter referred to as the 2022 PTMP).[4] The findings from this ADB Study will strengthen the position of Dili as the principal transport hub in the country and lay the groundwork to develop a sustainable and viable public transport system that can be replicated and adopted for Timor-Leste – through enabling planning, operating, and institutional frameworks and structures – based on international best practice aligning with national and local considerations and conditions. Key goals, objectives, and expected outcomes/outputs of the Study include:

Goals/Objectives of the Study

- Provide a high-quality, sustainable public transport system that meets the needs of users for safety, comfort, security, convenience, affordability, accessibility and availability
- Create a transparent and stable regulatory environment that encourages ongoing private sector investment and operations

Expected Outcomes from the Study

- **Output 1**: Climate-resilient and optimized public transport network system developed
- **Output 2**: Institutional capacity strengthened
- **Output 3**: Regulatory framework for low-carbon and climate-resilient development strengthened

Key Outputs of the Study

- **2024 Public Transport Master Plan** – Produce an independent updated PTMP (hereinafter referred to as the 2024 PTMP) based on the review of the 2022 PTMP including a public transport sector assessment, route analysis and network optimization study, investment plans with phases and cost estimates, options analysis for public transport facilities, suggestions for innovative solutions, as well as roadmap for capacity building and regulatory development.[5]
- **Feasibility Study (i.e., This Report)** – Conduct a feasibility study of ten selected facilities from the 2024 PTMP as presented in **Section 1.3** with key focuses on site assessment, facility schemes/design, cost estimates, financial analysis, economic analysis, climate change, environmental/social safeguards (including gender elements), and procurement.

[1] Source: Government of Timor-Leste. 2011. Timor-Leste Strategic Development Plan, 2011–2030. Dili.
[2] Source: Government of Timor-Leste. 2023. Program of the IX Constitutional Government. Dili.
[3] Sources (i) https://www.adb.org/sites/default/files/institutional-document/635976/cobp-tim-2021-2023.pdf; and (ii) https://www.adb.org/sites/default/files/institutional-document/806246/cps-tim-2023-2027.pdf
[4] The 2022 PTMP is an update of a previous iteration of the 2016 PTMP.
[5] The 2024 PTMP was completed, and it was officially launched in May 2024 by the MOTC.

- **Supporting Public Transport Reform Programs –** In addition to the above main feasibility study scope, there are six supporting public transport reform programs to develop and expand a quality public transport system for the Timorese as below:[6]
    - **Dili Pilot Bus Project –** Conduct pre-feasibility study of a pilot bus service requested by MOTC on an east-west corridor in Dili.
    - **Public Transport Fare and Fare Structure Modelling –** Assess fare scheme and structure for public transport including consideration of fare setting, revenue schemes, institutional arrangements, etc.
    - **Traffic Management Study to Improve Public Transport Operations –** Conduct a comprehensive assessment of traffic and parking operations/management options in Dili to create more effective management procedures and operations for public transport.
    - **Stringent Emission Standards for Public Transport Vehicles –** Assess potential for instituting more stringent emissions requirements for current public transport services.
    - **Hybrid Courier Service Model –** Identify opportunities for hybrid courier services and furthermore potential physical implications on the terminal designs.
    - **Microlet Operation Framework –** Assess potential to formulate operator associations to ensure coordinated operations and maintenances of microlet services.
- **Recruitment Assistance for Detailed Engineering Design (DED)** – Provide tender support including preparation of a draft for the DED consultant as well as assistance during the recruitment process.

A log-frame of the linkages between government vision/strategies, project objectives, outcomes and outputs are presented and summarized as below:

Table ES-1: Log-Frame of Study Goals, Objectives, and Outcomes/Outputs

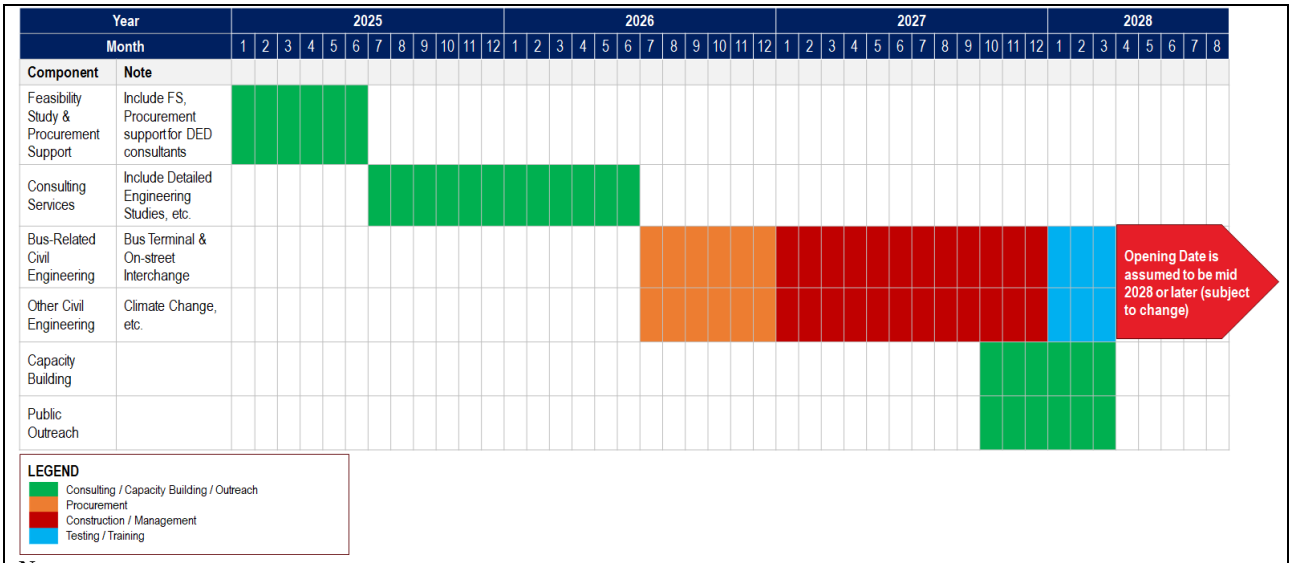
Item	Key Points in Log-Frame (Focus on Public Transport)
Government Vision & Strategies	• **Strategic Development Plan (SDP) 2011-2030** – envision an extensive network of quality and well-maintained roads to connect communities, promote rural development, industry and tourism, and provide access to markets. • **Program of the IX Constitutional Government** – develop and expand a quality public transport system for the Timorese (in particular for land transport).
Objectives	• Provide a **high-quality, sustainable public transport system** that meets the needs of users for safety, comfort, security, convenience, affordability, accessibility and availability • Create a **transparent and stable regulatory environment** that encourages ongoing private sector investment and operations
Outcomes	• **Output 1:** Climate-resilient and optimized public transport network system developed • **Output 2:** Institutional capacity strengthened • **Output 3:** Regulatory framework for low-carbon and climate-resilient development strengthened
Outputs	• **2024 Public Transport Master Plan** – the country's public transport master plan including diagnostic assessment, route analysis and network optimization study, vision/strategies, investment plans with phases and cost estimates, facility assessment framework to shortlist public transport facilities, suggestions for innovative solutions, as well as roadmap for capacity building and regulatory development. • **Feasibility Study** – feasibility study of ten selected public transport facilities including site assessment, facility schemes/design, cost estimates, financial analysis, economic analysis, climate change, environmental/social safeguards, and procurement. • **Supporting Public Transport Reform Programs –** • **Recruitment Assistance for DED** – tender support including preparation of a draft for the DED consultant as well as assistance during the recruitment process

[6] High-level assessment was conducted for these six supporting programs which do not include feasibility study level analysis such as financial/ economic analysis, safeguard assessment, and any other due diligence activities. Separate working papers will be produced for each study.

Key Assumptions in This Feasibility Study

The figure below shows the indicative timeline with key milestone activities including feasibility study, detailed engineering design, construction, testing and operation of bus terminals/on-street interchanges. Key assumptions in this timeline and preparation of the feasibility study are as follows:[7]

- **Mid 2025** – Start of DED work (to be completed by mid-2026)
- **Early 2027** – Construction of bus terminals/on-street interchanges (to be completed by end 2027)
- **Early 2028** – Testing / training of relevant personnel before opening of bus facilities
- **Mid 2028** – Opening of bus terminals/on-street interchanges



Notes:
1. Land acquisition is not considered at this stage as the selected sites are assumed to be owned by the government.
2. Key assumptions/timeline are indicative only and the timeline of milestone activities is subject to change in aling with the government's plan. For conservative purpose, cost, revenues, financial and economic assessment are estimated based on 2030 when bus terminal/facilities will be fully open (considering buffer time/potential delays of milestone activities).

Figure ES-1: Indicative Timeline of Bus Facility Development

Summary of Feasibility Assessment on Bus Facilities

Feasibility study assessment identified several aspects to be addressed (including social, hazard/risk and financial implications) – the project overall is considered "feasible" with mitigation measures, safeguard processes, and government support (financially and private sector development).

Table ES-2: Summary of Feasibility Assessment on Bus Facilities

Facility#	#1 – Dili CCD	#2 – Becora	#3 – Tibar	#4 – Manleuana	#5 – Hera	#6 – Baucau	#7 - Maliana	#8 – Suai	#9 – Lospalos	#10 – Viqueque
Location	**Dili**	**Dili**	**Dili**	**Dili**	**Dili**	**Baucau**	**Maliana**	**Suai**	**Lospalos**	**Viqueque**
Technical (i.e., Bus Terminal Schemes)	No technical issues identified (operation/design considerations such as access road, internal circulation, integration with surrounding developments addressed in the scheme/design)						No technical issues identified (leverage existing on-street space)			
Social	No issues identified	Potential impact on adjacent developments	No issues identified	Potential impact on residents	No issues identified					

[7] Key assumptions/timeline are indicative only and may subject to change based on decisions/priorities of key stakeholders on the timeline of milestone activities. For conservative purpose, cost, revenues, financial and economic assessment are based on 2030 when bus terminal/facilities are expected to be fully open (considering buffer time/potential delays of milestone activities).

Facility#	#1 – Dili CCD	#2 – Becora	#3 – Tibar	#4 – Manleuana	#5 – Hera	#6 – Baucau	#7 - Maliana	#8 – Suai	#9 – Lospalos	#10 – Viqueque
Location	**Dili**	**Dili**	**Dili**	**Dili**	**Dili**	**Baucau**	**Maliana**	**Suai**	**Lospalos**	**Viqueque**
				(due to access road)						
Environment	No issues identified during initial investigation									
Hazard / Risk	Potential flood risks identified at each site (climate change adaptation facilities provided to address potential hazards)									
Economic Implications	Likely potential benefits generated due to time savings (for vehicles/people), operation efficiency within site, reductions in safety/accidents, less waiting times, GHG reduction, etc.									
Financial Implications	Moderate revenues may be generated given increase in ridership (fares), organized terminal operation/ management (management fees), and adjacent development potential (revenue gains from market, etc.)						Revenue potential considered low due to low ridership and limited development around the site			

Total Investment Cost

The total investment cost (including 10% contingency) is estimated at about US$40.04 million, including (i) US$16.8 million for bus terminal & on-street interchange (46.2%); (ii) US$10.3 million for pilot bus project (28.3%); (iii) US$1.0 million for public transport fare structure (2.7%); (iv) US$4.6 million for traffic management program (12.6%); (v) US$1.0 million for stringent emission standards for microlet fleet replacement (2.7%); (vi) US$0.7 million for hybrid courier service model (1.9%); US$0.8 million for microlet operation framework (2.2%); and (vii) US$1.2 million for capacity development programs (3.3%).

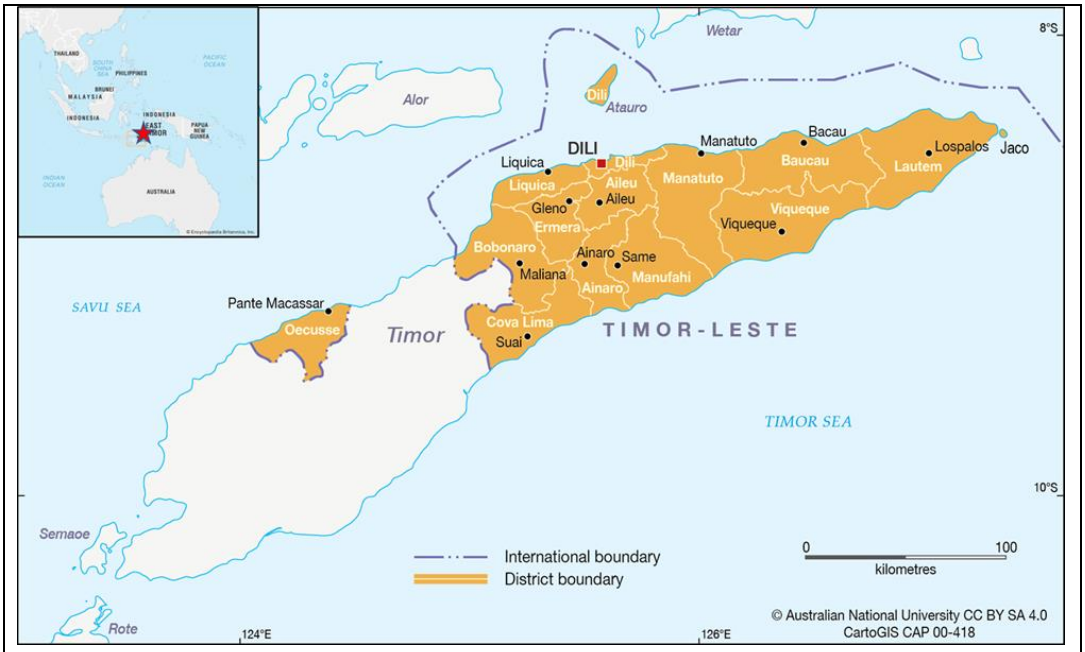
Table ES-3: Total Investment Cost by Package

#	Component	Total Cost (USD)	%	Key Outputs	Type of Improvements / Assumptions
1	Bus Facilities	16,800,000	46.2%	Development & improvement of bus terminals / facilities with climate mitigation measures	• 5 bus terminals and 5 on-street interchanges with provision of innovative measures, access road/walk improvements, climate change facilities
2	Polit Bus Project	10,300,000	28.3%	Introduction of a pilot bus service on Route 10 in Dili as part of the public transport system	• Proposed 25.3km round trip service with 59 bus stops • 10 buses (9m Euro 5 diesel city bus) • 1 depot to accommodate the fleet with ITS enhancement
3	Public Transport Fare Model	1,000,000	2.7%	Modernization of fare structures and payment system as part of the public transport system	• Consulting services for developing specifications of fare collection system
4	Traffic Management	4,600,000	12.6%	Comprehensive traffic improvement/management programs to improve public transport operations in Dili	• Traffic circulation modifications & ITS traffic enhancement • Key intersection improvements (including signals & crossings) • On-street parking meter facilities
5	Stringent Emission Standards	1,000,000	2.7%	Implementation of migration program for low-emission solutions in public transport vehicles	• 10% of existing microlet fleet in Dili (~90 vehicles) assumed to be replaced by more environmentally friendly vehicles (i.e., Euro 4/5 class)
6	Hybrid Courier Service Model	700,000	1.9%	Integration of logistics and passenger transport facilities and services	• Provision of logistics storage facilities including 3 gateway storage hub and 6 regional storage hub
7	Microlet Operation Framework	800,000	2.2%	Formulation of public transport associations for public transport services and operations	• Consulting services to develop institutional framework • Corporate branding, marketing, public outreach, social development program
8	Capacity Development Program	1,200,000	3.3%	Capacity development programs to enhance implementation, operation, management and monitoring of public transport system	• Capacity Building for Payment System Operator/Manager • Capacity building and training of drivers/staff
Subtotal		36,400,000	100.0%		
Contingency		3,640,000			• Assume 10% contingency based on subtotal cost (Item#1-8)
Total		**40,040,000**			

1. Introduction & Background

1.1 Introduction

Timor-Leste is Southeast Asia's newest country located between Indonesia and Australia. It includes the eastern half of the island of Timor (with an area of about 14,000 km^2), an exclave on the northwestern side of the island known as Oecussi (815 km^2), Atauro Island to the north (150 km^2), and Jaco Island to the east (11 km^2).[8] Altogether, the country has a cumulative area of about 15,000 km^2 with a total population of about 1.34 million (based on the 2022 Census). Population has grown at an average of 1.8% per year from 2015 to 2022, and the population is projected to reach 1.59 million by 2030.[9,10]



Source: Australian National University

Figure 1-1: Map of Timor-Leste

Dili, the capital of Timor-Leste, is located along the northern coast as shown in Figure 1-1. It has some 324,000 residents (based on the 2022 Census) having grown at an average rate of 2.7% per year from 2015 to 2022, much faster than that nationally (at 1.8% annually).[11] Dili is projected to grow to over 833,000 residents by 2030. Other major cities include Ermera (138,000 residents), Baucau (134,000 residents), and Bobonaro (107,000 residents). Based on the 2022 Census, Timor-Leste is predominantly rural with nearly 68% of the population living in rural areas and villages scattered throughout the country. The most populous city of Dili has a population density of 1,425 residents/km^2, while other rural cities have densities of less than 100 residents/km^2 (except for Ermera at 179 and Liquica at 152 residents/km^2).

The public transport system in Timor-Leste faces key challenges that constrain/inhibit attractiveness and more widespread use:

- **Growing Population and Demand for Travel** [12] – As noted, the population in Timor-Leste is expected to grow to 1.59 million by 2030 (833,000 in Dili), resulting in higher trip demand, additional vehicles on the road and congestion, as well as more congested public transport operations. ***More people traveling will increase the stress and strain on the existing public transport system, predominantly operated by informal enterprises. More people will drive or use private vehicles,***

[8] Source: http://timor-leste.gov.tl/?p=91&lang=en
[9] Source: Ministry of Finance. 2022. Population and Housing Census 2022 – Preliminary Results.
The population trends in the Census 2022 reveal that the population growth has steadily slowed since the last census conducted in 2015 and 2022 (for instance, the average annual growth rate in 2010 and 2015 was 2.4% and 2.1%, respectively).
[10] Source: ADB. 2022. Timor-Leste – Public Transport Master Plan Update.
[11] Source: Ministry of Finance. 2022. Population and Housing Census 2022 – Preliminary Results.
[12] Source: JICA 2016 Dili Urban Master Plan.

leading to congestion and emissions, if step-changes are not made to improve public transport and make it more attractive as a travel alternative.

- **Public Transport Attractiveness Constrained by Level of Service and Infrastructure –** Public transport (comprised of buses, microlets, and anggunas) account for about 25% of all trips in Timor-Leste. Attractiveness of public transport as a viable alternative to private vehicles and motorbikes is constrained by unscheduled and unreliable services, overcrowded low-capacity vehicles, short operating hours, and poor riding experience (such as lack of air-conditioning and older, poorly maintained vehicles). Bus infrastructure including bus stops, shelters, and terminals are in relatively poor condition. First/last-mile access to/from the bus stops and terminals has not been prioritized, making walking trips (and interlinkage with other modes such as private vehicles or motorbikes) inconvenient and uncomfortable. There is also a lack access-for-all facilities at terminals and bus stops to ensure safe and inclusive experiences for women and disadvantaged groups. These myriad issues combine to create a negative impression of bus services, resulting in uncomfortable and unsafe public transport journeys. ***Concerted efforts to improve bus service, bus infrastructure, as well as the perception of bus services are essential to attracting public transport users.***

- **Weak Regional Connectivity Limits Access to Jobs and Services** – As noted, Timor-Leste is predominantly rural with nearly 68% of the population living in rural areas. Limited inter-city and inter-regional transport options impose challenges for rural residents in accessing community services, healthcare, education, and job opportunities in major cities such as Dili. ***Better access to reliable public transport systems in all regions of the country is essential for inclusive development of the country.***

- **Slow Travel Speeds Impacting Journey Experience by Public Transport** – Average travel speeds range from 10-20 kph (during the morning, mid, and evening peak hours on weekdays) in urban areas of Dili, to below 10 kph in areas such as Colmera.[13] Public transport speeds in urban areas are slower than normal due to congestion and slow-moving roads, as well as frequent stop-and-go (including to load/unload passengers). These relatively slow travel speeds can elongate journeys and make public transport modes less competitive against other modes and inhibit modal shift to public transport. ***Slow travel speeds can elongate journeys and make public transport modes less competitive and attractive.***

- **Climate Change Impact on Current and Future Bus Infrastructure** – Timor-Leste is vulnerable to natural disaster and climate change impacts, which threaten Dili and other cities. The frequency and severity of flooding is increasing, for instance Tropical Cyclone Seroja in 2021 brought flash floods and landslides to all 13 municipalities in Timor-Leste, with nearly 80% of households in Dili being impacted.[14] During these inundation events, most main roads (particularly lowland, coastal areas in Dili) experience flooding, disrupting transport connectivity and causing significant direct/indirect economic losses. ***Current and future bus infrastructure (including bus stops and terminals) will continue to face inundation and climate change related impacts – thus planning and design must integrate the latest urban resilience and sustainable designs to minimize forthcoming impacts on public transport and allow buses to serve as a viable, safe, and convenient mode during these events.***

- **Limited Government Oversight on Efficiency, Safety and Attractiveness of Public Transport -** The Government maintains minimal oversight over intra-city and inter-regional services, as well as fixed microlet services. For instance, the Government approves the right to operate on a route, but does not specify/monitor service levels, service quality, or vehicle standards. Furthermore, the Government does not provide operating subsidies on these routes (except the noted subsidized fuel for microlet operators), encouraging operators to focus on profitable corridors and place less priority on routes providing "coverage" to key population areas or to provide high-quality services. Furthermore, the government does not penalize drivers for unsafe and unattractive conditions, leading to overcrowded vehicles, aggressive/coercive passenger herding (called *konja*), and long waits at terminals to fill up passengers (known as *kelining*). [15, 16] ***Therefore, the current institutional/***

[13] Source: Ministry of Planning and Territory. 2022. Dili Urban Master Plan Update.
[14] Source: Ministry of Planning and Territory. 2022. Dili Urban Master Plan Update (Draft). This study will be referred to as the 2022 Dili Urban Master Plan Update.
[15] Source: The Asia Foundation. 2015. A Political Economy of Public Transportation in Timor-Leste.
[16] Keiling (drivers slowly circling areas outside of a terminal to board more passengers) is illegal but tolerated by traffic police.

regulatory framework does not incentivize quality of service and penalize unsafe and unlawful driving behavior – thus bus reform is not only an issue of service and infrastructure, but also creating an enabling framework.

1.2 Key Findings of 2024 Public Transport Master Plan

The 2024 Public Transport Master Plan (hereinafter refer to as 2024 PTMP) was formulated to serve as a roadmap to guide the future growth and development of public transport system in Timor-Leste – which was approved by the Ministry of Transport and Communications (MOTC) in June 2024. Key findings of the 2024 PTMP are summarized in this section.

1.2.1 Vision Statement and Key Pillars

The Vision of the 2024 PTMP is defined as follows supported by the five key pillars to guide the goals of the 2024 PTMP in Table 1-1:

"***Public Transport in Timor-Leste is attractive, accessible, inclusive, and future-ready transport mode that supports economic growth, urban development, and quality of life across the country***."

Table 1-1: Vision and Five Key Pillars for Timor-Leste's Public Transport System

Five Key Pillar	Description
Economic Growth	The public transport system supports economic growth and the growth of urban Centers. It connects Dili with other strategic Centers and enables the movement of people and goods to support the economy.
Access for All	The public transport system provides the entire community with better access to jobs and services. Affordable, reliable services meet people's needs, are inclusive of marginalized groups like women and the disabled and improve social mobility.
Livable Cities	The public transport network and facilities are integrated with urban activity Centers. The system underpins healthy, safe, and connected places that improve livability in urban Centers and beyond.
Mode of Choice	The public transport network provides seamless and integrated journeys that encourage sustainable travel choices, attracting more users and reducing private vehicle use and congestion.
Sustainable Future	The public transport system plays a key role in meeting the goals of the Paris Agreement including by encouraging mode shift to reduce the emissions intensity of travel and harnesses new technologies and innovative features to support climate mitigation and resilience.

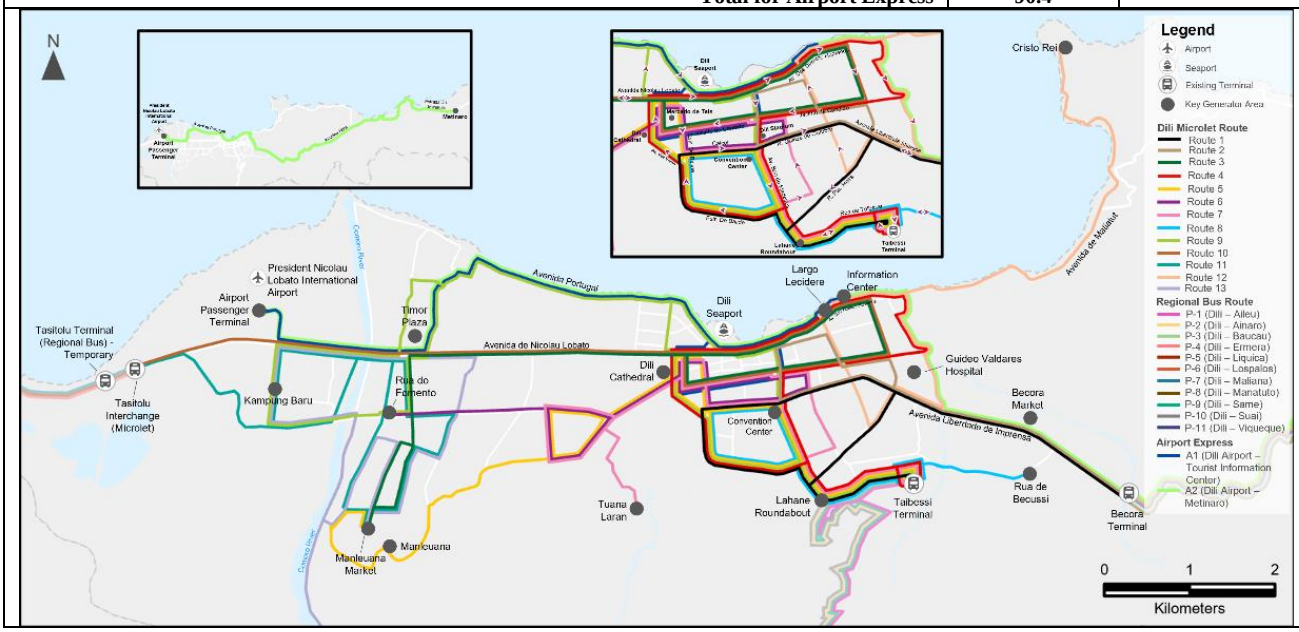
1.2.2 Overview of Modified Dili Microlet Routes and Regional Bus Routes

Route rationalization of Dili microlet routes as well as regional bus routes was undertaken in the 2024 PTPM to provide more efficient and convenient services to users. A summary of the modified Dili microlet routes (a total of 13 routes) as well as the two proposed Airport Express routes (between Airport and Tourist Information Center / Metinaro) is shown in Table 1-2. Also, a summary of the regional bus route recommendations (no change to the existing 11-route network) is shown in Table 1-3**.**

Table 1-2: Modified Dili Microlet Routes and Proposed Airport Express Routes

Route #	Origin	Destination	Via	Direction	Round-Trip Distance (km)	Terminals Serving [A]
M-1	Becora Terminal	Becora Terminal	Ave. Liberdade de Impresa, Estr. De Balide, R. Caicoli	Clockwise	14.8	Becora Terminal, Taibessi Terminal
M-2	Becora Terminal	Becora Terminal	Ave. Liberdade de Impresa, Ave. Bpo de Madeiros	Counter-Clockwise	10.1	Becora Terminal
M-3	Manleuana Market	Manleuana Market	Ave. de Nicolau Lobato, R. Jacinto de Candido	Clockwise	16.8	Manleuana Market
M-4	Taibessi Terminal	Taibessi Terminal	Estr. De Balide, Av. Alm Americo Tomas, R. Jacinto de Candido	Clockwise	12.6	Taibessi Terminal
M-5	Taibessi Terminal	Manleuana Market	Rua de Taibessi, Ave. de Manleuana	Clockwise	21.6	Taibessi Terminal, Manleuana Market
M-6	Rua do Fomento	Rua do Fomento	Rua Hudi-Laran, R. Caicoli, R. Jacinto de Candido,	Clockwise	12.2	No Terminal (serves Rua do Fomento)
M-7	Taibessi Terminal	Tuana Laran	Rua de Taibessi, Rua de Ai Lok Laran	Clockwise	15.9	Taibessi Terminal
M-8	Rua de Becussi	Rua de Becussi	Rua de Taibessi, Estr. De Balide	Clockwise	9.5	Taibessi Terminal (Thru)
M-9	Kampung Baru	Kampung Baru	Ave. de Nicolau Lobato, Av. de Portugal, Av. Salazar	Clockwise	22.7	Taibessi Terminal
M-10	Tasitolu Terminal	Tasitolu Terminal	Ave. de Nicolau Lobato, R. Jacinto de Candido	Clockwise	19.9	Tasitolu Terminal

Route #	Origin	Destination	Via	Direction	Round-Trip Distance (km)	Terminals Serving [A]
M-11	Tasitolu Terminal	Manleuana Market	Rua de Tali-Laran, Ave. de Nicolau Lobato, Rua de Has Laran	Clockwise	14.6	Tasitolu Terminal, Manleuana Market
M-12	Rua de Cristo Rei	Rua de Cristo Rei	Ave. dos Direitos Humanos, Ave. de Matiatut	Clockwise	15.9	No Terminal (serves Cristo Rei)
M-13	Kasnafar	Kasnafar	Ave/ Praia dos Conqueiros, Rua de Lesibutak	Clockwise	20.6	Manleuana Market
				Total for Dili Microlet	**207.2**	
AE-1	Airport	Tourist Information Center	Timor Plaza	EB/WB	19.1	Airport
AE-2	Airport	Metinaro	Timor Plaza, Tourist Information Center	EB/WB	71.3	Airport
				Total for Airport Express	**90.4**	



Notes:
[A] The terminal(s) serving this route may change subject to the MOTC's decision on future terminal locations.

Table 1-3: Overview of Regional Route Recommendations

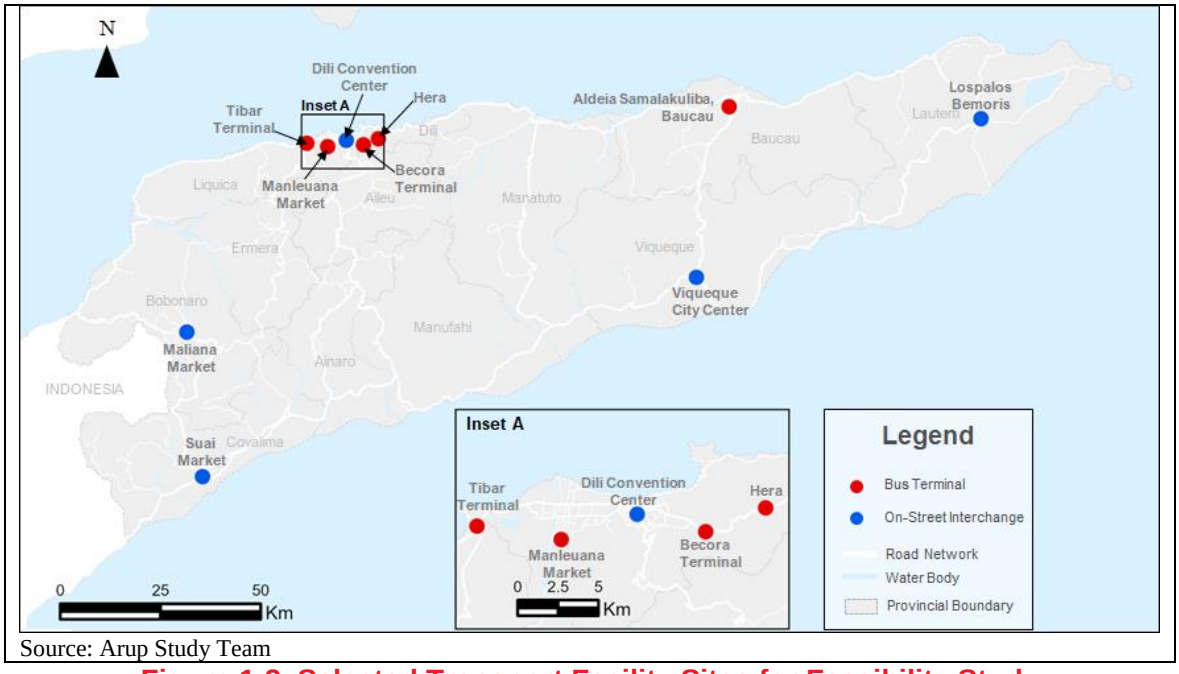
Route #	Origin	Destination	Direction	One-Way Distance (km)	Terminals Serving [A]	Region Covered by Route
P-1	Dili	Aileu	NB/SB	44.3	Taibessi	South
P-2	Dili	Ainaro	NB/SB	109.3	Taibessi	South
P-3	Dili	Baucau	EB/WB	117.7	Becora	East
P-4	Dili	Ermera	NB/SB	46.0	Tasitolu	West
P-5	Dili	Liquica	EB/WB	23.1	Tasitolu	West
P-6	Dili	Lospalos	EB/WB	205.1	Becora	East
P-7	Dili	Maliana	EB/WB	132.7	Tasitolu	West
P-8	Dili	Manatuto	EB/WB	58.7	Becora	East
P-9	Dili	Same	NB/SB	112.1	Taibessi	South
P-10	Dili	Suai	NB/SB	171.0	Taibessi	South
P-11	Dili	Viqueque	EB/WB	176.6	Becora	East
Total				1,196.6		

Notes:
[A] The terminal(s) serving this route may change subject to the MOTC's decision on future terminal locations.

1.2.3 Selected Facility Sites for Feasibility Study

A two-tier facility assessment was conducted in the 2024 PTMP to objectively assess a longlist of 40+ facility sites across the country and shortlist priority sites for feasibility assessment. The facility assessment framework comprised of various criteria including stakeholder preferences (i.e., MOTC), strategic alignment, operational impacts, environmental and social implications, and engineering considerations. Of the longlist of 40+ facility sites, some 20+ sites were shortlisted – which were further delineated into short (up to 2025), medium (2026-2030), and long-term (2031-2035) phasing plans (in align with the timeframe of the 2024 PTMP).[17]

Based on the results of the 2024 PTMP (priority sites identified in the medium-term investment plan 2026-2030) and following ADB missions conducted in April and October 2024, a total of ten sites are selected by MOTC for this feasibility study including five locations in Dili and five other locations in regional municipalities including Baucau, Maliana, Suai, Losaplos, and Viqueque. Key details of the sites are summarized as below:



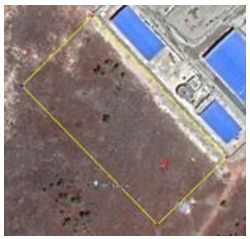
Source: Arup Study Team

Figure 1-2: Selected Transport Facility Sites for Feasibility Study

[17] For detailed analysis/results of the facility assessment framework, pleases refer to Section 7.5 in the 2024 PTMP.

Table 1-4: Selected Facility Sites for Feasibility Study

#	Site Name	Location	Context	Proposed Facility Type	Existing or New	Indicative Sizing (m^2)	Location Map (Indicative)
1	Dili Convention Center	Dili City Center	The Dili Convention Center is strategically positioned at the city center, surrounded by key generators, making it an ideal interchange location with an extensive microlet network that covers the entire Dili City. Nestled beside the convention center, this site optimizes its limited available space by utilizing vacant land and capitalizes on its proximity to a local road, rendering it suitable as an on-street interchange.	On-Street Interchange	Existing	~2,200	
2	Becora Terminal	Dili East	The Becora Terminal is an existing terminal strategically located in the eastern part of Dili serving as the gateway to the municipalities in the east. Major operational issues (i.e., safety, maintenance, no defined bays) and facility issues (i.e., lack of passenger amenities, access-for-all facilities) are identified. The facility is proposed to be redeveloped with enhanced passenger amenities and climate change facilities accommodating microlet and shuttle services between Becora and Hera.	Bus Terminal	Existing	~3,600	
3	Tibar Terminal	Dili West	The Tibar Terminal serves as the Dili west gateway terminal connecting Dili with municipalities in the west as well as hubs for international trips to/from Indonesia. The proposed location is a vacant open area with the potential to develop into a bus terminal integrated with growth opportunities and development potentials expected in the area.	Bus Terminal	New	~8,000	
4	Manleuana Market	Dili South	The Manleuana Market lies to the south of Dili and presents an opportunity for an integrated bus terminal with surrounding markets (with the preference of this site over the existing Taibessi Terminal strengthened since improved roads connecting to municipalities in south). Currently road space inside the market is used for loading/unloading activities with provision of minimal passenger facilities.	Bus Terminal	New	~9,600	
5	Hera Terminal	Dili East	The Hera site is in the eastern end of Dili (about 6km from Becora Terminal). This site was initially proposed as an on-street interchange in the 2024 PTMP. However, based on the findings and discussions during the ADB Mission in April 2024, the MOTC requested to consider Hera as a strategic bus terminal and include it in the feasibility study. Following another ADB Mission in October 2024, ADB/MOTC concluded that an existing government site (currently used for driver testing only) can be repurposed for a bus terminal connecting to municipalities in the east, while the Becora terminal focuses on serving the connectivity needs of Dili and act as a central link between Dili and Hera. This site would	Bus Terminal	New	~10,000	

#	Site Name	Location	Context	Proposed Facility Type	Existing or New	Indicative Sizing (m^2)	Location Map (Indicative)
			accommodate regional buses to/from municipalities in the east as well as shuttle services between Becora and Hera.				
6	Aldeia Samalakuliba	Baucau	Baucau is the second biggest municipality in the country and this location is proposed at about 1.5km to the west of city center. There is an opportunity to integrate a public transport terminal with the new market development in this area. The development of a municipal public transport hub would serve regional buses connecting to the eastern municipalities, as well as microlet services connecting into the urban area of Baucau. The existing Baucau Central Terminal site is being redeveloped into a sports venue by the local government and bus terminal functions will be transferred to this new location.	Bus Terminal	New	~11,600	
7	Maliana	Maliana	Maliana is in the western municipality of Timor-Leste (about 60km from Dili) and shares the border with Indonesia. This location is located next to the local market and also serves as a transit hub for international trips due to its proximity to Indonesia's land border. Maliana receives public transport passengers from six other administrative posts (Atabae, Balibo, Bobonaro, Cailaco, Lolotoe and Maliana).	On-Street Interchange	Existing but no facility provided	~680	
8	Suai Market	Suai	Suai is located to the southwest of Timor-Leste (about 90km from Dili) and shares the border with Indonesia. This location is located next to the local market and also serves as a transit hub for international trips due to its proximity to Indonesia's land border. Suai receives public transport passengers from seven other administrative posts (Fatululic, Fatumean, Fohorem, Maucatar, Suai, Tilomar and Zumalai).	On-Street Interchange	Existing but no facility provided	~210	
9	Lospalos Bemoris	Lospalos	Lautem municipality is in the eastern end of Timor-Leset (about 160km from Dili) and serves a destination with various landmarks/tourist spots (such as the largest national park, Nino Konis Santana). Lospalos receives public transport passengers from six other administrative posts (Iliomar, Lautém, Lospalos, Luro, Lore and Tutuala).	On-Street Interchange	Existing but no facility provided	~680	
10	Viqueque City Center	Viqueque	Viqueque is located to the southeast of Timor-Leste (about 100km from Dili) and serves a destination with various industrial centers for coconut oil, fishing, etc. Viqueque receives public transport passengers from five other administrative posts (Lacluta, Ossu, Uatucarbau, Viqueque and Watulari).	On-Street Interchange	Existing but no facility provided	~190	

1.3 Overarching Issues at Bus Terminal / Facilities

Key issues observed at the existing bus terminals/facilities (i.e., Becora Terminal, Baucau Terminal, Dili Convention Center) are delineated into operational (i.e., operating norms/ practices) and facility/amenity (i.e., physical issues related to the facility or provision of passenger amenities) although some may be cross-cutting:

Table 1-5: Overarching Issues at Bus Terminal / Facilities

Category	Key Issues
Operational Issues	• **Safety of Passengers –** Current operation around the terminal (i.e., loading/unloading at the perimeter parking space, clockwise operation with doors on the left) require passengers to walk through circulation areas for boarding/alighting a vehicle and cross active roadways creating potential conflicts with vehicles. • **Unsafe Operations within Terminal –** Vehicles spaces (loading, unloading and layover) are not orderly designed with some vehicles making back-up movements to enter/leave the space. • **Layover / Queuing for Passengers on Circulation Areas Within Market –** No designated space for each mode is provided at existing terminals which may be confusing to passengers and also results in potential conflicts between modes. • **Bus Facilities Used by Mixed Modes –** Non-designated vehicles (such as private vehicles, motorbikes) are allowed to enter the site which add more congestion to the site and results in delays to microlet/regional bus. • **Lack of Maintenance/Cleaning Inside Terminal –** The passenger waiting areas, floor, and the facility are not regularly cleaned with discarded trash and litter observed around the facility (thus leading to unattractive waiting environment) and have limited maintenance based on their deteriorated conditions. • **Vehicles Blocking Bus Stop Hindering Efficient Operation –** In some bus stops, trucks and other non-public transport vehicles were observed parking in the designated loading areas, blocking public transport vehicles from directly accessing the stop. This also forces passengers to access the vehicles from outside the bus stop area (and possibly enter the active roadway).
Facility / Amenity Issues	• **Dirt Surfacing and Lack of Pedestrian Crossing Markings –** The facility has unpaved sections (e.g., access roads near the entry gate, potholes within the site) which affect passenger experience and operation efficiency. In addition, the surfacing can be muddy during rain, soiling clothes of pedestrians / users passing by • **Limited Provision of Passenger Amenities –** There is limited provision of passenger amenities creating unattractive waiting environment. Some sites such as Becora have buildings with covered facilities, but these are poorly maintained and not safe/comfortable for passengers. • **No Road Markings for Vehicle Navigation & Pedestrian Crossing –** There is limited provision of road markings to navigate vehicles in an orderly manner and safe crossing environments for pedestrians. This endangers both drivers as well as passengers accessing the site. • **Deteriorating Roads on Access Road –** Access roads leading to/from the terminals are deteriorating with poor maintenance (as many potholders observed) affecting vehicle operation and posing safety issues. • **Minimal Provision of Lighting & Covered Facilities -** While there is limited provision of lighting within the waiting area, lighting is dim in the parking lot where the majority of vehicles load/unload. This can cause visibility and safety issues when passengers cross active circulation areas. • **Lack of Access-for-All Facilities (i.e., Ramps for Disabled People) -** Access-for-all facilities such as tactile paving, ramps, wheelchair facilities are also lacking in particular considerations for disadvantaged social groups such as elderly and disabled people.

1.4 Rationale and Objectives of this Study

Since achieving independence in 2002, Timor-Leste has made significant progress in state building and economic growth. The government's Strategic Development Plan (SDP) 2011-2030 is an instrument envisioning an extensive network of quality and well-maintained roads to connect communities, promote rural development, industry and tourism, and provide access to markets.[18] To transform the vision/goals in the SDP into reality, the government has also formulated the Program of the IX Constitutional Government with key focuses/priorities on land transport to develop and expand a quality public transport system for the Timorese.[19] ADB has been supporting such pursuit of economic growth, inclusive development, and climate resilience through several strategic documents including ADB Country Operations Business Plan 2021–2023 and ADB Country Partnership Strategy 2023-2027.[20]

Against this backdrop, the ADB is funding a multi-faceted study to support the Government of Timor-Leste's planned public transport reforms and improve public transport services and facilities in Timor-Leste by building on the findings and analysis from the 2022 Timor-Leste Public Transport Master Plan (PTMP) Update

[18] Source: Government of Timor-Leste. 2011. Timor-Leste Strategic Development Plan, 2011–2030. Dili.
[19] Source: Government of Timor-Leste. 2023. Program of the IX Constitutional Government. Dili.
[20] Sources (i) https://www.adb.org/sites/default/files/institutional-document/635976/cobp-tim-2021-2023.pdf; and (ii) https://www.adb.org/sites/default/files/institutional-document/806246/cps-tim-2023-2027.pdf

(hereinafter referred to as the 2022 PTMP).[21] The findings from this ADB Study will strengthen the position of Dili as the principal transport hub in the country and lay the groundwork to develop a sustainable and viable public transport system that can be replicated and adopted for Timor-Leste – through enabling planning, operating, and institutional frameworks and structures – based on international best practice aligning with national and local considerations and conditions. Key goals, objectives, and expected outcomes/outputs of the Study include:

Goals/Objectives of the Study

- Provide a high-quality, sustainable public transport system that meets the needs of users for safety, comfort, security, convenience, affordability, accessibility and availability
- Create a transparent and stable regulatory environment that encourages ongoing private sector investment and operations

Expected Outcomes from the Study

- **Output 1**: Climate-resilient and optimized public transport network system developed
- **Output 2**: Institutional capacity strengthened
- **Output 3**: Regulatory framework for low-carbon and climate-resilient development strengthened

Key Outputs of the Study

- **2024 Public Transport Master Plan** – Produce an independent updated PTMP (hereinafter referred to as the 2024 PTMP) based on the review of the 2022 PTMP including a public transport sector assessment, route analysis and network optimization study, investment plans with phases and cost estimates, options analysis for public transport facilities, suggestions for innovative solutions, as well as roadmap for capacity building and regulatory development.[22]
- **Feasibility Study (i.e., This Report)** – Conduct a feasibility study of ten selected facilities from the 2024 PTMP as presented in **Section 1.3** with key focuses on site assessment, facility schemes/design, cost estimates, financial analysis, economic analysis, climate change, environmental/social safeguards (including gender elements), and procurement.
- **Supporting Public Transport Reform Programs –** In addition to the above main feasibility study scope, there are six supporting public transport reform programs to develop and expand a quality public transport system for the Timorese as below:[23]
    - **Dili Pilot Bus Project –** Conduct pre-feasibility study of a pilot bus service requested by MOTC on an east-west corridor in Dili.
    - **Public Transport Fare and Fare Structure Modelling –** Assess fare scheme and structure for public transport including consideration of fare setting, revenue schemes, institutional arrangements, etc.
    - **Traffic Management Study to Improve Public Transport Operations –** Conduct a comprehensive assessment of traffic and parking operations/management options in Dili to create more effective management procedures and operations for public transport.
    - **Stringent Emission Standards for Public Transport Vehicles –** Assess potential for instituting more stringent emissions requirements for current public transport services.
    - **Hybrid Courier Service Model –** Identify opportunities for hybrid courier services and furthermore potential physical implications on the terminal designs.

[21] The 2022 PTMP is an update of a previous iteration of the 2016 PTMP.
[22] The 2024 PTMP was completed, and it was officially launched in May 2024 by the MOTC.
[23] High-level assessment was conducted for these six supporting programs which do not include feasibility study level analysis such as financial/ economic analysis, safeguard assessment, and any other due diligence activities. Separate working papers will be produced for each study.

- **Microlet Operation Framework –** Assess potential to formulate operator associations to ensure coordinated operations and maintenances of microlet services.

- **Recruitment Assistance for Detailed Engineering Design (DED)** – Provide tender support including preparation of a draft for the DED consultant as well as assistance during the recruitment process.

A log-frame of the linkages between government vision/strategies, project objectives, outcomes and outputs are presented and summarized in Table 1-6:

Table 1-6: Log-Frame of Study Goals, Objectives, and Outcomes/Outputs

Item	Key Points in Log-Frame (Focus on Public Transport)
Government Vision & Strategies	• **Strategic Development Plan (SDP) 2011-2030** – envision an extensive network of quality and well-maintained roads to connect communities, promote rural development, industry and tourism, and provide access to markets. • **Program of the IX Constitutional Government** – develop and expand a quality public transport system for the Timorese (in particular for land transport).
Objectives	• Provide a **high-quality, sustainable public transport system** that meets the needs of users for safety, comfort, security, convenience, affordability, accessibility and availability • Create a **transparent and stable regulatory environment** that encourages ongoing private sector investment and operations
Outcomes	• **Output 1:** Climate-resilient and optimized public transport network system developed • **Output 2:** Institutional capacity strengthened • **Output 3:** Regulatory framework for low-carbon and climate-resilient development strengthened
Outputs	• **2024 Public Transport Master Plan** – the country's public transport master plan including diagnostic assessment, route analysis and network optimization study, vision/strategies, investment plans with phases and cost estimates, facility assessment framework to shortlist public transport facilities, suggestions for innovative solutions, as well as roadmap for capacity building and regulatory development. • **Feasibility Study** – feasibility study of ten selected public transport facilities including site assessment, facility schemes/design, cost estimates, financial analysis, economic analysis, climate change, environmental/social safeguards, and procurement. • **Supporting Public Transport Reform Programs –** six supporting public transport reform programs to develop and expand a quality public transport system for the Timorese**.** • **Recruitment Assistance for DED** – tender support including preparation of a draft for the DED consultant as well as assistance during the recruitment process

In addition, the linkage of the feasibility study and six supporting public transport reform programs to the aforementioned key pillars of the public transport system in Timor-Leste are shown as below:

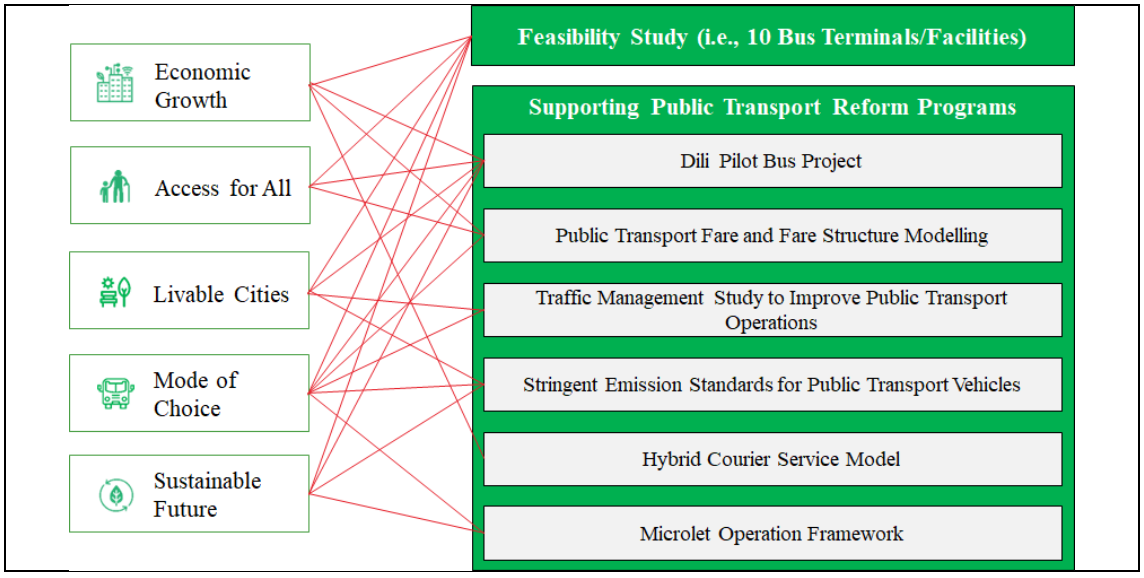


Figure 1-3: Linkage of Feasibility Study and Supporting Public Transport Reform Programs to Key Pillars in Public Transport Vision

Definition of Bus Terminal and On-Street Interchange

The purpose of this report is to conduct a feasibility study of transport facilities (i.e., bus terminals, on-street interchange) that are selected and prioritized in the 2024 PTMP. In total, ten bus facilities (including five bus terminals and five on-street interchanges) are identified as priority initiatives in terms of technical/strategic importance and government preferences following two ADB missions conducted in April and October 2024. The definition of bus terminal and on-street interchange is highlighted in the table below:

Table 1-7: Definition of Bus Terminal and On-Street Interchange

Facility Typology	On-Street Interchange	Bus Terminal
Facility Type & Characteristics		
	• Serves microlets only (or in the case of smaller municipalities, a small number of daily regional buses as well). • Located at key points within city/ municipality for convenient transfers. • Includes basic passenger amenities like sheltered waiting areas, seating, route maps, and real time arrival information. • Possesses integrated pedestrian connectivity to surrounding urban areas and provisions for persons with disabilities. • May incorporate active travel infrastructure (e.g., bicycle racks) to improve last mile connectivity.	• Serves microlets and/or major regional routes. • Located in residential & commercial areas/ centers for enhanced access. • Includes additional amenities (beyond ones at on-street interchange) like restrooms, food and beverage options, and bicycle parking. • Supports integration with other modes of transport (e.g., taxis & private shuttles) • Provides customer support (e.g., ticketing) • May include depot provisions – i.e., administration, maintenance, fueling, cleaning and storage for public transport vehicles, however these would be separate from passenger areas.
Demand Scale	Moderate passenger volume, primarily serving local areas.	Moderate to high passenger volume, serving urban centers and major employment centers.
Footprint Scale	Smaller-size footprint, generally occupying a single block or less.	Medium-size footprint, occupying a block or more, depending on available space and need.
Suitability	Implement at key locations within city/municipality, where bus/microlet routes intersect or where interchange is required between services.	Implement in areas with high public transport ridership, where multiple routes converge and there is a need to connect local neighborhoods to selected regional bus services.

Source: 2024 PTMP

As noted above, development of bus terminals will bring significant impacts and implications with robust buildings (i.e., operation and administration offices) and passenger amenities (such as covered waiting areas, ticket booth, retail/kiosk, etc.). In contrast, on-street interchanges are enhanced bus stops and have less impacts and influences on the surrounding environment.

The results of this study will inform investment decisions by the Government of Timor-Leste and support ADB's decision on loan approvals to ensure financially viable and sustainable operation of public transport facilities and support strategic procurement planning and procurement plan including recruitment assistance for the detailed engineering design consultant.

1.5 Structure of the Report

This report is structured as follows:

- **Section 1: Introduction and Background** – highlights the background, goals/objectives of the study, key findings from the 2024 PTMP, and structure of this report.

- **Section 2: Facility Design Principles and Key Assumptions** – presents key design principle and assumptions in estimating the size of facilities, design of bus terminals and on-street interchanges, as well as key assumptions in preparation of this feasibility study including project timeline.

- **Section 3: Site Assessment & Facility Schemes/Design** – presents an engineering and architectural study focusing on site analysis, public transport services/demand, existing conditions of the site, as well as facility improvement schemes/design including potential measures to strengthen climate resilience.

- **Section 4: Updated Cost Estimates & Revenues** – presents indicative order-of-magnitude capital costs and O&M costs for the selected bus terminals and on-street interchanges, as well as estimation of annual revenue and 30-year projection as potential revenues for bus terminal operation.

- **Section 5: Financial Analysis** – presents a preliminary, high-level financial assessment to assess the financial results of the Timor-Leste public transport scheme.

- **Section 6: Economic Assessment** – presents key findings/results and economic assessment including economic evaluation approach, economic costs and benefits, and results of economic analysis.

- **Section 7: Environmental Safeguards** – highlights an overview of environmental safeguards and environmental setting by site and potential environmental impacts by project phase.

- **Section 8: Gender Equality and Social Inclusion Assessment** – provides an overview of the initial Gender Equality and Social Inclusion (GESI) Assessment for the project including approach, review of GESI-related policies/plans, key gender issues, and best practices on innovative measures on GESI.

- **Section 9: Institutional and Governance Arrangements** – presents key entities and relevance to public transport and a proposed responsibility matrix for envisioned bus terminal functions.

- **Section 10: Options Analysis** – presents an options analysis to address observed issues and explore other potential solutions (besides developing new bus facilities) to support informed investment decisions.

- **Section 11: Risk Assessment** – provides an overview of potential risks to implement the project including technical risk (based on site assessment and facility design/scheme study), financial uncertainties, safeguard risks (including environment and social), legal and institutional risks, and other unforeseen events.

- **Section 12: Phasing Plan** – presents a phasing of the selected ten bus facilities to ensure successful implementation of the project that are delineated into two phases.

- **Section 13: Supporting Public Transport Reform Programs** – entails six supporting public transport reform programs with a focus on Dili, with each program comprising key issues, approaches, key findings, proposed enhancements, and indicative cost estimates.

- **Section 14: Total Investment Cost** – provides an indicative total investment cost of eight project components including ten bus facilities, pilot bus project, public transport fare model, traffic management, stringent emission standards, hybrid courier service model, microlet operation framework, and capacity development program.

- **Section 15: Conclusion** – summarizes key findings in this feasibility study report and outlines next steps based on the results of this Report.

1.6 Abbreviations

Abbreviation	Definition
ADB	Asian Development Bank
ADN	National Development Authority (or Agência de Desenvolvimento Nacional)
BAU	Business as Usual
BEB	Battery Electric Bus
BOT	Built-Operate-Transfer
CAFI	Council for the Administration of the Infrastructure Fund
CAPEX	Capital Expenditure
CBD	Central Business District
CCD	Dili Convention Center
CCTV	Closed-Circuit Television
CDB	Conventional Diesel Bus
CEPTED	Crime Prevention Through Environmental Design
DMA	Dili Metropolitan Area
DBFO	Design, Build, Finance, Operate & Maintenance
DED	Detailed Engineering Design
DGTP	General Directorate of Land and Property
DNSR	National Directorate of Road Safety
DNTT	National Directorate of Land Transport of Timor-Leste
DRBFC	National Directorate for Roads Bridges and Flood Control
EIRR	Economic Internal Rate of Return
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GESI	Gender Equality and Social Inclusion
GHG	Greenhouse Gas
ICE	Internal Combustion Engine
IEE	Initial Environmental Examination
IT	Information Technology
ITS	Intelligent Transportation System
JICA	Japan International Cooperation Agency
KII	Key Informant Interview
LNG	Liquefied Natural Gas
LEED	Leadership in Energy and Environmental Design
LTA	Land Transport Authority, Timor-Leste
MCA	Multi Criteria Analysis
MOF	Ministry of Finance, Timor-Leste
MOI	Ministry of Interior
MOJ	Ministry of Justice
MOP	Ministry of Planning and Territory
MOTC	Ministry of Transport and Communications, Timor-Leste
MPS	Major Projects Secretariat
MPT	Ministry of Planning and Territory, Timor-Leste
MPW	Ministry of Public Works, Timor-Leste
NCDC	National Capital District Commission
NPC	National Procurement Commission, Timor-Leste
NPV	Net Present Value
OPEX	Operating Expenditure
PMU	Project Management Unit
PNTL	National Police of Timor-Leste
PPP	Public Private Partnership
PTA	Public Transport Authority
PTMP	Public Transport Master Plan
REPEX	Replacement Capital Expenditure
TA	Technical Assistance
TCRP	Transit Cooperative Research Program
TOR	Terms of Reference
UNTL	National University of Timor-Leste
VOC	Vehicle Operating Cost

2. Facility Design Principles and Key Assumptions

2.1 Background

This section presents key design principle and assumptions in estimating the size of facilities as well as the design of bus terminals and on-street interchanges.

2.2 Bus Facility Enhancement Toolkit

National / local standards and codes for public transport terminals and facilities currently do not exist in Timor-Leste.[24] The Study Team developed the Bus Facility Enhancement Toolkit as below based on the review of international best practices and case studies – this toolkit provides a design guideline / framework with specific design requirements for creating an inclusive, accessible, and sustainable public transport system and infrastructure aligned to the vision for public transport.

2.2.1 Vision & Bus Facility Design Principles

The 2024 PTMP formulated the overarching vision for the public transport system as follows:

"Public transport in Timor-Leste is an attractive, accessible, inclusive, and future-ready transport mode that supports economic growth, urban development, and quality of life across the country."

In developing schemes/preliminary design for terminal/transit hubs, key operating and design principles (tied to the above vision) were formulated as follows with envisioned facilities/amenities for each facility type illustrated in Table 2-1 to create an attractive, inclusive, and future-ready public transport facilities that are attractive to all users:

- **Orderly / Organized** – Public transport is operated, maintained, and managed in an orderly and organized manner with seamless interchange between modes to ensure efficient passenger and vehicle movements.
- **Convenient / Comfortable** – Passenger facilities/amenities support convenient access to the site as well as a comfortable waiting environment, attracting more users and reducing private vehicle use.
- **Inclusive** – Universal access principles are integrated into designs of public transport facilities ensuring equality and social inclusion of the entire community and users of all mobility ability.
- **Secure** – Public transport facilities/designs improve security for all user groups to minimize dangers / harassment to bolster a sense of security.
- **Safe** – A safe access environment is created within and outside of public transport hubs with a suite of pedestrian-scale treatments supporting safe access for all users as well as safe vehicle operations within the site and minimized vehicle-pedestrian interactions/conflicts.
- **Climate Resilient** – Provision of climate resilience measures at public transport facilities minimize potential hazards and risks to users throughout their journey as well as future proof assets from climate change impacts and other hazard risks.

2.2.2 Bus Facility Enhancement Toolkit

The table provides a clear and structured framework for determining which design elements should be prioritized in the development of public transport passenger facilities, tailored to the unique characteristics and needs of each typology. Note that this framework represents a conceptual design framework and inclusion of key elements at each site will be further refined during this feasibility study.

[24] The 2022 Road Geometric Design Standards published by the Ministry of Public Works govern the provision of national directorate of roads, bridges, and flood control. Section 13.3 of this document includes some provision of bus laybys and parking bays along the road and have set minimum length and width of layover areas.

Table 2-1: Bus Facility Enhancement Toolkit

Focus Area	#	Elements	Description	On-Street Interchange 	Bus Terminal 
Orderly / Organized	1-1	Separation of People and Vehicles	Separate passenger and vehicle areas	✓	✓
	1-2	Separation by Vehicle Types	Separate areas for buses, PUV, private vehicles, and other vehicles	✓	✓
	1-3	Separation by Functions	Separate loading/unloading, layover, and circulation areas	✓	✓
	1-4	One-Way Operation	One-way internal circulation (excluding backup maneuvers)	✓	✓
	1-5	Paved Surfacing	Concrete paved loading/unloading, layover, and circulation areas	✓	✓
	1-6	Operation / Administration Office	Formal fully-equipped offices for operators and administrators		✓
	1-7	Signage	Directional and safety markings / signage		✓
	1-8	Facility Lighting	Well-lit vehicle areas	✓	✓
	1-9	Signalization [B]	Traffic signals at key junctions and mid-block areas outside of terminal	✓	✓
	1-10	Street Redesign [B]	Improved external access such as road/junction improvements, widening, etc.	✓	✓
	1-11	Curb Management [B]	Restricted parking, etc. outside of terminal	✓	✓
Convenient / Comfortable	2-1	Pick-Up & Drop-Off Curb [C]	Pick-up and drop-off curb for private vehicles		✓
	2-2	Interchange Zone [C]	Bus stop for loading/unloading and motorbike pick-up / drop-off		✓
	2-3	Covered Passenger Areas	Provision of covered passenger waiting and circulation areas	✓	✓
	2-4	Benches	Provision of benches in passenger waiting areas (especially for women, elderly, and PWD)	✓	✓
	2-5	Retail / Kiosk	Provision of retail and kiosk spaces for local businesses		✓
	2-6	Ticket & Information Center	Provision of ticketing & information center		✓
	2-7	Toilet	Provision of toilets		✓
	2-8	Wayfinding Signage [C]	Provision of wayfinding signage	✓	✓
	2-9	Convenient Walk Network [C]	Enhanced walk catchment network and linkages (such as expanded sidewalks)	✓	✓
Inclusive	3-1	Accessibility Ramps [C]	Provision of accessibility ramps at crosswalks	✓	✓
	3-2	Wheelchair Access [C]	Provision of wheelchair inclines	✓	✓
	3-3	Tactile Pavement [C]	Provision of tactile pavement	✓	✓
	3-4	Sensitive Design	Adoption of Crime Prevention Through Environmental Design (CEPTED)[A]	✓	✓
Secure	4-1	CCTV	Provision of CCTV for enhanced security		✓
	4-2	Pedestrian-Scale Lighting [C]	Well-lit facilities and walk areas to reduce harassment, etc.	✓	✓
	4-3	Guard Post	Provision of guard rooms		✓
Safe	5-1	Protected Sidewalk [C]	Curbed sidewalks, railings, etc.	✓	✓
	5-2	Crosswalks [C]	Provision of crosswalks	✓	✓
	5-3	Pedestrian Signals [B]	Pedestrian push buttons and countdown signs	✓	✓
Climate Resilient	6-1	Landscaping (trees, etc.)	Landscaping areas such as trees to provide green environment for users/visitors	✓	✓
	6-2	Climate Resilient Design	Future proofing of facilities from climate change impact		✓

Note:
[A] CEPTED is a design approach to manipulate the built environment to create a safer waiting area. This includes designing to eliminate blind spots, increasing visibility of waiting areas, etc. to deter crime and harassment, and minimize fear of crime.
[B] These elements can be considered for external access improvements outside of terminal / on-street interchange
[C] These elements can be considered for both facility improvements within terminal and external access improvements

2.3 Public Transport Facility Sizing Assumptions

2.3.1 Facility Sizing Assumptions

Scaling the sizing requirements for each facility is based on a combination of variable bay sizing and type of passenger amenities define by facility typology. For example, the number of bays is closely tied to peak hour trips by route and vehicle circulating area is increased relative to the number of bays. Similarly, concrete curb and gutters are scaled based on the total curb length required to support the total number of bays. Passenger amenities, such as the waiting area and roof are scaled based on the number of potential passengers resulting from the peak hour vehicles serving the facility. Key assumptions to estimate the size of bus terminals / on-street interchange are summarized as follows:

Table 2-2: Facility Sizing Assumptions

Element	Value	Unit	Assumption
Concrete Bus Bay + Bus Circulating Area			
Microlet Bay	15	m²	Based on microlet size
Microlet Bay with Circulating Area	22.5	m²	Assumed buffer space with 1.5 multiplier factor (based on 3000 sqm with 23 conventional bus bays in TCW)
Regional Bay	30	m²	Based on regional bus size
Regional Bay with Circulating Area	45	m²	Based on circulating area factor
Concrete Curb and Gutters			
Passenger bay	36	m/bay	Subject to final design - Estimate for initial costing purposes based on professional judgement
Layover bay	72	m/bay	Subject to final design - Estimate for initial costing purposes based on professional judgement
Drop Off Area (Off-Street)			
Minimum drop off area	126	m²	Subject to final design - Estimate for initial costing purposes based on professional judgement (3 pick/up drop off bays and queuing area)
Additional area for every 3 additional bays	13	m²	Assumption for initial costing purposes: one additional pick/up drop off bay per three passenger bays assume full microlet (14 passengers) with 20% of passengers being dropped off by private vehicle with 10 sec drop off rate per passenger.
Waiting and Queuing Area			
Area per person	1.2	m²	Transit Capacity and Quality of Service Manual, 2014
Area per passenger bay	16	m²	Bus Terminal Planning and Design Guidelines for India, 2014 (2m x 8 m)
Growth factor	25%	%	Preserve space upon the total waiting area
Terminal Facility Roof			
Facility Roof Factor	25%	%	25% more space added to the roof based on the build/waiting areas (to undercover elements combined)
Wayfinding and Signage			
Bus Terminal	10	number	Assume 4 possible entry/exit directions of interchange (two each - 8 wayfinding) + 2 inside passenger waiting area
On-Street Interchange	2	number	Assume 2 wayfinding info per location
Ticket & Fare Collection Point			
Bus Terminal	16	m²	Assume 4m x 4m space for ticket/fare collection
Tactile Paving			
Long length of passenger bays	13	m	N/A (Conservative estimate for costing purposes taken as long length of largest bay)
Other			
Operator Office	25	m²	Subject to final design - Estimate for initial costing purposes based on professional judgement
Administration Office	25	m²	Subject to final design - Estimate for initial costing purposes based on professional judgement
Booth (Regional)	9	m²	Assume 3m x 3m space for multi-function booth at regional on-street interchange.
Security Office	4	m²	Assume 2m x 2m space for security office
External works	100	m²	Assume 50m2 of pedestrian improvements either side of facility entrance
Retention Pond	3%	%	Assume 3% of the site area based on similar bus projects in the region
Solar Pannel Roof (Terminal)	50%	%	Assume 50% of passenger waiting areas (on building roof)
Solar Pannel Roof (On-Street Interchange)	11	m²	Assume solar panel on roof of a bus shelter (area of bus shelter roof is 6m x 1.8m)

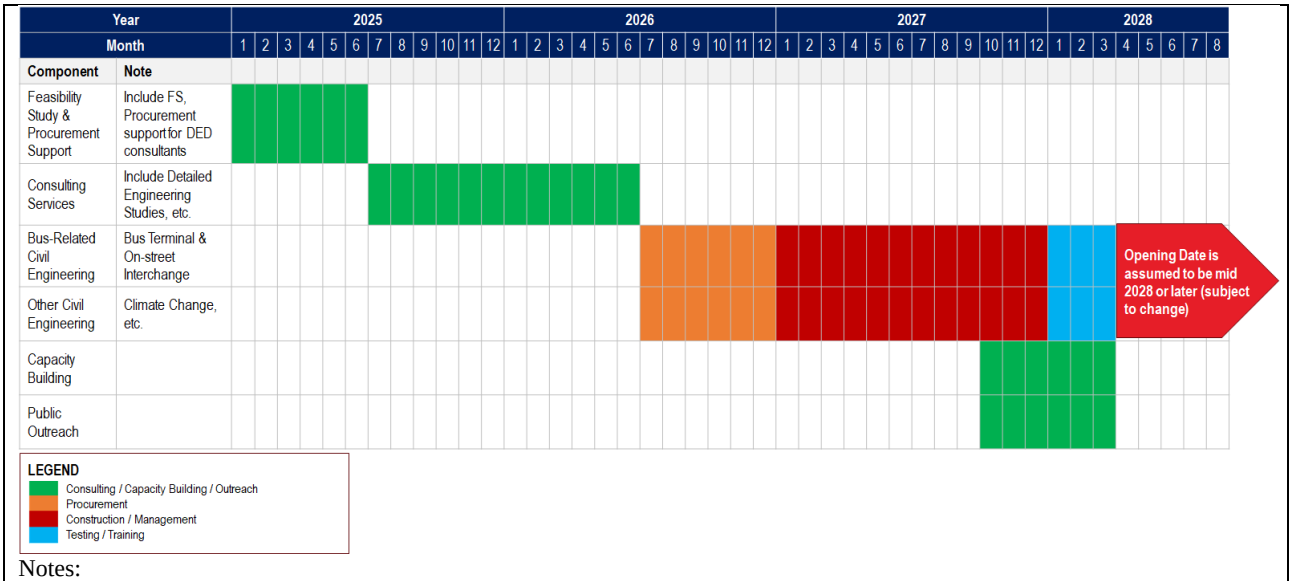
Source: 2024 PTMP and Facility Design Guidelines

2.4 Other Key Assumptions

2.4.1 Indicative Timeline of Key Milestone Activities

The figure below shows the indicative timeline with key milestone activities including feasibility study, detailed engineering design, construction, testing and operation of bus terminals/on-street interchanges. Key assumptions in this timeline and preparation of the feasibility study are as follows:[25]

- **Mid 2025** – Start of DED work (to be completed by mid-2026)
- **Early 2027** – Construction of bus terminals/on-street interchanges (to be completed by end 2027)
- **Early 2028** – Testing / training of relevant personnel before opening of bus facilities
- **Mid 2028** – Opening of bus terminals/on-street interchanges (partially)



Notes:

3. Land acquisition is not considered at this stage as the selected sites are assumed to be owned by the government.
4. Key assumptions/timeline are indicative only and the timeline of milestone activities is subject to change in aling with the government's plan. For conservative purpose, cost, revenues, financial and economic assessment are estimated based on 2030 when bus terminal/facilities will be fully open (considering buffer time/potential delays of milestone activities).

Figure 2-1: Indicative Timeline of Bus Facility Development

2.4.2 Key Assumptions in Preparation of This Feasibility Study

The feasibility study of bus terminals/facilities is prepared based on the following assumptions (as warranted):

- Future demand of microlet (Dili) and reginal buses was projected up to 2035 in the 2024 PTMP. Key findings on route-level demand are further distributed into assumed demand for individual facility sites to estimate fare revenues.
- Existing microlet vehicles are assumed to be operating in this scenario. In other words, no replacement of the microlet with modern buses is assumed for this feasibility study assessment.
- Additional surveys were conducted to understand traffic and pedestrian volumes/activities outside the selected facility sites which will be used to come up with access road/sidewalks improvements. Key details and survey results are summarized in Appendix C.

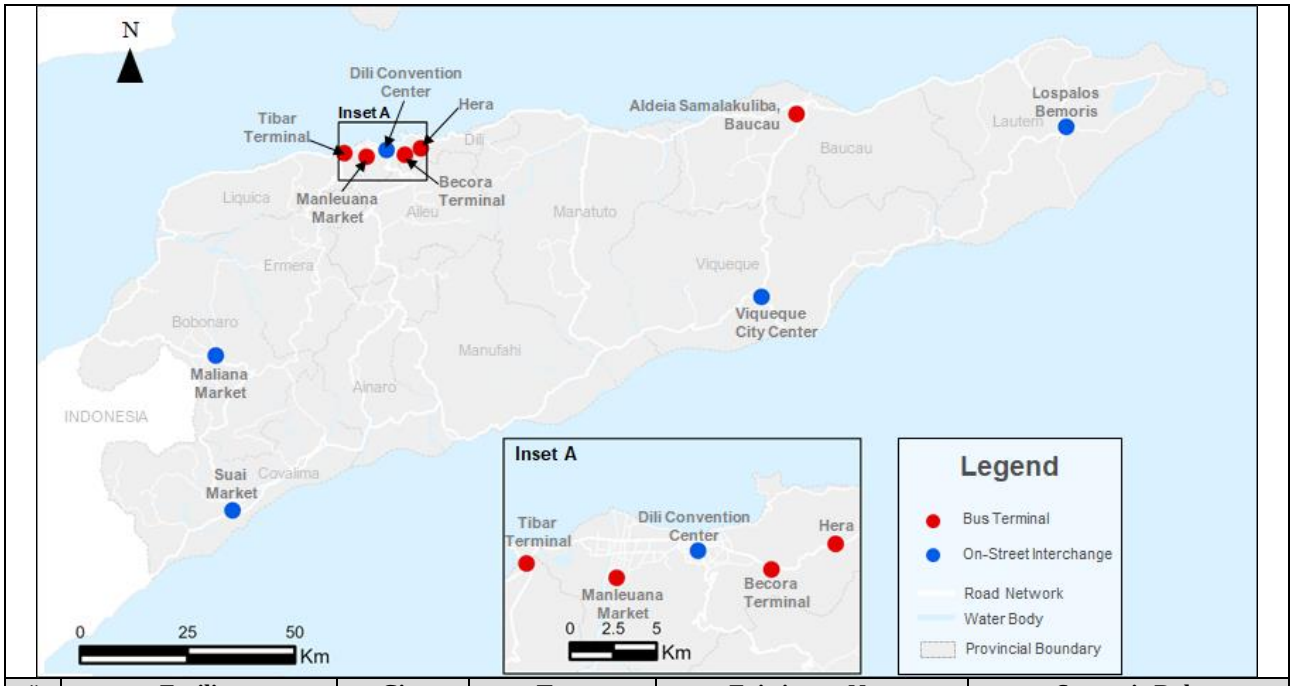
[25] Key assumptions/timeline are indicative only and may subject to change based on decisions/priorities of key stakeholders on the timeline of milestone activities. For conservative purpose, cost, revenues, financial and economic assessment are based on 2030 when bus terminal/facilities are expected to be fully open (considering buffer time/potential delays of milestone activities).

3. Site Assessment & Facility Schemes/Design

3.1 Background

This section presents an engineering and architectural study focusing on site analysis, public transport services/demand, existing conditions of the site, as well as facility improvement schemes/design including potential measures to strengthen climate resilience. The overview of the selected sites is presented in Table 3-1.

Table 3-1: Overview of Selected Transport Facility Sites



#	Facility	City	Type	Existing or New	Strategic Role
1	Dili Convention Center	Dili	On-Street Interchange	Existing	Interchange hub in Dili city center
2	Becora Terminal	Dili	Bus Terminal	Existing	Dili east gateway for intracity trips
3	Tibar Terminal	Dili	Bus Terminal	New	Dili west gateway and international access point
4	Manleuana Terminal	Dili	Bus Terminal	New	Dili south gateway
5	Hera Terminal	Dili	Bus Terminal	New	Dili east gateway for regional / intercity trips
6	Aldeia Samalakuliba Terminal	Baucau	Bus Terminal	New	Key interchange hub for regional trips in 2nd biggest city
7	Maliana Market	Maliana	On-Street Interchange	Existing but no facility provided	Western destination in the country
8	Suai Market	Suai	On-Street Interchange	Existing but no facility provided	Southeastern destination in the country
9	Lospalos Bemoris	Lospalos	On-Street Interchange	Existing but no facility provided	Eastern destination in the country
10	Viqueque City Center	Viqueque	On-Street Interchange	Existing but no facility provided	Southeastern destination in the country

Based on the bus facility enhancement toolkit, operational and facility issues are identified at site level (with key findings summarized in Appendix A). Furthermore, engineering data such as civil, structural, utilities, geotech, etc. are collected through various channels (including request for information via government agencies and site investigations) and are compiled in Appendix B.

3.2 Facility#1: Dili Convention Center

3.2.1 Overview of Location and Strategic Importance

Dili Convention Center is an existing on-street bus stop located in the center of Dili and serve as a key interchange hub to travel/transfer across the city of Dili. The area size (including parking spaces for private vehicles) is about 2,200m^2 and surrounded by R. Caicoli in north (two-way roads, one lane per direction) and Dili Convention Center in south (with sidewalk access provided on east/west side of the site). A roundabout (two lanes) lies to the northeast of the site which constitutes a major corridor spanning the city (from Ave. de Nicalau Lobato to Ave. Liverdade de Imprensa leading to Becora Terminal).

Figure 3-1: Site Location – Dili Convention Center

Key generators around the site include Dili Convention Center (civic public center), schools, commercial buildings, hotel, government offices (the government office of DNTT located across R. Caicoli), landmark, Dili Municipal Stadium (within 500m) and schools, hospitals, and park (within 1km).

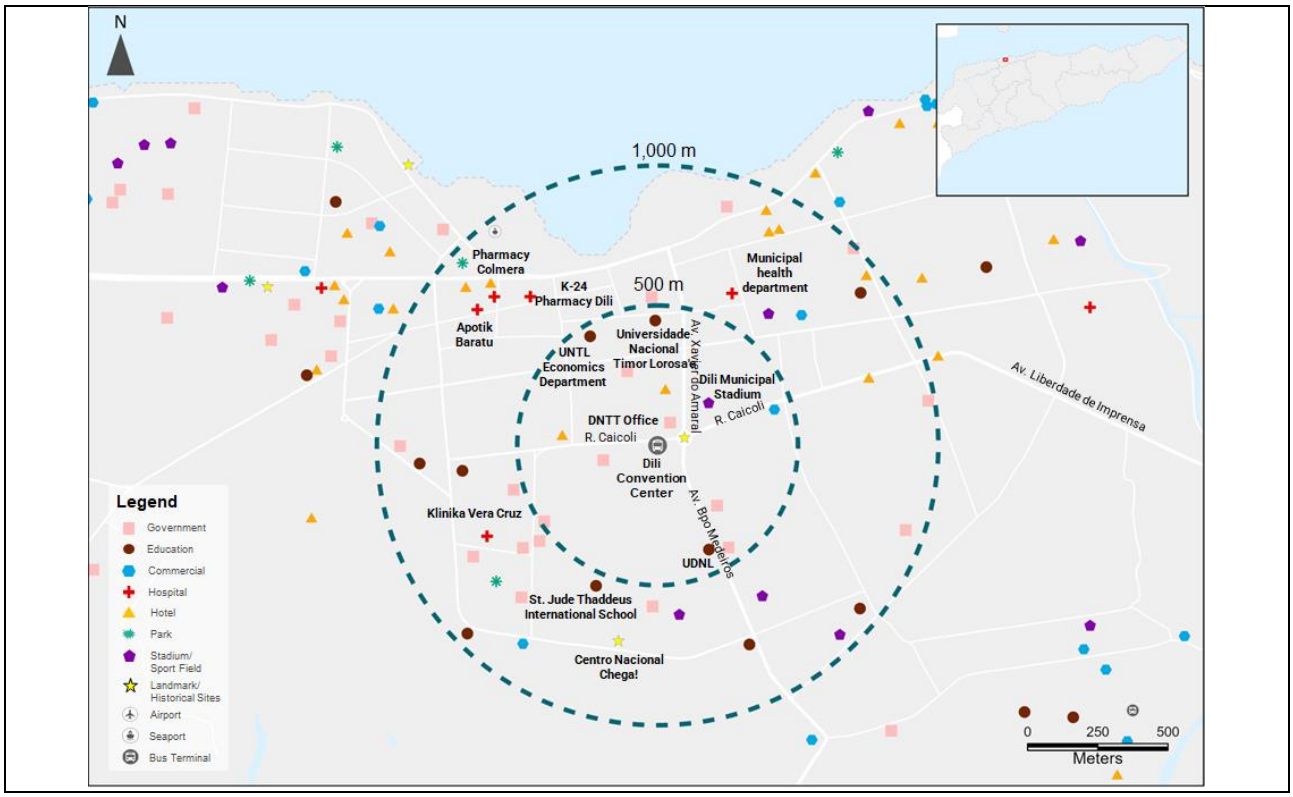


Figure 3-2: Key Generator – Dili Convention Center

3.2.2 Public Transport Services and Demand

A total of eight microlet routes (Route 1, Route 2, Route 4, Route 5, Route 6, Route 7, Route 8, and Route 9) are proposed to serve this facility. The existing and future microlet services, operation, routing, and demand details are summarized below based on the key findings/results from the 2024 PTMP:

Table 3-2: Public Transport Services and Demand (Existing and Future) – Dili Convention Center

						Existing [A, B]			Future [A, B]		
Route #	Origin	Destination	Vehicle Type	Direction	Distance (km)	Peak Headway (Minutes)	Daily Round Trips	Daily Demand	Peak Headway (Minutes)	Daily Round Trips	Daily Demand
Dili Microlet											

						Existing [A, B]			Future [A, B]		
Route #	Origin	Destination	Vehicle Type	Direction	Distance (km)	Peak Headway (Minutes)	Daily Round Trips	Daily Demand	Peak Headway (Minutes)	Daily Round Trips	Daily Demand
M-1	Becora Terminal	Becora Terminal	Microlet	Clockwise	11.8	1.5	240	6,420	1.5	260	15,110
M-2	Becora Terminal	Becora Terminal	Microlet	Counter-Clockwise	10.1	1.5	360	9,720	1	400	10,390
M-4	Taibessi Terminal	Taibessi Terminal	Microlet	Clockwise	12.6	3	180	5,590	2	270	14,390
M-5	Taibessi Terminal	Taibessi Terminal	Microlet	Clockwise	17.8	2	210	8,140	1.5	270	23,390
M-6	Rua do Fomento	Rua do Fomento	Microlet	Clockwise	12.2	1.5	230	6,200	1.5	290	17,160
M-7	Taibessi Terminal	Taibessi Terminal	Microlet	Clockwise	15.9	3.5	140	5,290	3	170	13,480
M-8	Rua de Becussi	Rua de Becussi	Microlet	Clockwise	9.5	2.5	140	3,760	2	170	9,550
M-9	Kampung Baru	Kampung Baru	Microlet	Clockwise	18.3	1.5	370	10,260	1	500	29,670

Note:
[A] Daily round trips and demand are based on weekday data.
[B] Daily demand is based on route-level boardings which is further distributed into assumed demand for individual facility sites for revenue analysis.

3.2.3 Existing Facilities

The current layout of Dili Convention Center is illustrated below. The facility utilizes an open lot in front of the Dili Convention Center which is mainly used for parking spaces of private vehicles as well as loading, unloading and layover spaces for microlet services. A poorly maintained bus stop with concrete seating is provided at the south corner of the site (without other amenities such as lighting) as shown in Figure 3-3. Vehicles enter from the access point in the west corner, circulate in a counterclockwise fashion, and exit via the access point in the east corner (immediately adjacent to the roundabout). Other private vehicles also share the spaces for loading, unloading and parking and facility spaces are not clearly defined by mode/function. Assessment of observed site conditions/issues based on the bus facility enhancement toolkit and assessment framework are summarized in Appendix A.

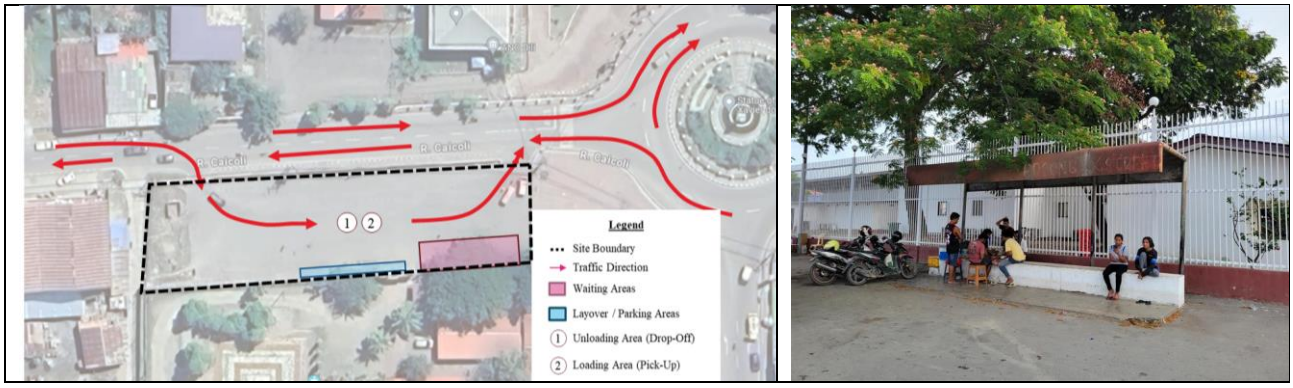


Figure 3-3: Current Facility Layout and Streetview – Dili Convention Center

3.2.4 Key Routes Serving and Proposed # of Bays

As noted, this facility will be served by eight microlet routes – all operating as thru routes at this key interchange hub. Based on the bay estimation process detailed in Facility Design Guidelines in 2024 PTMP, bay assignment of boarding/alighting bay and layover spaces are summarized by route in Table 3-3.[26] In total, the facility requires six bays (with each bay size assumed for microlet operation) comprised of six boarding/alighting bays without layover space.

During the ADB Mission held in October 2024, it was agreed to reserve parking spaces for private vehicle for event purposes (as visitors normally use parking spaces in front of Dili Convention Center) which translates into less spaces reserved for public transport. To overcome such spatial constraints at this location, it is suggested to split loading/unloading bays by route/service direction where eastbound routes (i.e., Route 1,

[26] Bay estimation process is presented in Section 4.6 which combines the Transit Cooperative Research Program (TCRP) approach with our optimization proposal.

Route 5, Route 6, Route 7, and Route 8 operating on R. Caicoli) will serve Dili Convention Center, while southbound routes (i.e., Route 2, Route 4, Route 9 operating on Av. Xavier do Amaral at the north of the roundabout) will utilize the curbside lane for convenient loading/unloading as well as transfers between the two locations (with the latter serving as a bus stop).

3.2.5 Proposed Scheme and Preliminary Design

Based on the facility design principles in the Bus Facility Enhancement Toolkit, the following considerations were taken into account in developing schemes/design for this facility:

- **Site Access** – The main entry/exit point is proposed in the west corner along Rua Caicoli (with geometric improvements required for improved access road). Another access road is provided for private vehicles to minimize conflicts between microlet and private vehicle upon accessing the site.
- **Separation of Public Transport and Private Vehicles** – Boarding/alighting zones and circulation areas are proposed to be physically separated to reduce potential incidents.

Table 3-3: Bay Assignment by Route for Dili Convention Center

							# of Equivalent Bays (Based on Dwell Time Calculation)		Bay Assignment (where A = Alighting Only, B = Boarding Only, and C = Boarding/Alighting)						
Route #	**Vehicle Type**	**Service Type**	**Terminating Point#1**	**Terminating Point#2**	**Direction**	**Trips/ Hour**	**Boarding Bays per Route (With 20% Growth)**	**Alighting Bays per Route (With 20% Growth)**	**Bay 1**	**Bay 2**	**Bay 3**	**Bay4**	**Bay 5**	**Bay 6**	**Lay-over**
M-1	Microlet	Thru	Becora Terminal	Becora Terminal	Loop	40.0	0.24	0.48	C						0
M-2	Microlet	Thru	Becora Terminal	Becora Terminal	Loop	60.0	0.36	0.72		C					0
M-4	Microlet	Thru	Taibessi Terminal	Taibessi Terminal	Loop	30.0	0.18	0.36			C				0
M-5	Microlet	Thru	Taibessi Terminal	Taibessi Terminal	Loop	40.0	0.24	0.48					C		0
M-6	Microlet	Thru	Rua do Fomento	Rua do Fomento	Loop	40.0	0.24	0.48				C			0
M-7	Microlet	Thru	Taibessi Terminal	Taibessi Terminal	Loop	20.0	0.12	0.24				C			0
M-8	Microlet	Thru	Rua de Becussi	Rua de Becussi	Loop	30.0	0.18	0.36	C						0
M-9	Microlet	Thru	Kampung Baru	Kampung Baru	Loop	60.0	0.36	0.72						C	0

- **Operational Considerations** – No backup maneuvers are assumed within the facility for safety purposes. Routes are assigned to specific bays with potential interchange in mind.
- **Provision of Facilities and Passenger Amenities** – Enhanced passenger facilities will be provided for better service/travel experience (such as covered waiting areas, benches) as well as access-for-all facilities (such as lighting, tactile paving, curb ramps) to enable safe access for all. Furthermore, climate adaptation measures (i.e., stormwater drainage) are proposed to strengthen the resilience of the facility against climate change impacts.

Based on these considerations above, the preliminary layout/design for this site is depicted below. Of note:

- Loading/unloading bays are split by service direction – with five routes heading to the east along Rua Caicoli (Route 1, Route 5, Route 6, Route 7, and Route 8) will serve Dili Convention Center, while other three southbound routes (Route 2, Route 4, Route 9) operating on Ave. Xavier do Amaral will use the curbside lane for loading/unloading – as illustrated in Figure 3-4.
- At Dili Convention Center public transport vehicles circulate in a clockwise direction, with all circulation being one-way to reduce chances of incidents. Access is only permitted from the west corner and designated for microlet only.
- Covered passenger waiting areas are proposed between loading/unloading areas and private vehicle parking spaces to facilitate transfers.
- New pedestrian crossings and sidewalks are provided to enhance passenger connectivity within and outside the facility.

Figure 3-4: Preliminary Layout/Design for Dili Convention Center (Above) & Proposed Loadin/Unloading Spaces on Ave. Xavier do Amaral (Bottom)

3.3 Facility#2: Becora Terminal

3.3.1 Overview of Location and Strategic Importance

The Becora Terminal is one of existing bus terminals located in the east of Dili and serves as a gateway connecting Dili and the East Region such as Baucau, Manatuto, Lospalos, and Viqueque. The area size is about 3,600m^2 and surrounded by Benamauc River in west, Rua Pe. Moteiro in south (which is a two-way road, one lane per direction), a local village road in north (narrower two-way road), and various low-floor commercial developments in north and east.

Figure 3-5: Site Location – Becora Terminal

Key generators around the site include commercial establishments (i.e., Traditional Market), education (i.e., EPC Sabraka Laran, Escola Publica EPC Bedois), hotel, and several landmark sites within 500m of the site, as well as hospital (i.e., Centro Salude Comunitaria Becora) and sports center (i.e., Kampu Desportu Becora) within 1.0km of the site.

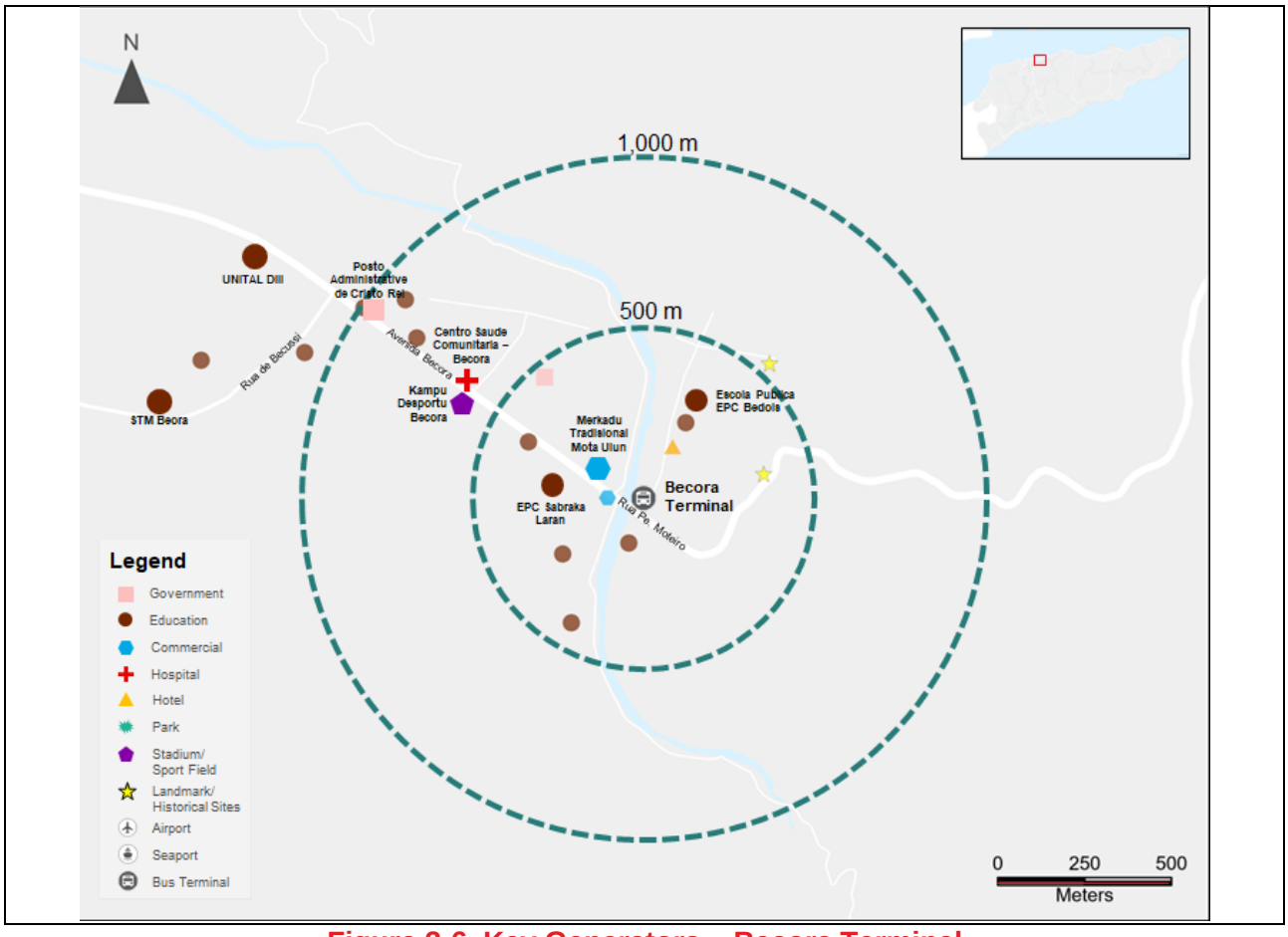


Figure 3-6: Key Generators – Becora Terminal

3.3.2 Public Transport Services and Demand

Currently two microlet routes (Route 1 and Route 2) as well as four regional bus routes connecting to municipalities in the east (i.e., Baucau, Lospalos, Manatuto, Viqueque) serve Becora Terminal. In the future this facility will be served by microlet and shuttle services connecting Becora and Hera (see next section for details). The existing and future microlet and regional bus services, operation, routing, and demand details are summarized below based on the key findings/results from the 2024 PTMP:

Table 3-4: Public Transport Services and Demand (Existing and Future) – Becora Terminal

						Existing [A, B]			Future [A, B]		
Route #	**Origin**	**Destination**	**Vehicle Type**	**Direction**	**Distance (km)**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**
Dili Microlet											
M-1	Becora Terminal	Becora Terminal	Microlet	Clockwise	11.8	1.5	240	6,420	1.5	260	15,110
M-2	Becora Terminal	Becora Terminal	Microlet	Counter-Clockwise	10.1	1.5	360	9,720	1	400	10,390
Regional Bus											
P-3	Becora Terminal	Baucau	Bus	EB/WB	117.7	10	39	1,218	Proposed to move to Hera Terminal as per the ADB/MOTC decision in the join Mission conducted in April 2024		
P-6	Becora Terminal	Lospalos	Bus	EB/WB	205.1	20	6	153			
P-8	Becora Terminal	Manatuto	Bus	EB/WB	58.7	60	6	126			
P-11	Becora Terminal	Viqueque	Bus	EB/WB	176.6	7	13	377			
Shuttle Service [C]											
S-1	Becora Terminal	Hera Terminal	Microlet	Clockwise	15.2	-	-	-	3	240	2,460

Note:
[A] Daily round trips and demand are based on weekday data.
[B] Daily demand is based on route-level boardings which is further distributed into assumed demand for individual facility sites for revenue analysis.
[C] Operational scheme for shuttle service is assumed to be provided by existing microlet operators (such as by permitting Microlet Route 1 and Route 2 to provide extended services to Hera or allowing other operators/drivers to provide the service). This requires close coordination with relevant stakeholders including DNTT to ensure feeder services are provided prior to the opening of upgraded Becora Terminal.

3.3.3 Existing Facilities

The current layout of Becora Terminal is illustrated below. The terminal includes a sheltered passenger waiting area (with seating and some lighting as well as retail/food kiosk activities placed inside), a ticketing office (although purportedly not used), spaces for loading/unloading and layover (though not designated by function), a security post, and buildings adjacent to the terminal. Vehicles circulate in a clockwise fashion, though some vehicles are observed to operate in an opposite counterclockwise fashion (including private vehicles accessing the village road in north). Assessment of observed site conditions/issues based on the bus facility enhancement toolkit and assessment framework are summarized in **Appendix A**.

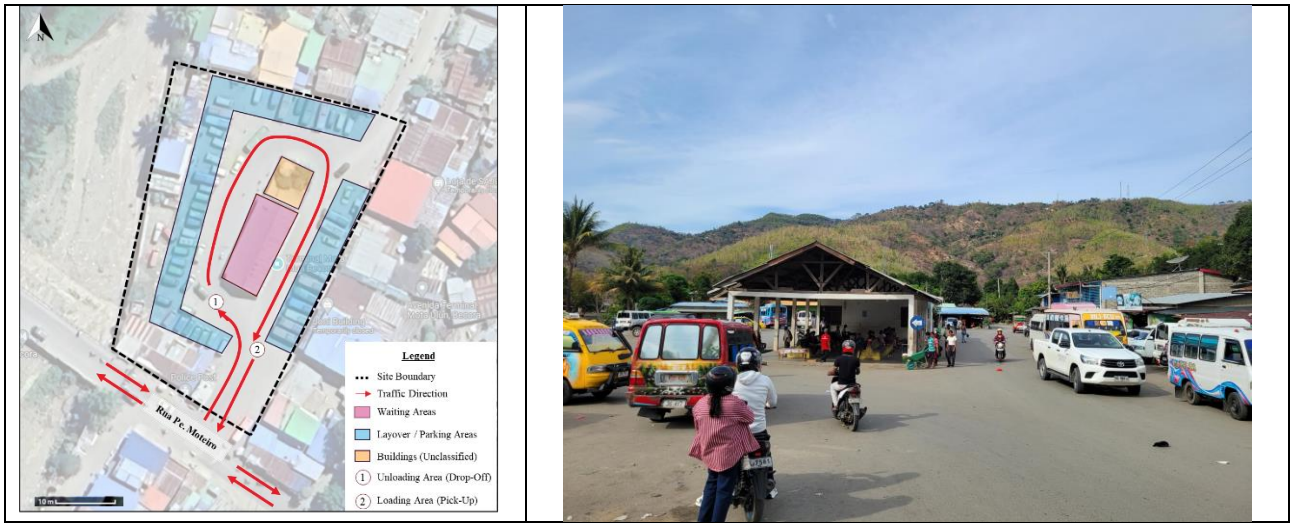


Figure 3-7: Current Facility Layout and Streetview – Becora Terminal

3.3.4 Key Routes Serving and Proposed # of Bays

As noted, this facility will be served by two microlet routes (Route 1 and Route 2) and shuttle services which will connect Becora Terminal and Hera Terminal in the future (see **Section 3.6** for Hera Terminal). All routes operate as terminating routes. No regional buses will operate at this facility in the future as these will be transferred to Hera Terminal – which is a key outcome of the ADB Mission in April 2024 in line with the

MOTC's strategic decision on public transport terminal. [27] The Becora Terminal focuses on serving connectivity needs of Dili and act as a central link between Dili and Hera, while Hera Terminal serves regional trips.

Based on the bay estimation process detailed in Facility Design Guidelines in 2024 PTMP, bay assignment of boarding/alighting bay and layover spaces are summarized by route in the table below. [28] In total, the facility requires 17 bays (with each bay size assumed for microlet operation) comprised of 10 boarding/alighting bays and 7 layover spaces.

3.3.5 Proposed Scheme and Preliminary Design

Based on the facility design principles in the Bus Facility Enhancement Toolkit, the following considerations were taken into account in developing schemes/design for this facility:

- **Site Access** – The main entry/exit point is proposed in south along existing road Rua Pe. Moteiro (with geometric improvements required for improved access road). The local road located in the north will be kept for local access needs (but circulation areas will be separate as noted below).
- **Separation of Public Transport and Private Vehicles** – Boarding/alighting zones and circulation areas (partially) are proposed to be physically separated to reduce potential incidents. Access point in the south along Rua Pe. Moteiro will be shared between the two modes as this is the only entry point to access residential areas in the north of the site.
- **Operational Considerations** – No backup maneuvers are assumed within the facility for safety purposes. Routes are assigned to specific bays with potential interchange in mind. Alighting and boarding areas are separated as well, but within a short distance for easy interchange.
- **Provision of Facilities and Passenger Amenities** – Enhanced passenger facilities will be provided for better service/travel experience (such as covered waiting areas, kiosk/retail, toilet, office) as well as access-for-all facilities (such as lighting, tactile paving, curb ramps). Furthermore, climate adaptation measures (i.e., rainwater storage, stormwater drainage) are proposed to strengthen the resilience of the facility against climate change impacts.

[27] ADB Timor-Leste Public Transport Project Consultation Mission held on 8-12 April 2024. Aide Memoire (Page 3).
[28] Bay estimation process is presented in Section 4.6 which combines the Transit Cooperative Research Program (TCRP) approach with our optimization proposal.

Table 3-5: Bay Assignment by Route for Becora Terminal

							# of Equivalent Bays (Based on Dwell Time Calculation)		Bay Assignment (where A = Alighting Only, B = Boarding Only, and C = Boarding/Alighting)										
Route #	**Vehicle Type**	**Service Type**	**Terminating Point#1**	**Terminating Point#2**	**Direction**	**Trips/ Hour**	**Boarding Bays per Route (With 20% Growth)**	**Alighting Bays per Route (With 20% Growth)**	**Bay 1**	**Bay 2**	**Bay 3**	**Bay4**	**Bay 5**	**Bay 6**	**Bay 7**	**Bay 8**	**Bay 9**	**Bay 10**	**Lay-over**
M-1	Microlet	Terminating Routes (50% Layover at This Terminal)	Becora Terminal	Becora Terminal	Loop	40.0	0.96	1.92	A	A	B								2
M-2	Microlet	Terminating Route (100% Layover at This Terminal)	Becora Terminal	Becora Terminal	Loop	60.0	1.44	2.88				A	A	A	B	B			5
S-1	Microlet	Terminating Routes (No Layover at This Terminal)	Becora Terminal	Hera Terminal	Loop	20.0	0.48	0.96									A	B	0

Based on these considerations above, the preliminary layout/design for this site is depicted below. Of note:

- Public transport vehicles circulate in a clockwise direction, with all circulation being one-way to reduce chances of incidents.
- Operation facilities and passenger amenities are proposed along the perimeter of the site in the west (with retail/toilet placed close to the gate for easy access). Passenger waiting areas are split into two defined by routes and loading/unloading purpose.
- Circulation spaces are redesigned to allow one-way movement (i.e. provision of mini roundabout) and provide safe pathways for local private vehicles accessing the area in north.
- Layover areas for microlet are provided in the north corner of the site.
- New pedestrian crossings and sidewalks are provided to enhance passenger connectivity within and outside the facility.
- Interchange point and pickup/drop-off zones are proposed in the south along Rua Pe. Moteiro to facilitate transfers between modes.
- Although not specifically shown in the design, provision of a bus stop near the bus terminal is preferred and supported by key stakeholders (during a workshop conducted in October 2024) for quick implementation and create momentum and attractions for public transport.

Figure 3-8: Preliminary Layout/Design for Becora Terminal

3.4 Facility#3: Tibar Terminal

3.4.1 Overview of Location and Strategic Importance

The Tibar Terminal is a proposed bus terminal located in the west of Dili and serves as a gateway connecting Dili and the West Region such as Maliana, Suai, Batugade (sharing the border with Indonesia), etc. The area is about 150m north of the Rotunda Tibar (roundabout) as shown in the image below. The area size is about 8,000m^2 and located on a greenfield site connected to Rua Tibar-Gleno (two-way, one lane per direction) in

south serving as the main access road. Tobar Shortcut (two-way, two lanes per direction) connects this area with the city center in Dili – constituting a major east-west corridor in the city.

Key generators around the site include several government offices, natural parks and mangrove sites, with the ocean lying at some 500m to the west. Tibar Port is located to the southwest of the site but beyond the catchment area (some 1.5km). Limited developments are observed around the site – however the Tibar area is expected to grow into a major industrial/residential hub in next decades according to the 2022 Dili Urban Master Plan.

Figure 3-9: Site Location – Tibar Terminal

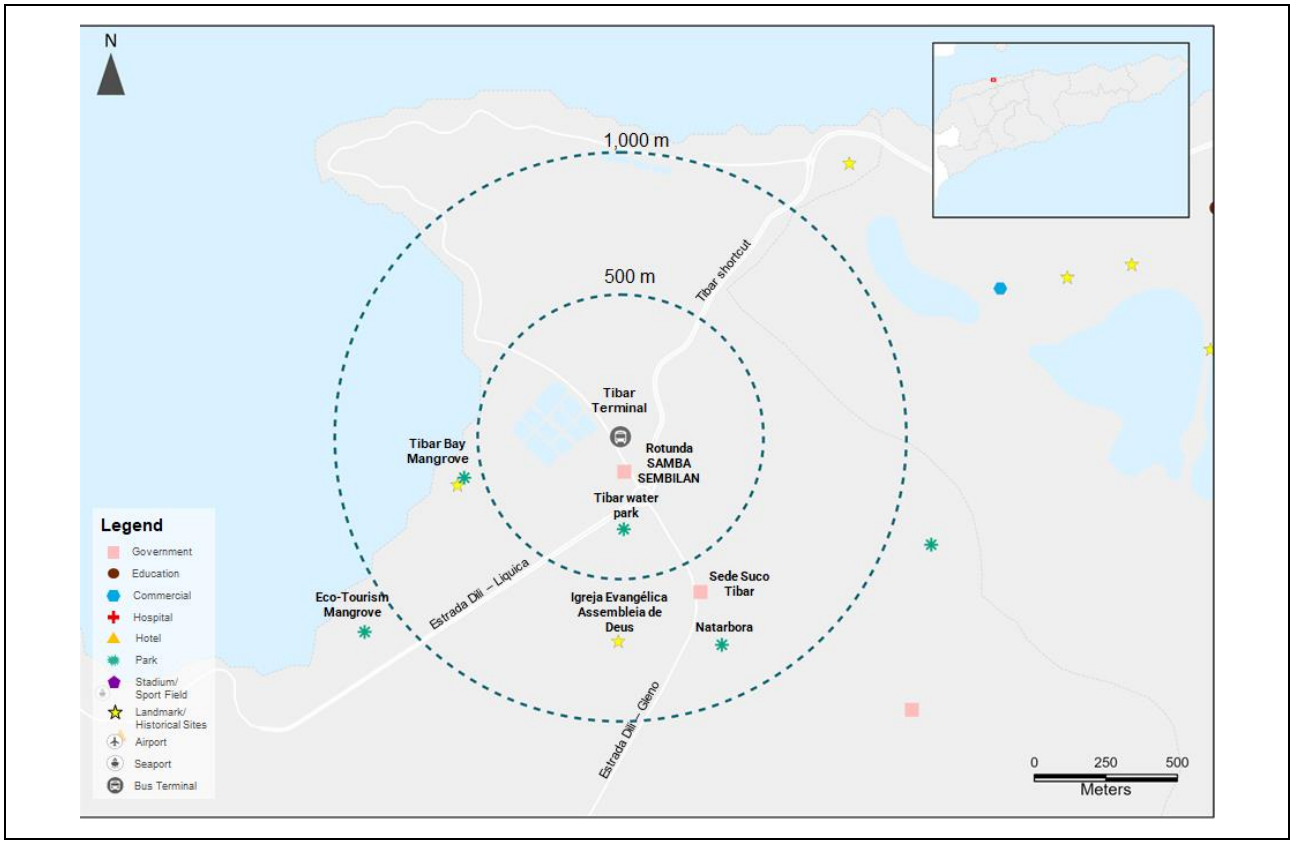


Figure 3-10: Key Generators – Tibar Terminal

3.4.2 Public Transport Services and Demand

There is no dedicated public transport facility in the west of Dili. One microlet route (Route 10) and three regional bus routes (i.e., Ermera, Liquica, and Maliana) use Tasitolu areas comprised of on-street stop and off-street open lot (without any facilities). The joint ADB/MOTC Mission team held in October 2024 agreed that given the strategic importance of this location as a future bus terminal, public transport routes serving the western part of Dili will be transferred and extended to Tibar Terminal (with necessary changes to DNTT route licensing regulations to permit route extensions). During the workshop in October 2024, DNTT requested to accommodate international transport (i.e., Indonesia) at this facility. With these assumptions in mind, existing and future microlet and regional bus services, operation, routing, and demand details are summarized below based on the key findings/results from the 2024 PTMP:[29]

[29] Existing services/demand refer to Tasitolu data as a proxy and future services/demand for Airport Transit Hub which was ultimately replaced by Tibar Terminal at the ADB/MOTC Mission in October 2024.

Table 3-6: Public Transport Services and Demand (Existing and Future) – Tibar Terminal

						Existing [A,B]			Future [A,B]		
Route #	**Origin**	**Destination**	**Vehicle Type**	**Direction**	**Distance (km)**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**
Dili Microlet											
M-10	Tasitolu Terminal	Tasitolu Terminal	Microlet	Clockwise	19.9	1	420	12,830	0.5	660	18,730
M-11	Tasitolu Terminal	Tasitolu Terminal	Microlet	Clockwise	14.6				1	610	14,630
Regional Bus											
P-4	Tasitolu Terminal	Ermera	Bus	SB/NB	46.0	12	19	470	12	21	620
P-5	Tasitolu Terminal	Liquica	Bus	WB/EB	23.1	5	56	1,970	4	70	2,690
P-7	Tasitolu Terminal	Maliana	Bus	WB/EB	132.7	20	6	310	15	8	400
International Bus [C]											
I-1	Tibar	Indonesia	Bus	WB/EB	-				60	28	840

Note:
[A] Daily round trips and demand are based on weekday data.
[B] Daily demand is based on route-level boardings which is further distributed into assumed demand for individual facility sites for revenue analysis.
[C] International bus is assumed to operate one trip/hour.

3.4.3 Existing Facilities

As noted, there is no existing facility currently. Streetview images show that the site lies on an empty, unpaved lot with no establishments identified nearby (except some utilities). Assessment of observed site conditions/issues based on the bus facility enhancement toolkit and assessment framework are summarized in **Appendix A**.

Site Overview

Rua Tibar-Gleno or Access Road (Site on Left Side)

Figure 3-11: Current Conditions / Streetview – Tibar Terminal

3.4.4 Key Routes Serving and Proposed # of Bays

As noted, this facility will be served by two microlet routes (Route 10 and Route 11), three regional bus routes, as well as international buses linking the facility with Indonesia. Based on the bay estimation process detailed in Facility Design Guidelines in 2024 PTMP, bay assignment of boarding/alighting bay and layover spaces are summarized by route in Table 3-7.[30] In total, the facility requires 45 bays comprised of 21 boarding/alighting bays (of which 14 for microlet and 7 for regional/international bus) and 24 layover spaces (of which 21 for microlet and 3 for regional/international bus).

3.4.5 Proposed Scheme and Preliminary Design

Based on the facility design principles in the Bus Facility Enhancement Toolkit, the following considerations were taken into account in developing schemes/design for this facility:

[30] Bay estimation process is presented in Section 4.6 which combines the Transit Cooperative Research Program (TCRP) approach with our optimization proposal.

- **Site Access** – The main entry/exit point is proposed in the west along Rua Tibar-Gleno connected to Rotunda Tibar (with geometric improvements required for improved access road and pedestrian access).
- **Separation of Public Transport and Private Vehicles** – Boarding/alighting zones and circulation areas are proposed to be physically separated to reduce potential incidents. Pickup/drop-off zones will be provided along the local road in the west to facilitate transfers between modes (but private vehicles are not allowed to enter the terminal).
- **Operational Considerations** – No backup maneuvers are assumed within the facility for safety purposes. Routes are assigned to specific bays with potential interchange in mind. Alighting and boarding areas are separated as well, but within a short distance for easy interchange.
- **Provision of Facilities and Passenger Amenities** – Enhanced passenger facilities will be provided for better service/travel experience (such as covered waiting areas, kiosk/retail, toilet, office) as well as access-for-all facilities (such as lighting, tactile paving, curb ramps). Furthermore, climate adaptation measures (i.e., retention pond, rainwater storage, stormwater drainage) are proposed to strengthen the resilience of the facility against climate change impacts.

Table 3-7: Bay Assignment by Route for Tibar Terminal

							# of Equivalent Bays (Based on Dwell Time Calculation)		Bay Assignment (where A = Alighting Only, B = Boarding Only, and C = Boarding/Alighting)																				
Route #	**Vehicle Type**	**Service Type**	**Termin-ating Point#1**	**Termin-ating Point#2**	**Dire cti-on**	**Trips / Hour**	**Board-ing Bays per Route (With 20% Growth)**	**Alight-ing Bays per Route (With 20% Growth)**	**Bay 1**	**Bay 2**	**Bay 3**	**Bay 4**	**Bay 5**	**Bay 6**	**Bay 7**	**Bay 8**	**Bay 9**	**Bay 10**	**Bay 11**	**Bay 12**	**Bay 13**	**Bay 14**	**Bay 15**	**Bay 16**	**Bay 17**	**Bay 18**	**Bay 19**	**Bay 20**	**Bay 21**	**Lay-over**
M-10	Microlet	Terminating Route (100% Layover at This Terminal)	Tasitolu Terminal	Tasitolu Terminal	Loop	120.0	2.88	5.76	A	A	A	A	A	A	B	B	B													19
M-11	Microlet	Terminating Routes (50% Layover at This Terminal)	Tasitolu Terminal	Tasitolu Terminal	Loop	60.0	1.44	2.88										A	A	A	B	B								2
P-4	Regional Bus	Terminating Routes (50% Layover at This Terminal)	Tasitolu Terminal	Ermera	EB/ WB	5.0	0.60	0.60															C							1
P-5	Regional Bus	Terminating Routes (50% Layover at This Terminal)	Tasitolu Terminal	Liquica	EB/ WB	17.0	2.04	2.04																A	A	B	B			1
P-7	Regional Bus	Terminating Routes (50% Layover at This Terminal)	Tasitolu Terminal	Maliana	EB/ WB	4.0	0.48	0.48																				C		0
Inter-national Bus	Regional Bus	Terminating Routes (50% Layover at This Terminal)	Tibar	Indonesia	EB/ WB	2.0	0.24	0.24																					C	1

Based on these considerations above, the preliminary layout/design for this site is depicted below. Of note:

- Public transport vehicles circulate in a clockwise direction, with all circulation being one-way to reduce chances of incidents.
- Operation facilities and passenger amenities are proposed along the perimeter of the site in the north (with retail/toilet placed close to the gate for easy access for passengers). Passenger waiting areas are split into six zones defined by routes and loading/unloading purpose.
- Layover areas for microlet are provided in the south corner of the site.
- New pedestrian crossings and sidewalks are provided to enhance passenger connectivity within and outside the facility.
- Interchange point and pickup/drop-off zones are proposed in the west along Rua Tibar-Gleno to facilitate transfers between modes.

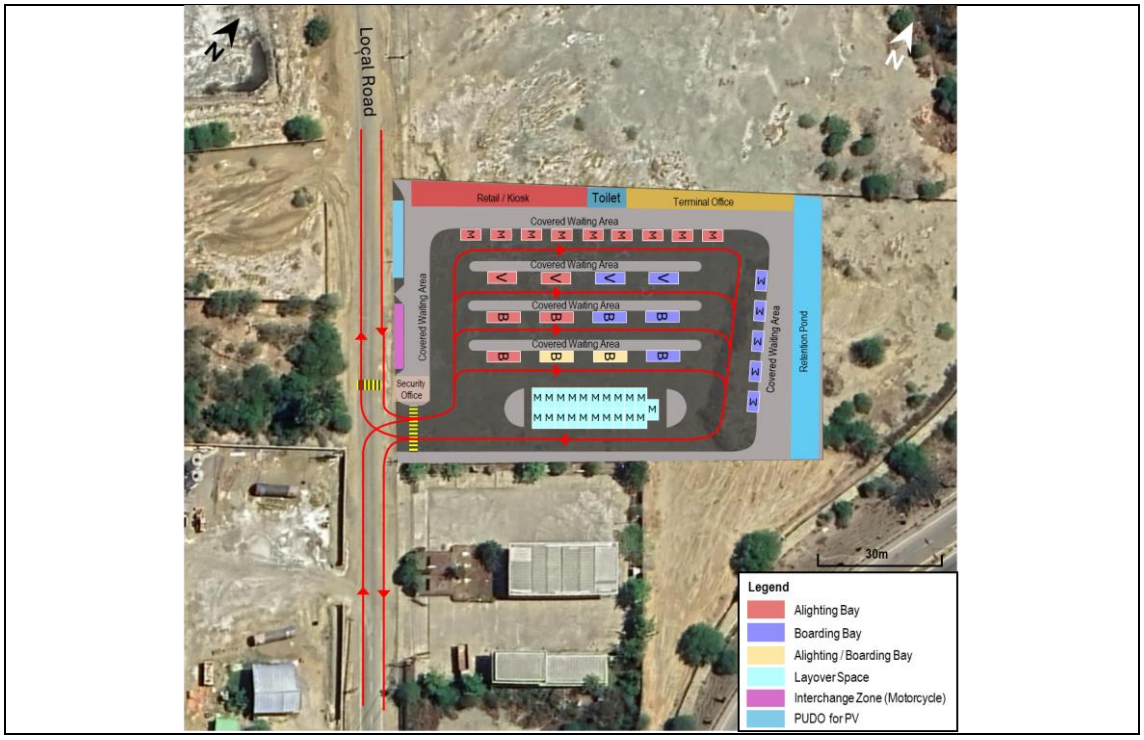


Figure 3-12: Preliminary Layout/Design for Tibar Terminal

3.5 Facility#4: Manleuana Terminal

3.5.1 Overview of Location and Strategic Importance

The Manleuana Terminal is a proposed new bus terminal located in the southeast of Dili and serves as a gateway connecting Dili and the South Region such as Aileu, Ainaro, Same, Suai, etc. The area size is about 9,600 m^2 and surrounded by a cluster of markets (i.e., Manleuana Market) in north, and residential areas / schools in east/west/south. Comoro River runs about 500m to the west of the site. The site can be accessed from three directions – with the north access road (two-way road, one lane per direction) serving as the main entry/exit for vehicles to the Manleuana Market, the east access comprised of an unpaved pedestrian pathway (with no vehicles passable), and the south access comprised of narrow gravel roads used by local vehicles and residents.

Figure 3-13: Site Location – Manleuana Terminal

Key generators around the site include Manleuana Market in north and a cluster of residential areas in south (both immediately adjacent to the site) and numerous educational institutes are located within 1.0km of the site such as primary schools, middle schools, and Dili Institute of Technology.

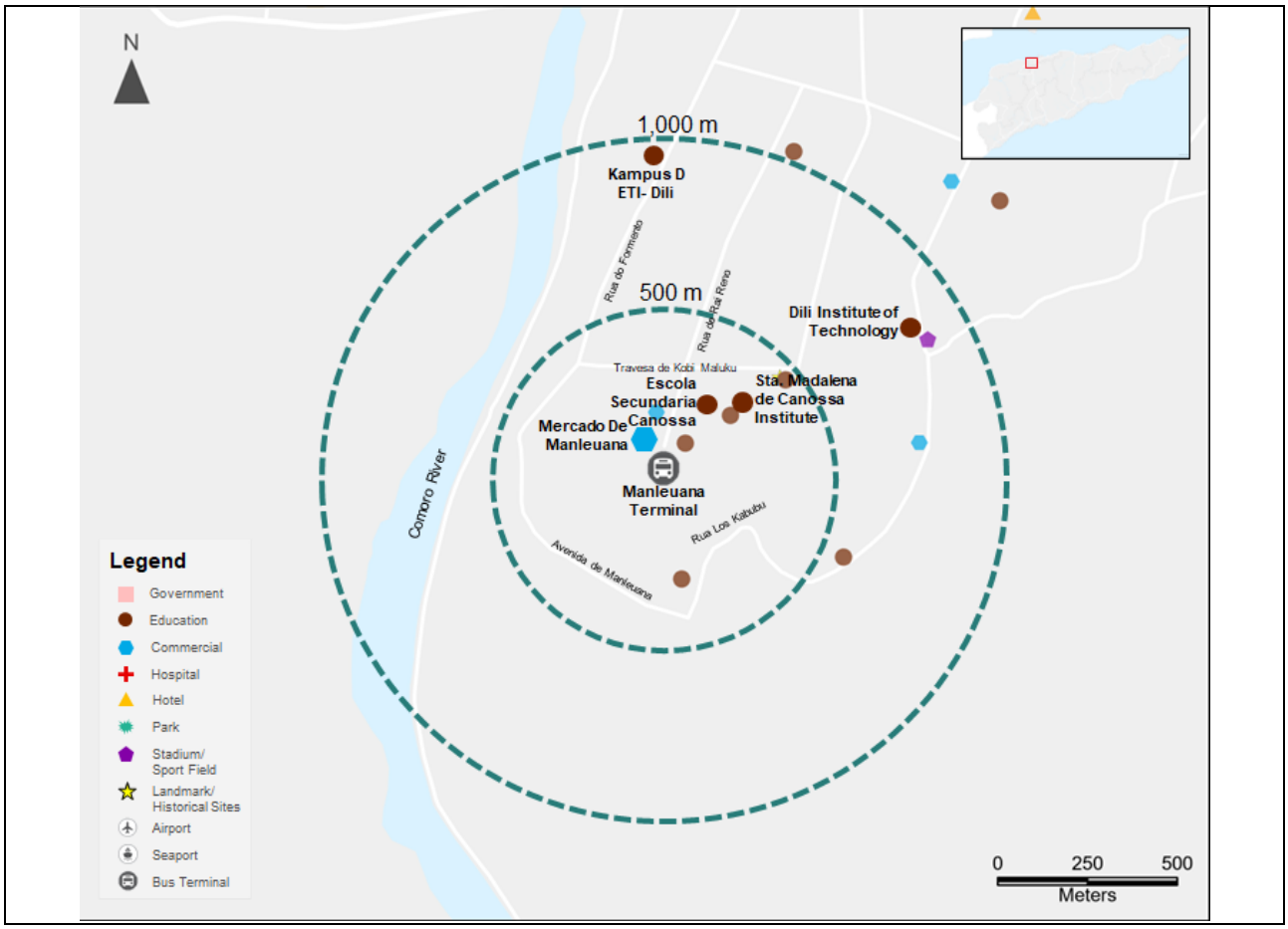


Figure 3-14: Key Generators – Manleuana Terminal

3.5.2 Public Transport Services and Demand

Currently three microlet routes (Route 3, Route 11, Route 13) serve this location as terminating routes – with loading/unloading activities taking place on the road inside the market (which is explained in the next section). Three bus routes connecting to/from municipalities in the south also access here as thru routes. In the future a total of four microlet routes and four regional bus routes are proposed to serve this facility. The existing and future microlet and regional bus services, operation, routing, and demand details are summarized below based on the key findings/results from the 2024 PTMP:

Table 3-8: Public Transport Services and Demand (Existing and Future) – Manleuana Terminal

						Existing [A, B]			Future [A, B]		
Route #	**Origin**	**Destination**	**Vehicle Type**	**Direction**	**Distance (km)**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**
Dili Microlet											
M-3	Manleuana Market	Manleuana Market	Microlet	Clockwise	16.8	2	340	11,880	1.5	470	31,510
M-5	Taibessi Terminal	Taibessi Terminal	Microlet	Clockwise	17.8	-	-	-	1.5	270	23,390
M-11	Tasitolu Terminal	Tasitolu Terminal	Microlet	Clockwise	14.6	1.5	440	11,520	1	610	14,630
M-13	Kasnafar	Kasnafar	Microlet	Clockwise	22.1	4	120	2,910	3	150	3,780
Regional Bus											
P-1	Taibessi Terminal	Aileu	Bus	SB/NB	44.3	30	4	70	20	5	80
P-2	Taibessi Terminal	Ainaro	Bus	SB/NB	109.3	60	2	40	60	2	40
P-9	Taibessi Terminal	Same	Bus	SB/NB	112.1	60	4	150	30	6	190

						Existing [A, B]			Future [A, B]		
Route #	Origin	Destination	Vehicle Type	Direction	Distance (km)	Peak Headway (Minutes)	Daily Round Trips	Daily Demand	Peak Headway (Minutes)	Daily Round Trips	Daily Demand
P-10	Taibessi Terminal	Suai	Bus	SB/NB	171.0	-	-	-	20	10	350

Note:
[A] Daily round trips and demand are based on weekday data.
[B] Daily demand is based on route-level boardings which is further distributed into assumed demand for individual facility sites for revenue analysis.

3.5.3 Existing Facilities

Current operation of microlet services at this site (Manleuana Market) is illustrated below. On-street space inside the market is used for loading/unloading with passengers waiting for microlet along the roadside (without any facilities such as covered waiting areas, benches). Microlet services are customed to use available road space at the market for layover with most vehicles observed to be parking in the north of the market. Vehicles circulate in a clockwise fashion (with entry/exit gates separated). A mix of microlet and private vehicles are observed to operate and park at the market with no demarcation of functional spaces by mode. Assessment of observed site conditions/issues based on the bus facility enhancement toolkit and assessment framework are summarized in **Appendix A**.

Note: Current operation shown above is at the Manleuana Market which is not a dedicated public transport facility (located about 100m north of the proposed site).

Figure 3-15: Current Facility Layout and Streetview – Manleuana Terminal

3.5.4 Key Routes Serving and Proposed # of Bays

As noted, this facility will be served by four microlet routes (Route 3, Route 5, Route 11, Route13) and four regional bus routes (Aileu, Ainaro, Same, Suai) in the future. All microlet routes operate as terminating routes, while regional bus routes serve as thru routes and terminate at Taibessi Terminal.

Based on the bay estimation process detailed in Facility Design Guidelines in 2024 PTMP, bay assignment of boarding/alighting bay and layover spaces are summarized by route in Table 3-9.[31] In total, the facility requires 25 bays (for microlet) comprised of 12 boarding/alighting bays and 13 layover spaces. Regional bus routes require two loading/unloading bays (as thru routes are assumed to operate with shorter alighting/boarding time compared to terminating routes and no provision for layover). Thus a total of 27 bays (14 loading/unloading bays and 13 loading spaces) are proposed at this terminal.

3.5.5 Proposed Scheme and Preliminary Design

Based on the facility design principles in the Bus Facility Enhancement Toolkit, the following considerations were taken into account in developing schemes/design for this facility:

[31] Bay estimation process is presented in Section 4.6 which combines the Transit Cooperative Research Program (TCRP) approach with our optimization proposal.

- **Site Access** – Three access road options are considered from a nearby road to the site (based on the review of existing conditions and field observations). All options involve land acquisition for access road improvements as compared in the maps below. Of these, Option 2 is a preferred option as it requires minimum land acquisition (~960m^2), while other two options will require extensive land acquisition (with Option 1: North Access Road requiring some 1,440m^2 and Option 3: South Access Road some 2,300m^2) involving existing residential areas and markets.

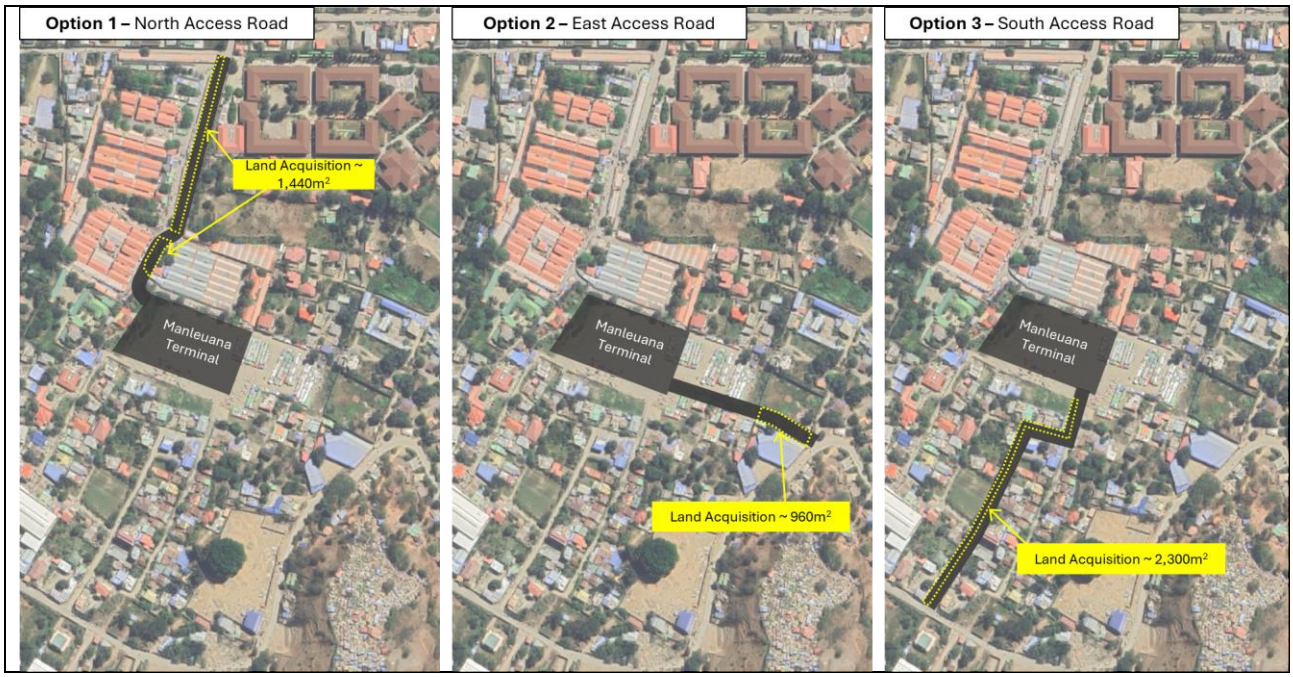


Figure 3-16: Access Road Options Around Manleuana Terminal

- **Separation of Public Transport and Private Vehicles** – Boarding/alighting zones and circulation areas are proposed to be physically separated to reduce potential incidents. Access road in the east connected to Los Kabubu will have four lane roads (with two lanes / direction) with one lane for public transport and the other for private vehicles and taxi access.

- **Operational Considerations** – No backup maneuvers are assumed within the facility for safety purposes. Routes are assigned to specific bays with potential interchange in mind. Alighting and boarding areas are separated as well, but within a short distance for easy interchange including access to taxi stand.

- **Provision of Facilities and Passenger Amenities** – Enhanced passenger facilities will be provided for better service/travel experience (such as covered waiting areas, kiosk/retail, toilet, office) as well as access-for-all facilities (such as lighting, tactile paving, curb ramps). Furthermore, climate adaptation measures (i.e., retention pond, rainwater storage, stormwater drainage) are proposed to strengthen the resilience of the facility against climate change impacts.

Table 3-9: Bay Assignment by Route for Manleuana Terminal

							# of Equivalent Bays (Based on Dwell Time Calculation)		Bay Assignment (where A = Alighting Only, B = Boarding Only, and C = Boarding/Alighting)																		
Route #	**Vehicle Type**	**Service Type**	**Terminating Point#1**	**Terminating Point#2**	**Direction**	**Trips/ Hour**	**Boarding Bays per Route (With 20% Growth)**	**Alighting Bays per Route (With 20% Growth)**	**Bay 1**	**Bay 2**	**Bay 3**	**Bay4**	**Bay 5**	**Bay 6**	**Bay 7**	**Bay 8**	**Bay 9**	**Bay 10**	**Bay 11**	**Bay 12**	**Bay 13**	**Bay14**	**Bay 15**	**Bay 16**	**Bay 17**	**Layover**
M-3	Microlet	Terminating Route (100% Layover at This Terminal)	Manleuana Market	Manleuana Market	Loop	40.0	0.96	1.92	A	A	B																6
M-5	Microlet	Terminating Routes (50% Layover at This Terminal)	Taibessi Terminal	Taibessi Terminal	Loop	40.0	0.96	1.92				A	A	B													4
M-11	Microlet	Terminating Routes (50% Layover at This Terminal)	Tasitolu Terminal	Tasitolu Terminal	Loop	60.0	1.44	2.88							A	A	A	B	B								2
M-13	Microlet	Terminating Routes (50% Layover at This Terminal)	Kasnafar	Kasnafar	Loop	20.0	0.48	0.96												A	B						1
P-1	Regional Bus	Thru	Taibessi Terminal	Aileu	NB/SB	3.0	0.09	0.09														C					0
P-2	Regional Bus	Thru	Taibessi Terminal	Ainaro	NB/SB	1.0	0.03	0.03															C				0
P-9	Regional Bus	Thru	Taibessi Terminal	Same	NB/SB	2.0	0.06	0.06																C			0
P-10	Regional Bus	Thru	Taibessi Terminal	Suai	NB/SB	3.0	0.09	0.09																	C		0

Based on these considerations above, the preliminary layout/design for this site is depicted below. Of note:

- Public transport vehicles circulate in a clockwise direction, with all circulation being one-way to reduce chances of incidents.
- Operation facilities and passenger amenities are proposed along the perimeter of the site in the north and west (with retail/toilet placed close to commercial areas and Manleuana Market). Passenger waiting areas are split into three zones defined by routes and loading/unloading purpose.
- Layover areas for microlet are provided in the north corner of the site.
- New pedestrian crossings and sidewalks are provided to enhance passenger connectivity within and outside the facility.
- Interchange point and pickup/drop-off zones are proposed outside of the facility (about 150m to the east) along Los Kabubu to facilitate transfers between modes, while minimizing congestion within the facility.

Figure 3-17: Preliminary Layout/Design for Manleuana Terminal

3.6 Facility#5: Hera Terminal

3.6.1 Overview of Location and Strategic Importance

The Hera Terminal is a proposed new terminal located in the east of Dili and serves as a gateway connecting Dili (Becora) and the East Region such as Baucau, Manatuto, Lospalos, and Viqueque. The proposed location is within the driver training institute owned by DNTT, with an estimated area size for the terminal is about 10,000 m^2 (about one third of the institute area).[32] The proposed terminal site is surrounded by R. Hera in south (two-way road, one lane per direction), a church in west, and a driving training site in east. The north of the site is green areas with some residential houses spotted.

Figure 3-18: Site Location – Hera Terminal

[32] According to the DNTT, the Korea International Cooperation Agency plans to rehabilitate the existing building to develop a multi-story multi-purpose building.

Key generators around the site include government offices (within the site), church, schools, etc. within 500m of the site with some schools scattered along the road within 1.0km of the site.

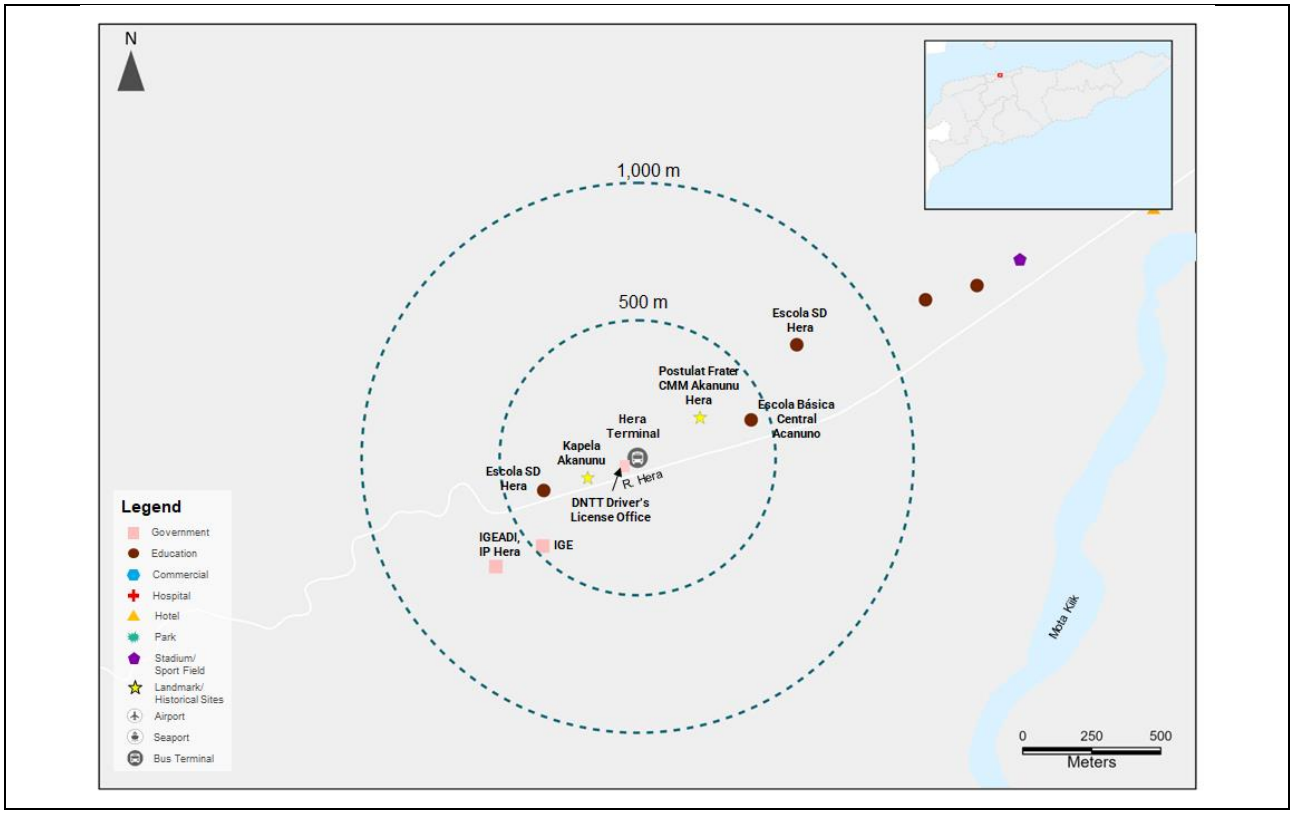


Figure 3-19: Key Generators – Hera Terminal

3.6.2 Public Transport Services and Demand

Currently no services are provided at this site as there is no facility. Four regional bus routes (Baucau, Manatuto, Lospalos, Viqueque) pass through the site as this location sits between Becora and Baucau. The existing and future microlet and regional bus services, operation, routing, and demand details are summarized below based on the key findings/results from the 2024 PTMP:

Table 3-10: Public Transport Services and Demand (Existing and Future) – Hera Terminal

						Existing [A, B]			Future [A, B]		
Route #	**Origin**	**Destination**	**Vehicle Type**	**Direction**	**Distance (km)**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**
Regional Bus											
P-3	Becora Terminal	Baucau	Bus	EB/WB	117.7	-	-	-	7.5	51	1,650
P-6	Becora Terminal	Lospalos	Bus	EB/WB	205.1	-	-	-	20	7	180
P-8	Becora Terminal	Manatuto	Bus	EB/WB	58.7	-	-	-	60	6	170
P-11	Becora Terminal	Viqueque	Bus	EB/WB	176.6	-	-	-	5	16	480
Shuttle Service [C]											
S-1	Becora Terminal	Hera Terminal	Microlet	Clockwise	15.2	-	-	-	3	240	2,460

Note:
[A] Daily round trips and demand are based on weekday data.
[B] Daily demand is based on route-level boardings which is further distributed into assumed demand for individual facility sites for revenue analysis.
[C] Operational scheme for shuttle service is assumed to be provided by existing microlet operators (such as by permitting Microlet Route 1 and Route 2 to provide extended services to Hera or allowing other operators/drivers to provide the service). This requires close coordination with relevant stakeholders including DNTT to ensure feeder services are provided prior to the opening of upgraded Becora Terminal.

3.6.3 Existing Facilities

No public transport facilities are provided at this site (as no public transport serves here). The current conditions and street view of the driving test site/office are shown in the figure below. Assessment of observed site conditions/issues based on the bus facility enhancement toolkit and assessment framework are summarized in **Appendix A**.

Site Overview

Access Road (Site on Right Side)

Driving Testing Site

Driving Test Institute and Office

Figure 3-20: Current Conditions / Streetview – Hera Terminal

3.6.4 Key Routes Serving and Proposed # of Bays

As noted, this facility will be served by four regional bus routes (Baucau, Manatuto, Lospalos, Viqueque) and shuttle services which will connect Becora Terminal and Hera Terminal in the future. All routes operate as terminating routes. Establishing this site as a major transport hub (i.e., bus terminal) in Dili is a key outcome of the ADB Mission in April 2024 in line with the MOTC's strategic decision on public transport terminal. [33]

Based on the bay estimation process detailed in Facility Design Guidelines in 2024 PTMP, bay assignment of boarding/alighting bay and layover spaces are summarized by route in Table 3-11.[34] In total, the facility requires 9 boarding/alighting bays (i.e., 7 for regional bus, 2 for shuttle) with 2 layover spaces (shuttle only).

3.6.5 Proposed Scheme and Preliminary Design

Based on the facility design principles in the Bus Facility Enhancement Toolkit, the following considerations were taken into account in developing schemes/design for this facility:

- **Middle Section Preferred for Bus Terminal** – During the site visit, two sections are considered for a future bus terminal (the east or the middle with both sites are currently used by a driving test site).
    - **Option#1 (Bus Terminal in East with Driving Test Site in Middle)** – This option proposes building a bus terminal in the east corner of the site, with a driving test site adjacent to the existing building (which will be refurbished and repurposed as a multi-function building with terminal offices). In this site arrangement, passengers would be required to walk some 150m passing through the driving site – which poses grave safety concerns and inconvenient for passengers. This option is therefore not recommended.
    - **Option#2 (Bus Terminal in Middle with Driving Test Site in East)** – In contrary, this option proposes building a bus terminal adjacent to the existing building and passengers would benefit from convenient and direct access to terminal facilities (once refurbished). Furthermore, passengers are not required to walk through the driving test site with minimal safety concerns. From the operational and safety point of view, this option is recommended for Hera Terminal.
- **Site Access** – The main entry/exit point is proposed in south along existing road R. Hera (with geometric improvements required for improved access road).
- **Separation of Public Transport and Private Vehicles** – Boarding/alighting zones and circulation areas are proposed to be physically separated to reduce potential incidents. Access point to the terminal in the south to/from R. Hera will be for public transport only. Private vehicle will continue

[33] ADB Timor-Leste Public Transport Project Consultation Mission held on 8-12 April 2024. Aide Memoire (Page 3).
[34] Bay estimation process is presented in Section 4.6 which combines the Transit Cooperative Research Program (TCRP) approach with our optimization proposal.

to access the site via the driver training institute with dedicated parking spaces reserved at the northwestern corner of the site.

- **Operational Considerations** – No backup maneuvers are assumed within the facility for safety purposes. Routes are assigned to specific bays with potential interchange in mind. Alighting and boarding areas are separated as well, but within a short distance for easy interchange.
- **Provision of Facilities and Passenger Amenities** – Enhanced passenger facilities will be provided for better service/travel experience (such as covered waiting areas, kiosk/retail, toilet, office) as well as access-for-all facilities (such as lighting, tactile paving, curb ramps). Furthermore, climate adaptation measures (i.e., retention pond, rainwater storage, stormwater drainage) are proposed to strengthen the resilience of the facility against climate change impacts.
- **Inspection Site** – The DNTT envisions developing this site into a multi-purpose transport facility comprised of driving training institute, public transport terminal, administrative offices, etc. As such, provision of inspection areas and light maintenance facilities is also a key component of the future facility (given that there is no maintenance site in the eastern part of Dili requiring all vehicles to travel through the city to access the maintenance site near Comoro). Inspection areas are proposed to be away from offices and passenger waiting areas to minimize negative impacts on passengers/visitors/staff and reduce incidents.

Based on these considerations above, the preliminary layout/design for this site is depicted below. Of note:

- Public transport vehicles circulate in a clockwise direction, with all circulation being one-way to reduce chances of incidents.
- Passenger facilities/amenities are proposed in the south next to pickup/drop-off zones along R. Hera (for convenient access for visitors/passengers). Passenger waiting areas are split into three zones defined by routes and loading/unloading purpose.
- Layover areas for bus/shuttle are provided at the site (with buffer space for additional layover spaces).
- New pedestrian crossings and sidewalks are provided to enhance passenger connectivity within and outside the facility.

Interchange point and pickup/drop-off zones are proposed in the south along R. Hera to facilitate transfers between modes.

Figure 3-21: Preliminary Layout/Design for Hera Terminal

Table 3-11: Bay Assignment by Route for Hera Terminal

							# of Equivalent Bays (Based on Dwell Time Calculation)		Bay Assignment (where A = Alighting Only, B = Boarding Only, and C = Boarding/Alighting)									
Route #	**Vehicle Type**	**Service Type**	**Terminating Point#1**	**Terminating Point#2**	**Direction**	**Trips/ Hour**	**Boarding Bays per Route (With 20% Growth)**	**Alighting Bays per Route (With 20% Growth)**	**Bay 1**	**Bay 2**	**Bay 3**	**Bay4**	**Bay 5**	**Bay 6**	**Bay 7**	**Bay 8**	**Bay 9**	**Lay-over**
P-3	Regional Bus	Terminating Routes (50% Layover at This Terminal)	Becora Terminal	Baucau	EB/WB	8.0	0.96	0.96	A	B								0
P-6	Regional Bus	Terminating Routes (50% Layover at This Terminal)	Becora Terminal	Lospalos	EB/WB	3.0	0.36	0.36			C							0
P-8	Regional Bus	Terminating Routes (50% Layover at This Terminal)	Becora Terminal	Manatuto	EB/WB	1.0	0.12	0.12				C						0
P-11	Regional Bus	Terminating Routes (50% Layover at This Terminal)	Becora Terminal	Viqueque	EB/WB	11.0	1.32	1.32					A	B	B			0
S-1	Microlet	Terminating Route (100% Layover at This Terminal)	Becora Terminal	Hera Terminal	EB/WB	20.0	0.48	0.96								A	B	2

3.7 Facility#6: Aldeia Samalakuliba Terminal (Baucau)

3.7.1 Overview of Location and Strategic Importance

The Aldeia Samalakuliba Terminal is a proposed bus terminal located in the west of Baucau, the second largest city in Timor-Leste (with the proposed site located about 1.5km to the west from the city center). This location serves as a gateway to several regions including Dili to the west, Lospalos to the east, and Viqueque to the south. The area size is about 11,600m^2 with limited developments surrounding the site (except the government building located next to the site). Access road is unpaved which is connected to Ave. Vicente do Reis Bieky Sahe which links to the city center. This site is proposed as a future bus terminal in the 2024 PTMP as the current bus terminal in city center will be re-purposed and re-developed into a sports venue in the future – thus all transport services, operation functions, and terminal facilities need to be transferred to this new site in the future.

Figure 3-22: Site Location – Aldeia Samalakuliba Terminal

A few key generators exist around the site include government properties and warehouse within a 500m buffer and a newly built market and several schools within 1 km catchment areas.

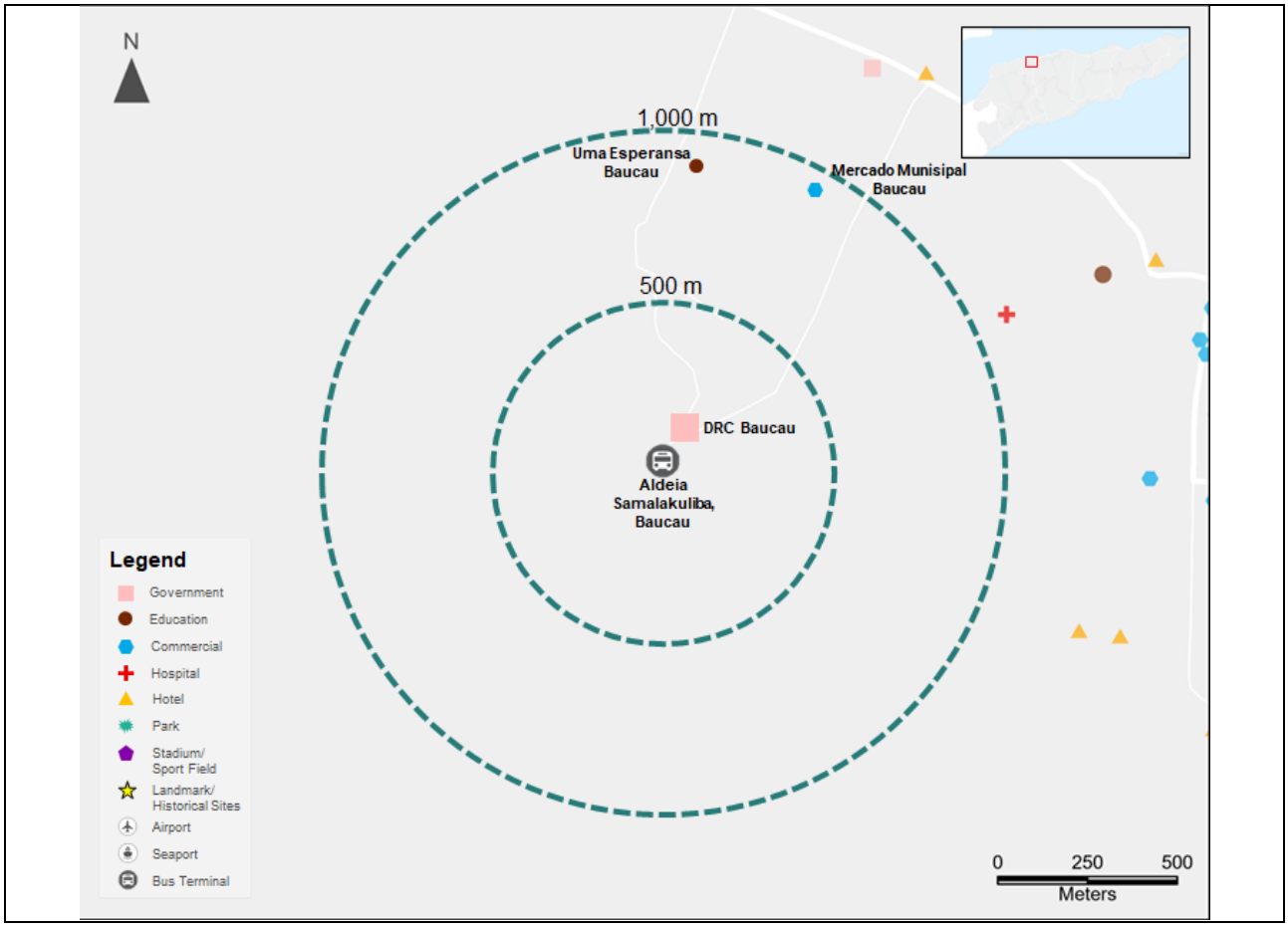


Figure 3-23: Key Generators – Aldeia Samalakuliba Terminal

3.7.2 Public Transport Services and Demand

Given that no public transport routes serve this location, the existing bus terminal (Baucau Terminal) is used as a proxy for service/demand analysis as well as to develop schemes/design for the future bus terminal. The

existing and future microlet and regional bus services, operation, routing, and demand details are summarized below based on the key findings/results from the 2024 PTMP:

Table 3-12: Public Transport Services and Demand (Existing and Future) – Aldeia Samalakuliba Terminal

						Existing [A, B]			Future [A, B]		
Route #	**Origin**	**Destination**	**Vehicle Type**	**Direction**	**Distance (km)**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**
Regional Bus											
P-3	Becora Terminal	Baucau Terminal	Bus	EB/WB	117.7	10	39	1,220	7.5	51	1,650
P-6	Becora Terminal	Lospalos	Bus	EB/WB	205.1	-	-	-	20	7	180
P-11	Becora Terminal	Viqueque	Bus	EB/WB	176.6	-	-	-	5	16	480

Note:
[A] Daily round trips and demand are based on weekday data.
[B] Daily demand is based on route-level boardings which is further distributed into assumed demand for individual facility sites for revenue analysis.

3.7.3 Existing Facilities

As noted, there is no existing facility at Aldeia Samalakuliba Terminal with the proposed site lying on an empty, unpaved lot with no establishments identified nearby (except government building nearby). Streetview of the existing Baucau Terminal are shown below for reference. Assessment of observed site conditions/issues based on the bus facility enhancement toolkit and assessment framework are summarized in **Appendix A**.

Figure 3-24: Streetview of Existing Baucau Terminal (Reference Only)

3.7.4 Key Routes Serving and Proposed # of Bays

As noted, this facility will be served by three regional bus routes (Dili, Lospalos, and Viqueque) and local microlet services. Based on the bay estimation process detailed in Facility Design Guidelines in 2024 PTMP, bay assignment of boarding/alighting bay and layover spaces are summarized by route in Table 3-13.[35] In total, it is assumed that the facility requires 3 loading/unloading bays without layover (for regional bus routes). Furthermore, additional loading/unloading areas for local microlet services will be provided to cater for local travel needs.

3.7.5 Proposed Scheme and Preliminary Design

Based on the facility design principles in the Bus Facility Enhancement Toolkit, the following considerations were taken into account in developing schemes/design for this facility:

- **Site Access** – The main entry/exit point is proposed in east along a proposed local road connected to Ave. Vicente do Reis Bieky Sahe (with geometric improvements required for improved access road).
- **Separation of Public Transport and Private Vehicles** – Boarding/alighting zones and circulation areas are proposed to be physically separated to reduce potential incidents.

[35] Bay estimation process is presented in Section 4.6 which combines the Transit Cooperative Research Program (TCRP) approach with our optimization proposal.

- **Operational Considerations** – No backup maneuvers are assumed within the facility for safety purposes. Routes are assigned to specific bays with potential interchange in mind. Alighting and boarding areas are separated as well, but within a short distance for easy interchange.
- **Provision of Facilities and Passenger Amenities** – Enhanced passenger facilities will be provided for better service/travel experience (such as covered waiting areas, kiosk/retail, toilet, office) as well as access-for-all facilities (such as lighting, tactile paving, curb ramps). Furthermore, climate adaptation measures (i.e., retention pond, rainwater storage, stormwater drainage) are proposed to strengthen the resilience of the facility against climate change impacts.

Based on these considerations above, the preliminary layout/design for this site is depicted below. Of note:

- Public transport vehicles circulate in a clockwise direction, with all circulation being one-way to reduce chances of incidents.
- Operation facilities and passenger amenities are proposed along the perimeter of the site in the south (with retail/toilet placed close to the gate for easy access).
- Sufficient buffer space is provided to account for loading/unloading areas for local microlet services as well as additional layover spared required.
- New pedestrian crossings and sidewalks are provided to enhance passenger connectivity within and outside the facility.
- Interchange point and pickup/drop-off zones are proposed along the local road in the south.

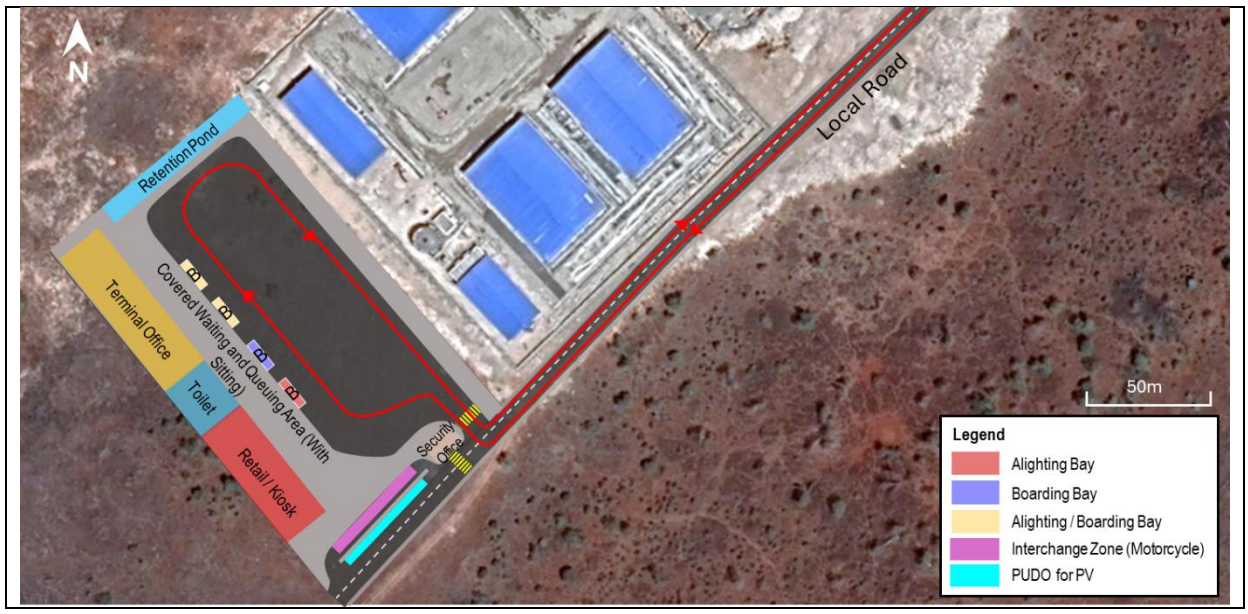


Figure 3-25: Preliminary Layout/Design for Aldeia Samalakuliba Terminal

Table 3-13: Bay Assignment by Route for Aldeia Samalakuliba Terminal

							# of Equivalent Bays (Based on Dwell Time Calculation)		Bay Assignment (where A = Alighting Only, B = Boarding Only, and C = Boarding/Alighting)			
Route #	**Vehicle Type**	**Service Type**	**Terminating Point#1**	**Terminating Point#2**	**Direction**	**Trips/ Hour**	**Boarding Bays per Route (With 20% Growth)**	**Alighting Bays per Route (With 20% Growth)**	**Bay 1**	**Bay4**	**Bay 7**	**Layover**
P-3	Regional Bus	Terminating Routes (50% Layover at This Terminal)	Becora Terminal	Baucau Terminal	EB/WB	8.0	0.96	0.96	A	B		0
P-6	Regional Bus	Thru	Becora Terminal	Lospalos	EB/WB	3.0	0.09	0.09			C	0
P-11	Regional Bus	Thru	Becora Terminal	Viqueque	EB/WB	11.0	0.33	0.33			C	0

3.8 Facility#7: Maliana Market

3.8.1 Overview of Location and Strategic Importance

The Maliana Market is a terminating location in the western end of Timor-Leste. An on-street interchange is proposed utilizing on-street space near the market next to a major local road running through the city (two-way road, one lane per direction).

Key generators around the site include commercial properties, hospitals, sports field and government offices (within 500m of the site) and several schools and commercial sites located along major roads connected to the site (within 1.0km of the site).

Figure 3-26: Site Location – Maliana Market

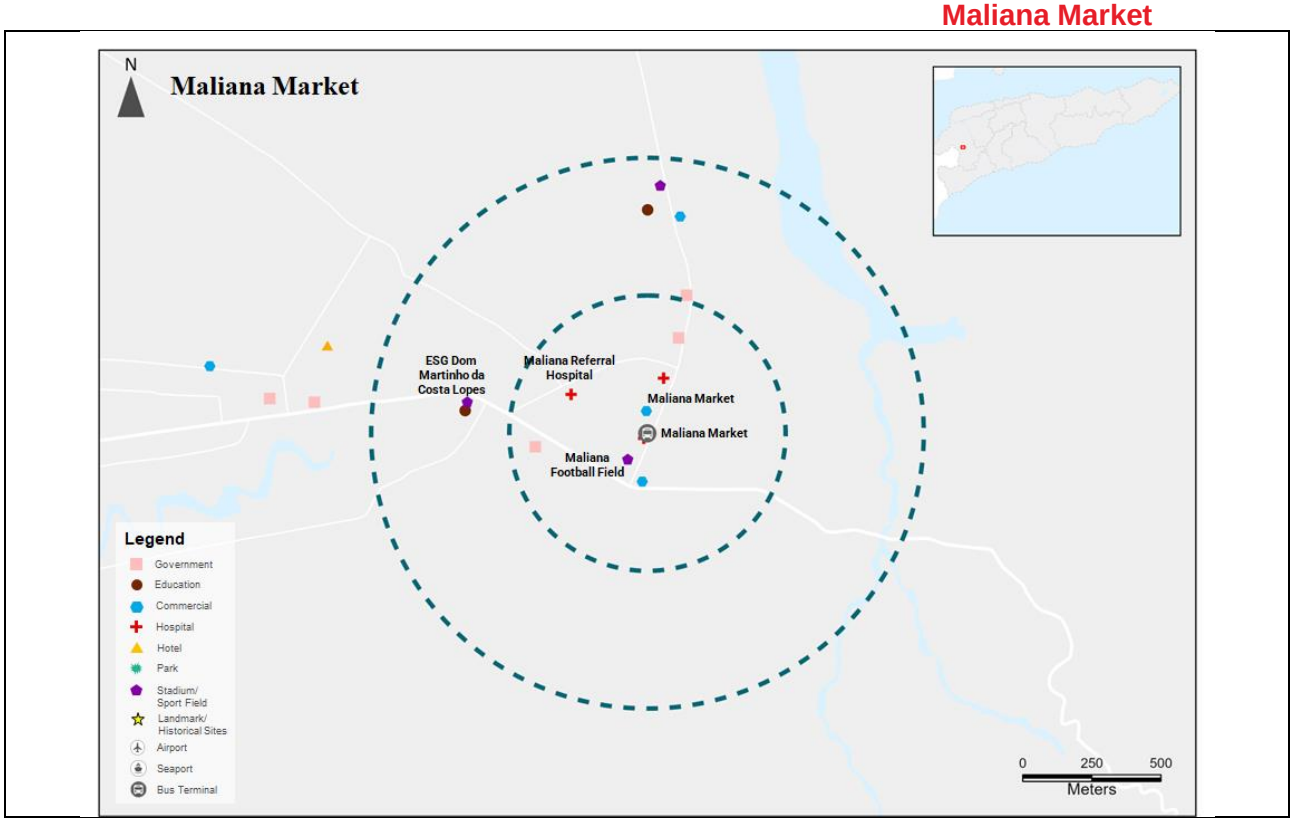


Figure 3-27: Key Generator – Maliana Market

3.8.2 Public Transport Services and Demand

Regional Bus Route 7 connect Maliana to Dili. The existing and future regional bus services, operation, routing, and demand details are summarized below based on the key findings/results from the 2024 PTMP.

Table 3-14: Public Transport Services and Demand (Existing and Future) – Maliana Market

						Existing [A, B]			Future [A, B]		
Route #	Origin	Destination	Vehicle Type	Direction	Distance (km)	Peak Headway (Minutes)	Daily Round Trips	Daily Demand	Peak Headway (Minutes)	Daily Round Trips	Daily Demand
Regional Bus											
P-7	Tasitolu Terminal	Maliana	Bus	WB/EB	132.7	20	6	310	15	8	400

Note:
[A] Daily round trips and demand are based on weekday data.
[B] Daily demand is based on route-level boardings which is further distributed into assumed demand for individual facility sites for revenue analysis.

3.8.3 Existing Facilities

As noted, there is no existing facility at this on-street facility. Streetview images of the proposed on-street facility are provided below for reference. Assessment of observed site conditions/issues based on the bus facility enhancement toolkit and assessment framework are summarized in **Appendix A**.

Figure 3-28: Streetview of Malian Market On-Street Interchange

3.8.4 Key Routes Serving and Proposed # of Bays

As noted, this facility is proposed as an on-street interchange and served by one regional route and assumed local microlet service. Based on the bay estimation process detailed in Facility Design Guidelines in 2024 PTMP, bay assignment of boarding/alighting bay and layover spaces are summarized by route in Table 3-15.[36] In total, it is assumed that the facility requires 2 bays comprised of 1 loading/unloading bay for reginal bus and 1 loading/unloading bay for local microlet (for interchange opportunities).

Table 3-15: Bay Assignment by Route for Maliana Market

							# of Equivalent Bays (Based on Dwell Time Calculation)		Bay Assignment (where A = Alighting Only, B = Boarding Only, and C = Boarding/Alighting)		
Route #	**Vehicle Type**	**Service Type**	**Terminating Point#1**	**Terminating Point#2**	**Direction**	**Trips/ Hour**	**Boarding Bays per Route (With 20% Growth)**	**Alighting Bays per Route (With 20% Growth)**	**Bay 1**	**Bay 2**	**Lay-over**
P-7	Regional Bus	Terminating Routes (50% Layover at This Terminal)	Tibar Terminal	Maliana	EB/WB	4.0	0.48	0.48	C		0
-	Microlet	Assumed Terminating	Within Maliana City	Within Maliana City	-	-	-	-		C	0

3.8.5 Proposed Scheme and Preliminary Design

Based on the facility design principles in the Bus Facility Enhancement Toolkit, the following considerations were taken into account in developing schemes/design for this facility:

- **Site Access to Curbside Space –** The site has sufficient curbside space accommodating the required number of bays estimated above by route.
- **ROW and Sidewalk Constraints –** Sidewalks are relatively narrow without provision for access-for-all facilities. Creating a safe and connected walk environment to access the site is essential to the success of this scheme.

Based on these considerations above, the proposed preliminary design for this on-street interchange is depicted below. Of note:

[36] Bay estimation process is presented in Section 4.6 which combines the Transit Cooperative Research Program (TCRP) approach with our optimization proposal.

- Two boarding/alighting bays are proposed on the curbside lane (currently used for parking spaces) which will have enhanced passenger facilities such as shelter.
- Improved crosswalks, signages and markings are proposed to provide a safe crossing environment for pedestrians and passengers.

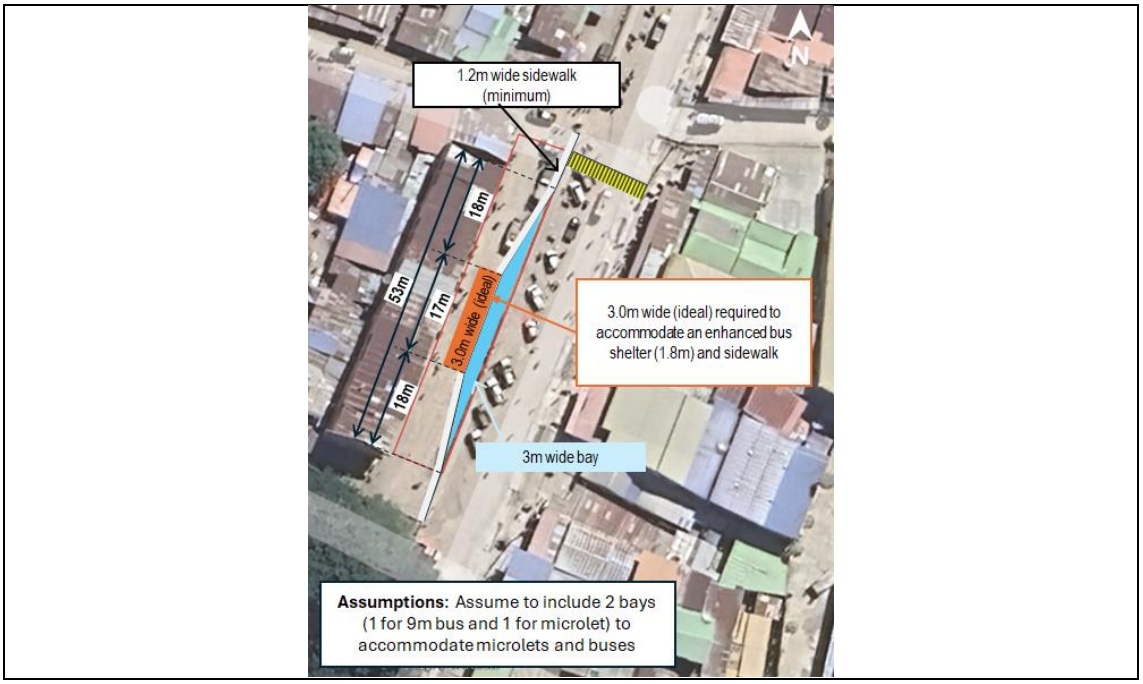


Figure 3-29: Preliminary Layout/Design for Maliana Market

3.9 Facility#8: Suai Market

3.9.1 Overview of Location and Strategic Importance

The Suai Market is a terminating location in the southwest of Timor-Leste. An on-street interchange is proposed utilizing on-street space near the market next to a north-south local road running through the city (two-way road, one lane per direction).

Key generators around the site include commercial properties, hospitals, sports field and government offices (within 500 m of the site) and government buildings located along major roads connected to the site (within 1.0 km of the site).

Figure 3-30: Site Location – Suai Market

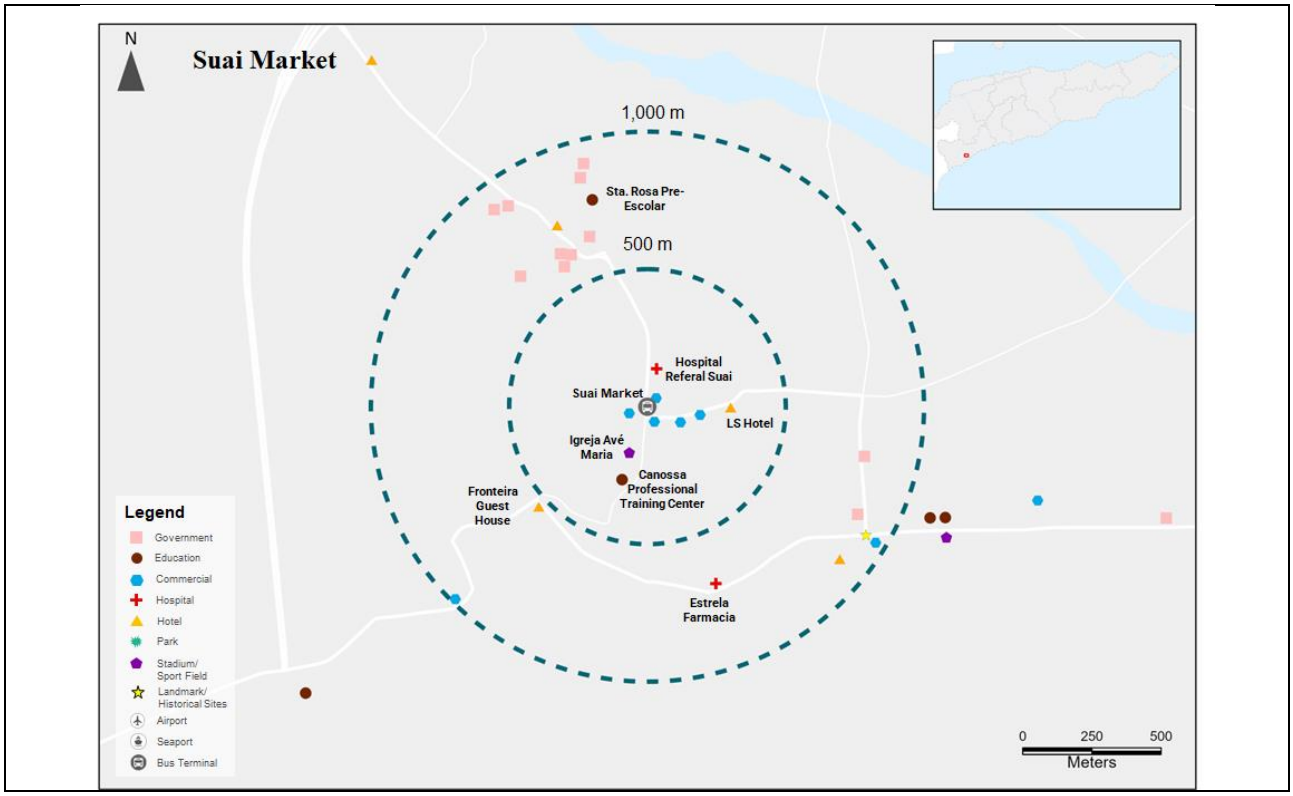


Figure 3-31: Key Generators – Suai Market

3.9.2 Public Transport Services and Demand

Regional Bus Route 10 connect Suai to Dili. The existing and future regional bus services, operation, routing, and demand details are summarized below based on the key findings/results from the 2024 PTMP.

Table 3-16: Public Transport Services and Demand (Existing and Future) – Suai Market

						Existing [A, B]			Future [A, B]		
Route #	**Origin**	**Destination**	**Vehicle Type**	**Direction**	**Distance (km)**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**
Regional Bus											
P-10	Taibessi Terminal	Suai	Bus	SB/NB	171.0	20	10	290	20	10	350

Note:
[A] Daily round trips and demand are based on weekday data.
[B] Daily demand is based on route-level boardings which is further distributed into assumed demand for individual facility sites for revenue analysis.

3.9.3 Existing Facilities

As noted, there is no existing facility at this on-street facility. Streetview images of the proposed on-street facility are provided below for reference. Assessment of observed site conditions/issues based on the bus facility enhancement toolkit and assessment framework are summarized in **Appendix A**.

Figure 3-32: Streetview of Suai Market On-Street Interchange

3.9.4 Key Routes Serving and Proposed # of Bays

As noted, this facility is proposed as an on-street interchange and served by one regional route and assumed local microlet service. Based on the bay estimation process detailed in Facility Design Guidelines in 2024 PTMP, bay assignment of boarding/alighting bay and layover spaces are summarized by route in Table 3-17.[37] In total, it is assumed that the facility requires 2 bays comprised of 1 loading/unloading bay for reginal bus and 1 loading/unloading bay for local microlet (for interchange opportunities).

Table 3-17: Bay Assignment by Route for Suai Market

							# of Equivalent Bays (Based on Dwell Time Calculation)		Bay Assignment (where A = Alighting Only, B = Boarding Only, and C = Boarding/Alighting)		
Route #	**Vehicle Type**	**Service Type**	**Terminating Point#1**	**Terminating Point#2**	**Direction**	**Trips/ Hour**	**Boarding Bays per Route (With 20% Growth)**	**Alighting Bays per Route (With 20% Growth)**	**Bay 1**	**Bay 2**	**Lay-over**
P-10	Regional Bus	Terminating Routes (50% Layover at This Terminal)	Taibessi Terminal	Suai	EB/WB	3.0	0.36	0.36	C		0
-	Microlet	Assumed Terminating	Within Suai City	Within Suai City	-	-	-	-		C	0

3.9.5 Proposed Scheme and Preliminary Design

Based on the facility design principles in the Bus Facility Enhancement Toolkit, the following considerations were taken into account in developing schemes/design for this facility:

- **Site Access to Curbside Space –** The site has sufficient curbside space accommodating the required number of bays estimated above by route.
- **ROW and Sidewalk Constraints –** Sidewalks are relatively narrow without provision for access-for-all facilities. Creating a safe and connected walk environment to access the site is essential to the success of this scheme.

Based on these considerations above, the proposed preliminary design for this on-street interchange is depicted below. Of note:

- Two boarding/alighting bays are proposed on the curbside lane (currently used by local microlet for loading/unloading) which will have enhanced passenger facilities such as shelter.
- Improved crosswalks, signages and markings are proposed to provide a safe crossing environment for pedestrians and passengers.

[37] Bay estimation process is presented in Section 4.6 which combines the Transit Cooperative Research Program (TCRP) approach with our optimization proposal.

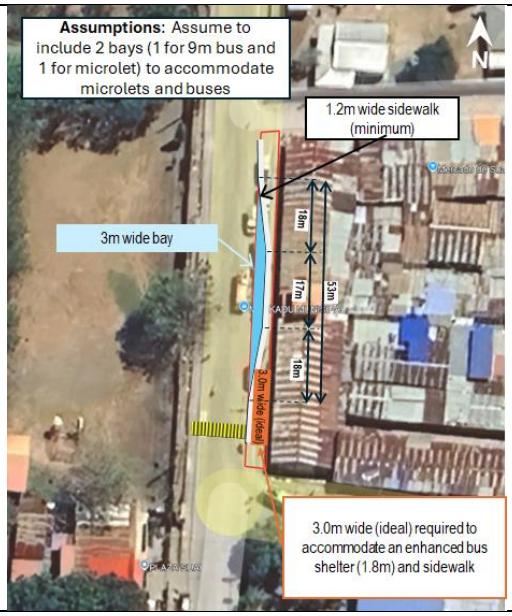


Figure 3-33: Preliminary Layout/Design for Suai Market

3.10 Facility#9: Lospalos Bemoris

3.10.1 Overview of Location and Strategic Importance

The Lospalso Bemoris is a terminating location in the eastern end of Timor-Leste. An on-street interchange is proposed utilizing on-street space near the traditional market next to an east-west major local road connected to the city (two-way road, one lane per direction).

Key generators around the site include commercial properties, hospitals, sports field and government offices (within 500m of the site) and several schools and commercial sites located along major roads connected to the site (within 1.0km of the site).

Figure 3-34: Site Location – Lospalos Bemoris

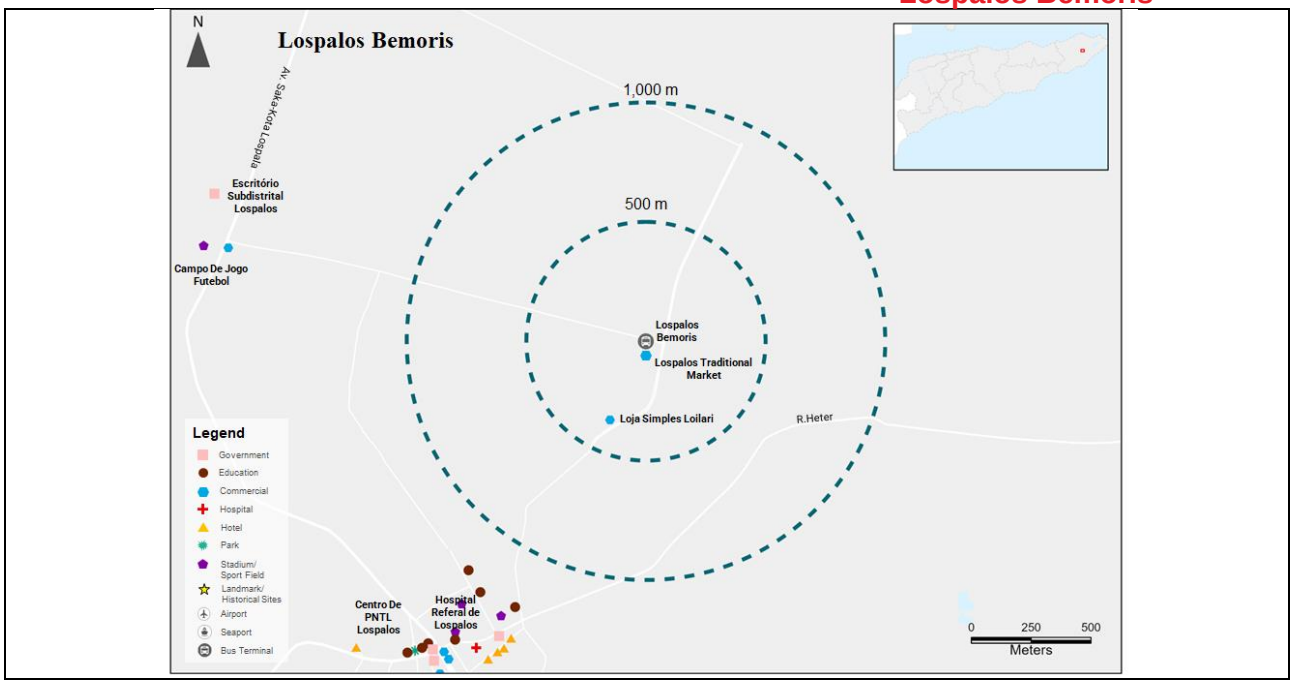


Figure 3-35: Key Generators – Lospalos Bemoris

3.10.2 Public Transport Services and Demand

Regional Bus Route 6 connect Lospalos to Dili The existing and future regional bus services, operation, routing, and demand details are summarized below based on the key findings/results from the 2024 PTMP.

Table 3-18: Public Transport Services and Demand (Existing and Future) – Lospalos Bemoris

						Existing [A, B]			Future [A, B]		
Route #	**Origin**	**Destination**	**Vehicle Type**	**Direction**	**Distance (km)**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**	**Peak Headway (Minutes)**	**Daily Round Trips**	**Daily Demand**
Regional Bus											
P-6	Becora Terminal	Lospalos	Bus	EB/WB	205.1	20	6	160	20	7	180

Note:
[A] Daily round trips and demand are based on weekday data.
[B] Daily demand is based on route-level boardings which is further distributed into assumed demand for individual facility sites for revenue analysis.

3.10.3 Existing Facilities

As noted, there is no existing facility at this on-street facility. Streetview images of the proposed on-street facility are provided below for reference. Assessment of observed site conditions/issues based on the bus facility enhancement toolkit and assessment framework are summarized in **Appendix A**.

Figure 3-36: Streetview of Lospalos Bemoris On-Street Interchange

3.10.4 Key Routes Serving and Proposed # of Bays

As noted, this facility is proposed as an on-street interchange and served by one regional route and local microlet service. Based on the bay estimation process detailed in Facility Design Guidelines in 2024 PTMP, bay assignment of boarding/alighting bay and layover spaces are summarized by route in Table 3-19.[38] In total, it is assumed that the facility requires 2 bays comprised of 1 loading/unloading bay for reginal bus and 1 loading/unloading bay for local microlet (for interchange opportunities).

Table 3-19: Bay Assignment by Route for Lospalos Bemoris

							# of Equivalent Bays (Based on Dwell Time Calculation)		Bay Assignment (where A = Alighting Only, B = Boarding Only, and C = Boarding/Alighting)		
Route #	**Vehicle Type**	**Service Type**	**Terminating Point#1**	**Terminating Point#2**	**Direction**	**Trips/ Hour**	**Boarding Bays per Route (With 20% Growth)**	**Alighting Bays per Route (With 20% Growth)**	**Bay 1**	**Bay 2**	**Lay-over**
P-6	Regional Bus	Terminating Routes (50% Layover at This Terminal)	Becora Terminal	Lospalos	EB/WB	3.0	0.36	0.36	C		0

[38] Bay estimation process is presented in Section 4.6 which combines the Transit Cooperative Research Program (TCRP) approach with our optimization proposal.

							# of Equivalent Bays (Based on Dwell Time Calculation)		Bay Assignment (where A = Alighting Only, B = Boarding Only, and C = Boarding/Alighting)		
Route #	**Vehicle Type**	**Service Type**	**Terminating Point#1**	**Terminating Point#2**	**Direction**	**Trips/ Hour**	**Boarding Bays per Route (With 20% Growth)**	**Alighting Bays per Route (With 20% Growth)**	**Bay 1**	**Bay 2**	**Lay-over**
-	Microlet	Assumed Terminating	Within Lospalos City	Within Lospalos City	-	-	-	-		C	0

3.10.5 Proposed Scheme and Preliminary Design

Based on the facility design principles in the Bus Facility Enhancement Toolkit, the following considerations were taken into account in developing schemes/design for this facility:

- **Site Access to Curbside Space –** The site has sufficient curbside space accommodating the required number of bays estimated above by route.
- **ROW and Sidewalk Constraints –** Sidewalks are relatively narrow without provision for access-for-all facilities. Creating a safe and connected walk environment to access the site is essential to the success of this scheme.

Based on these considerations above, the proposed preliminary design for this on-street interchange is depicted below. Of note:

- Two boarding/alighting bays are proposed on the curbside lane (adjacent to the market) which will have enhanced passenger facilities such as shelter.
- Improved crosswalks, signages and markings are proposed to provide a safe crossing environment for pedestrians and passengers.

Figure 3-37: Preliminary Layout/Design for Lospalos Bemoris

3.11 Facility#10: Viqueque City Center

3.11.1 Overview of Location and Strategic Importance

The Viqueque City Center is a terminating location in the southeast of Timor-Leste. An on-street interchange is proposed utilizing on-street space (between the Monumento Pancasilla and local police office) which lies at the center of the city. A local road passing through here is a two-way road, one lane per direction.

Key generators around the site include commercial properties, government offices, and schools (within 500m of the site) and several schools, government offices and hotels located in the north along major roads connected to the site (within 1.0km of the site).

Figure 3-38: Site Location – Viqueque City Center

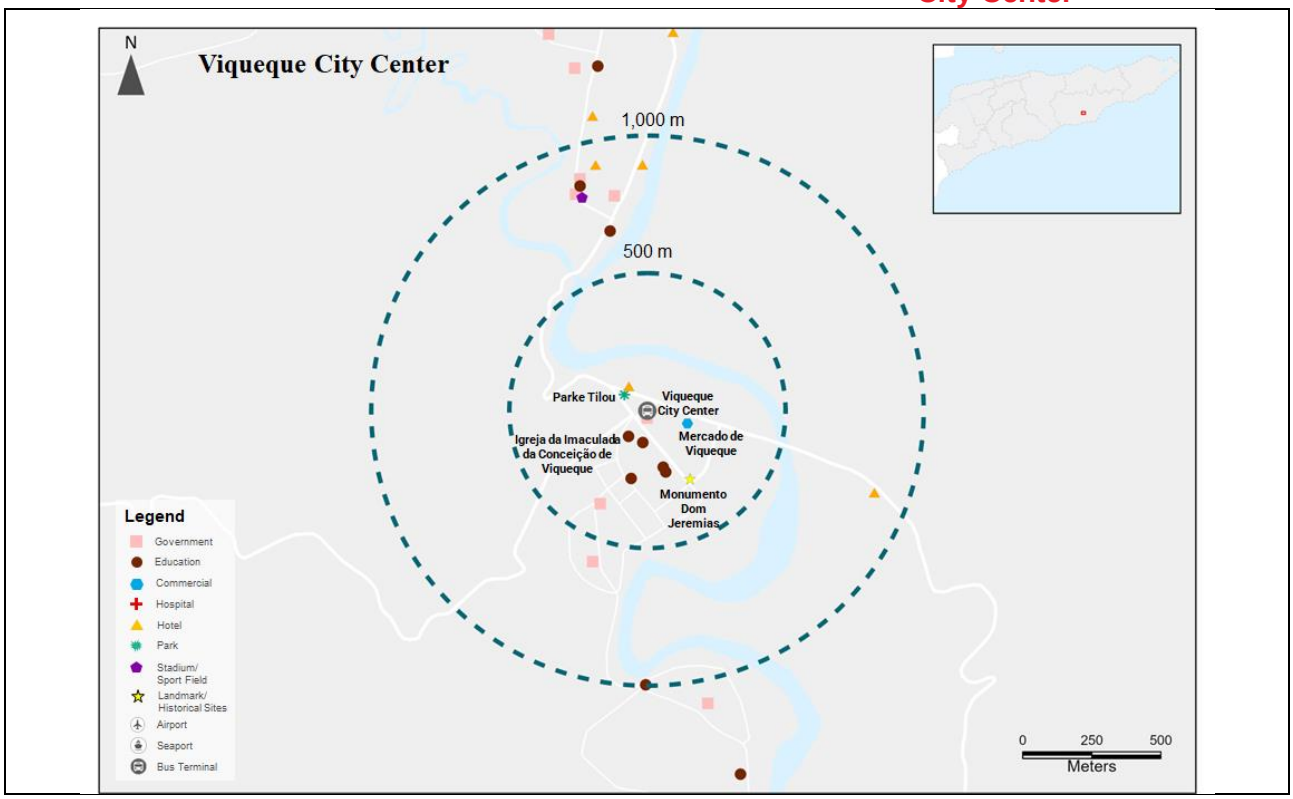


Figure 3-39: Key Generators – Viqueque City Center

3.11.2 Public Transport Services and Demand

Regional Bus Route 11 connect Viqueque to Dili. The existing and future regional bus services, operation, routing, and demand details are summarized below based on the key findings/results from the 2024 PTMP.

Table 3-20: Public Transport Services and Demand (Existing and Future) – Viqueque

						Existing [A, B]			Future [A, B]		
Route #	Origin	Destination	Vehicle Type	Direction	Distance (km)	Peak Headway (Minutes)	Daily Round Trips	Daily Demand	Peak Headway (Minutes)	Daily Round Trips	Daily Demand
Regional Bus											
P-11	Becora Terminal	Viqueque	Bus	EB/WB	176.6	7	13	380	5	16	480

Note:
[A] Daily round trips and demand are based on weekday data.
[B] Daily demand is based on route-level boardings which is further distributed into assumed demand for individual facility sites for revenue analysis.

3.11.3 Existing Facilities

As noted, there is no existing facility at this on-street facility. Streetview images of the proposed on-street facility are provided below. Assessment of observed site conditions/issues based on the bus facility enhancement toolkit and assessment framework are summarized in **Appendix A**.

Figure 3-40: Streetview of Viqueque City Center On-Street Interchange

3.11.4 Key Routes Serving and Proposed # of Bays

As noted, this facility is proposed as an on-street interchange and served by one regional route and local microlet service. Based on the bay estimation process detailed in Facility Design Guidelines in 2024 PTMP, bay assignment of boarding/alighting bay and layover spaces are summarized by route in Table 3-21.[39] In total, it is assumed that the facility requires 2 bays comprised of 1 loading/unloading bay for reginal bus and 1 loading/unloading bay for local microlet (for interchange opportunities).

Table 3-21: Bay Assignment by Route for Viqueque City Center

							# of Equivalent Bays (Based on Dwell Time Calculation)		Bay Assignment (where A = Alighting Only, B = Boarding Only, and C = Boarding/Alighting)			
Route #	**Vehicle Type**	**Service Type**	**Terminating Point#1**	**Terminating Point#2**	**Dir-ection**	**Trips/ Hour**	**Boarding Bays per Route (With 20% Growth)**	**Alighting Bays per Route (With 20% Growth)**	**Bay 1**	**Bay 2**	**Bay 3**	**Lay-over**
P-11	Regional Bus	Terminating Routes (50% Layover at This Terminal)	Becora Terminal	Viqueque	EB/WB	11.0	1.32	1.32	A	B	B	0
-	Microlet	Assumed Terminating	Within Viqueque City	Within Viqueque City	-	-	-	-	-	-	C	0

3.11.5 Proposed Scheme and Preliminary Design

Based on the facility design principles in the Bus Facility Enhancement Toolkit, the following considerations were taken into account in developing schemes/design for this facility:

- **Site Access to Curbside Space –** The site has sufficient curbside space accommodating the required number of bays estimated above by route.
- **ROW and Sidewalk Constraints –** Sidewalks are relatively narrow without provision for access-for-all facilities. Creating a safe and connected walk environment to access the site is essential to the success of this scheme.

Based on these considerations above, the proposed preliminary design for this on-street interchange is depicted below. Of note:

- Two boarding/alighting bays are proposed on the curbside lane which will have enhanced passenger facilities such as shelter.

[39] Bay estimation process is presented in Section 4.6 which combines the Transit Cooperative Research Program (TCRP) approach with our optimization proposal.

- Improved crosswalks, signages and markings are proposed to provide a safe crossing environment for pedestrians and passengers.

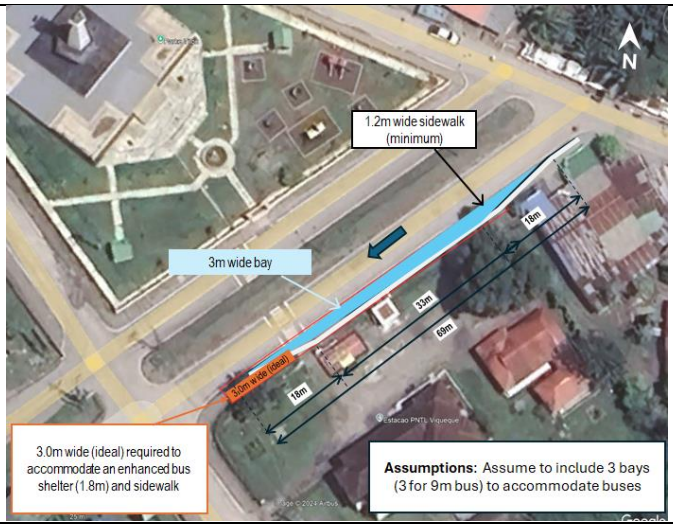


Figure 3-41: Preliminary Layout/Design for Viqueque City Center

4. Updated Cost Estimates & Revenues

This section presents indicative order-of-magnitude capital costs as well as O&M costs for the selected bus terminals and on-street interchanges based on Timor-Leste and international benchmarks, which are localized to Timor-Leste. In addition, revenues schemes are presented in this section with estimation of annual revenue and 30-year projection as potential revenues for bus terminal operation.

4.1 Indicative Capital Costs

Capital costs for bus facilities (i.e., bus terminals, on-street interchanges) include various passenger facilities and amenities defined as follows:

- **Bus Terminal** – includes terminal facility roof, concrete bus bays (assumed for a 9m bus to accommodate actual buses), drop-off areas, parking areas, waiting and queuing areas (with seating), pavement markings, wayfinding signages, ticket and fare collection booth, retail and kiosk, security office, operation office, administration office, air conditioning (inside the offices), fans at waiting areas, toilets, lighting, tactile paving, circulation areas, utility removal and relocation, as well as other additional works (including site formation, utility connections+, drainage, mechanical and electrical works). Besides bus facilities, innovative measures (such as ITS) and climate adaptation measures (i.e., retention pond, rainwater storage, stormwater drainage, solar panel) are also proposed to future proof facilities and create an innovative and attractive bus terminal for Timorese.

- **On-Street Interchange** – includes bus shelter (enhanced 6m shelter), concrete bus bays (assumed for a 9m bus), sidewalk improvement, streetlights, trees, utility poles, tactile paving, signage, additional sidewalk improvement on each side of bus stop (to improve access to bus stops), as well as other additional works (including site cleaning, drainage, etc.). Similarly, climate adaptation measures (i.e., stormwater drainage, solar panel) are proposed to future proof facilities against climate change events.

Indicative cost estimates for the selected ten bus facilities with unit cost of each element and assumptions are presented in the table below. The size of each facility site is informed by the facility schemes and preliminary design from **Section 3.2** to **Section 3.11**. Key findings are as follows:

- The total capital cost for all ten facility sites is about US$16.72 million (including bus facilities at terminal/on-street interchange, ITS elements, climate resilient facilities, and 20% contingency). Of the selected ten sites, Tibar Terminal is the most expensive site accounting for about US$5.0 million (29.9%), followed by Hera Terminal at US$3.5 million (20.9%), Manleuana Terminal at US$3.3 million (19.7%), Becora Terminal at US$2.3 million (13.8%), and Aldeia Samalakuliba Terminal at US$1.9 million (11.4%).

- On-street interchange sites are less expensive items with Dili Convention Center accounting for US$0.2 million (1.2%) and other four regional sites including Maliana, Suai, Lospalos and Viqueque each accounting for some 0.1 million (0.8%) of the total capital cost estimates.

Table 4-1: Indicative Capital Cost Estimates

	#	1	2	3	4	5	6	7	8	9	10	
	Site	**Dili Convention Center**	**Becora Terminal**	**Tibar Terminal**	**Manleuana Terminal**	**Hera Terminal**	**Aldeia Samalakuliba Terminal**	**Maliana Market**	**Suai Market**	**Lospalos Bemoris**	**Viqueque City Center**	
	Facility Type	**On-Street Interchange**	**Bus Terminal**	**Bus Terminal**	**Bus Terminal**	**Bus Terminal**	**Bus Terminal**	**On-Street Interchange**	**On-Street Interchange**	**On-Street Interchange**	**On-Street Interchange**	**Total**
	Cost Item	**USD**	**USD**	**USD**	**USD**	**USD**	**USD**	**USD**	**USD**	**USD**	**USD**	**USD**
1	Bus Facilities at Terminal	0	1,436,989	3,115,130	2,012,282	1,797,619	1,081,650	0	0	0	0	9,443,670
2	ITS at Terminal	0	249,398	596,260	380,524	398,058	202,900	0	0	0	0	1,827,140
3	Climate Resilient Facilities at Terminal	0	184,700	414,300	330,600	641,700	284,300	0	0	0	0	1,855,600
4	Bus Facilities at On-Street Interchange	94,333	0	0	0	0	0	58,907	58,907	58,907	58,907	329,961
5	ITS at On-Street Interchange	0	0	0	0	0	0	0	0	0	0	0
6	Climate Resilient Facilities at On-Street Interchange	64,100	0	0	0	0	0	41,600	41,600	41,600	41,600	230,500
7	Contingency (20%)	31,687	374,217	825,138	544,681	567,475	313,770	20,101	20,101	20,101	20,101	2,737,374
Gran Total		**190,120**	**2,245,304**	**4,950,828**	**3,268,087**	**3,404,852**	**1,882,620**	**120,608**	**120,608**	**120,608**	**120,608**	**16,424,245**
Gran Total (Rounded to Nearest Hundred)		**200,000**	**2,300,000**	**5,000,000**	**3,300,000**	**3,500,000**	**1,900,000**	**130,000**	**130,000**	**130,000**	**130,000**	**16,720,000**

4.2 Indicative Annualized O&M Costs

Annualized O&M cost estimates for bus facilities (i.e., bus terminals and on-street interchanges) comprise of various elements including bus infrastructure O&M, ITS O&M, and other direct operating expenses (facility operation/management costs), and personnel cost. Key assumptions on O&M are summarized as follows:

Table 4-2: O&M Cost Assumptions

#	Component	Assumptions
1	Bus Facilities O&M	• Bus facilities include bus terminal, shelter, bays, terminal operation offices, passenger waiting areas, etc. • Assumed to be 2% of capita cost
2	ITS O&M	• Assumed to be 2% of capital cost of ITS
3	Climate Resilient Facilities O&M	• Climate resilient facilities include retention pond, drainage, stormwater system, solar panel, etc. • Assumed to be 2% of capital cost
4	Other Direct Operating Expenses	• Other direct operating cost includes miscellaneous cost such as management, utility bills, etc. • Assumed to be 5% of the total OPEX cost of bus facilities, ITS, and climate resilient facilities.
5	Personnel	• Personnel cost is related to the size of facilities and number of bays provided at the facility as well as provision of offices. • Assumed staff includes operation, technical maintenance, administrative, and management.

Total O&M cost estimates by component are summarized in the table below. Of note, the total annualized O&M cost is about US$0.63 million, with personnel cost accounting for US$0.3 million (53.1%), followed by bus facilities O&M at about US$0.2 million (31.0%), climate resilient facilities at about US$0.04 million (6.6%), ITS O&M at about US$0.04 (5.8%), and other direct operating expenses at US$0.1 million (2.2%).

Table 4-3: Annualized O&M Costs

#	Component	Annualized Cost (US$)	Breakdown (%)	Notes
1	Bus Facilities O&M	195,473	31.2%	Assumed to be 2% of capital cost
2	ITS O&M	36,543	5.8%	Assumed to be 2% of capital cost
3	Climate Resilient Facilities O&M	41,722	6.7%	Assumed to be 2% of capital cost
4	Other Direct Operating Expenses	13,687	2.2%	Assumed to be 5% of OPEX cost of bus facilities, ITS, and climate resilient facilities
5	Personnel	334,560	54.1%	Estimated number of staff required for operation and management of bus facilities. See Appendix D for build-up cost estimates
Total Annual O&M Cost (US$)		**621,984**	**100.0%**	
Total Annual O&M Cost (US$)		**630,000**	**-**	

4.3 Revenues Analysis

Four revenue streams are considered to estimate potential revenues for terminal operations in the future – these include farebox revenues, commercial space rental, advertisement (on panel of bus facilities), and on-street parking. Key assumptions for each revenue scheme are summarized in the table below (with detailed assumptions used for revenue analysis in Appendix E):

Table 4-4: Type of Revenue Schemes

Type of Revenues	Assumptions [A]	Sources
Farebox Revenues	• Estimated based on yearly ridership forecast by route from the 2024 PTMP • 5% of fare revenues per year (based on adults $0.25/trip and students $0.15/trip) is assumed to be allocated to bus terminal O&M (including entry fees)	Based on the current fare structure set by DNTT
Commercial Space Rental	• Commercial space (3m x 3m) provided within the terminal assumed to be rented out to merchants at a daily rental fee of US$2.0/day (rounded a daily minimum fee based on US$6.0 per m^2 per month). In total 124 rental spaces are assumed to be generated at bus terminals.	Decree Law No. 19/2003, Section 34 on lease of office space [B, C]
Advertisement	• Revenue generated from advertising on panel/displays/walls of infrastructure (i.e., terminals, stops). Bus shelters assumed to have 2 advertisement displays (with assumed fees of US$2-5/day) depending on locations.	Assumed similar or higher rate than commercial rental space
Parking Levy	• 20% of on-street parking levies assumed to be allocated to public transport (each space assumed to generate US$3/day based on parking fee/hour at US$0.25 and 50% occupancy).	Based on current parking charges in Dili

Source: https://timor-leste.gov.tl/wp-content/uploads/2010/03/DL_2003_19_PortFees_and_Charges_.pdf
Notes:
[A] Potential revenues are indicative only and assumptions may be fine-tuned based on further feedback from stakeholders.
[B] Decree-Law No. 19/2003 outlines the fees and charges associated with port services, including the leasing of office space within port premises. Section 34 of this decree-law specifies that the Port Authority may lease buildings or parts thereof for business activities directly related to port operations, with monthly rentals determined based on market values and location, starting from a minimum of US$6.00 per square meter per month.
[C] Based on sample interviews with existing market owners/coordinators at Manleuana Market, market vendors pay US$50 for initial cost to rent space (with some using space for free of charge). The market coordinator (under the Ministry of State of Administration) also mentioned that a new law on allocation of taxes for market space is being drafted currently.

Key findings are as follows:

- The total annual revenue is estimated at about US$1.33 million, with fare revenue being the largest revenue source accounting for US$0.96 million (72.2%), followed by advertisement income from panels at bus facilities/shelters at about US$0.16 million (12.4%), on-street parking levy at about US$0.11 million (8.6%), and kiosk rental at about US$0.09 million (6.8%). The annual revenue estimates are based on 2030 year and illustrated in Table 5-2 and Figure 5-1.

- A revenue projection over 30 years (up to 2053) is illustrated in Table 5-3. Annual fare revenue is assumed to grow yearly with incremental growth in ridership while other three items (kiosk rental, shelter advertising, and on-street parking levy) are assumed to be the same.[40]

Table 4-5: Annual Revenue Estimate in US$ (2030)

#	Item	Annual Revenue (US$)	Composition (%)
1	Annual Fare Revenue	958,215	72.2%
2	Annual Kiosk Rental	90,520	6.8%
3	Annual Advertising Income from Panel	164,980	12.4%
4	Annual On-Street Parking Levy	113,880	8.6%
Total		**1,327,595**	**100.0%**

[40] Projection of 30-year revenue analysis may be further fine-tuned based on feedback from stakeholders and align with other disciplines such as financial and economic assumptions.

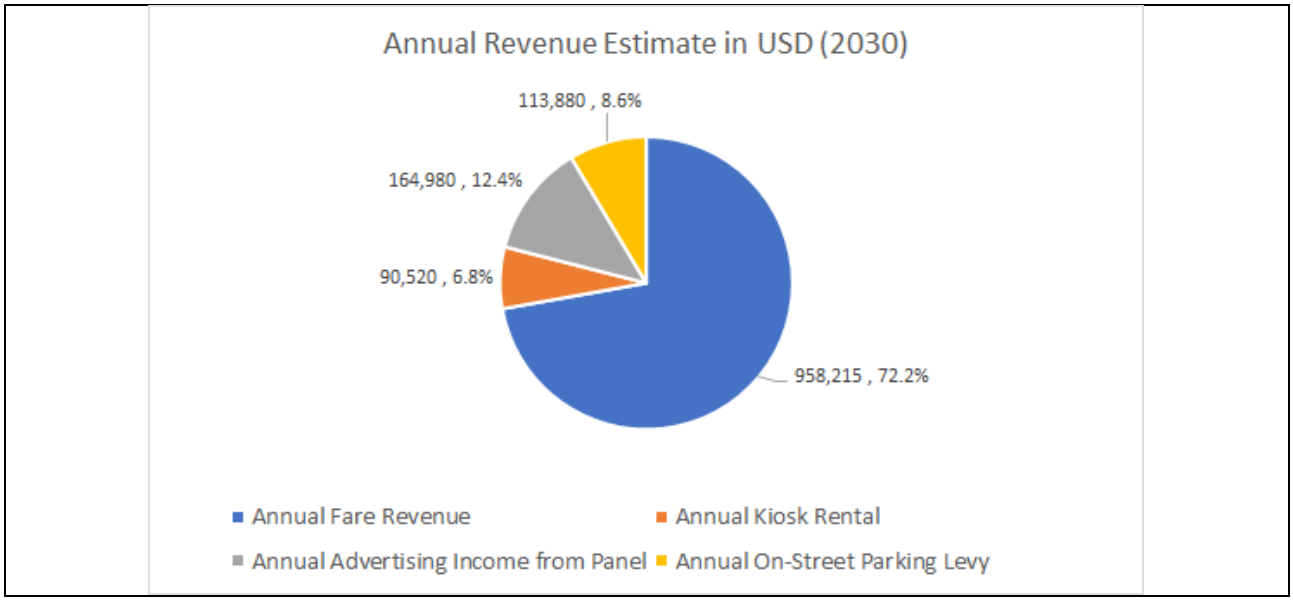
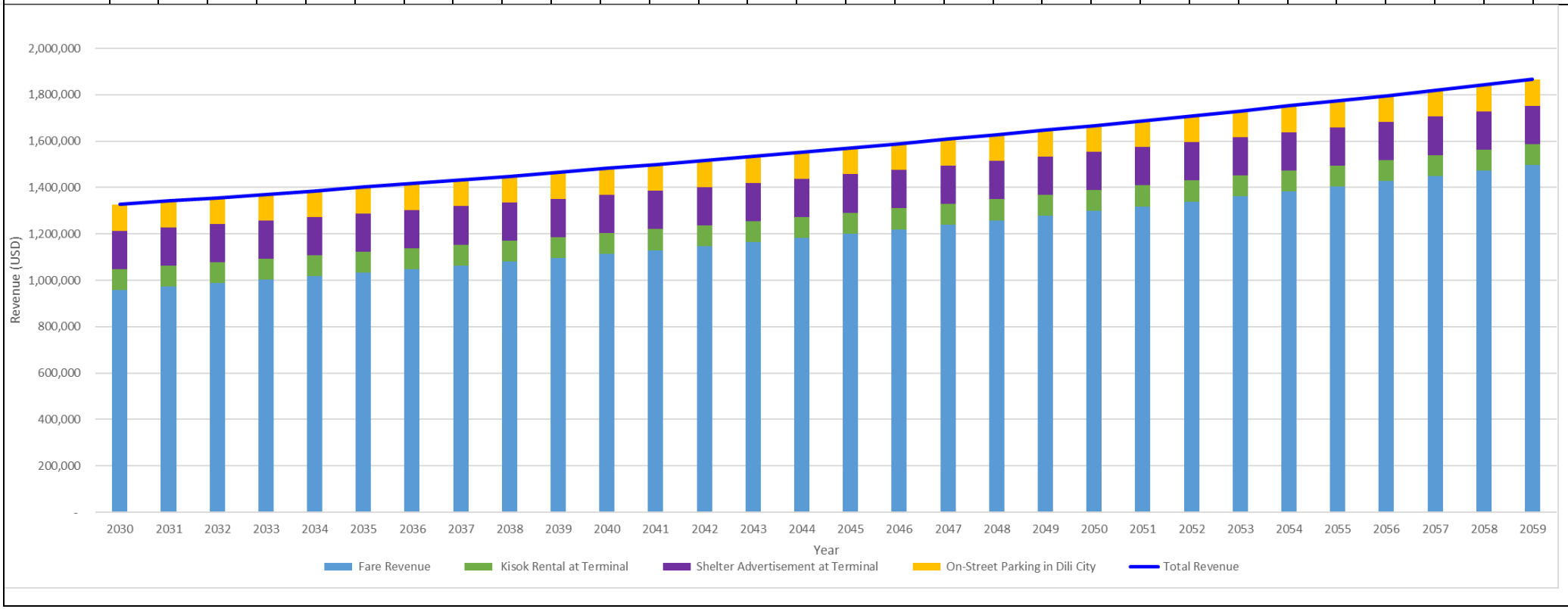


Figure 4-1: Composition of Annual Revenue Estimate in US$ (2030)

Table 4-6: Revenue Projection for 30 Years (US$ in 1,000)

Item	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Fare Revenue	958	972	987	1,002	1,017	1,032	1,048	1,064	1,080	1,096	1,113	1,130	1,147	1,165	1,183	1,201	1,220	1,239	1,259	1,278	1,298	1,319	1,340	1,361	1,383	1,405	1,427	1,450	1,473	1,497
Kisok Rental at Terminal	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Shelter Advertisement at Terminal	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165
On-Street Parking Levy	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114
Total Revenue	**1,328**	**1,342**	**1,356**	**1,371**	**1,386**	**1,401**	**1,417**	**1,433**	**1,449**	**1,466**	**1,482**	**1,499**	**1,517**	**1,534**	**1,553**	**1,571**	**1,590**	**1,609**	**1,628**	**1,648**	**1,668**	**1,688**	**1,709**	**1,730**	**1,752**	**1,774**	**1,797**	**1,819**	**1,843**	**1,866**



5. Financial Viability Assessment

In this section, a preliminary, high-level financial assessment was conducted to assess the financial results of the Timor-Leste public transport scheme. Note that the findings here are only prepared at initial stage, based on a simple cashflow model, and will be fine-tuned further as the study progresses, particularly to incorporate potential delivery model options as well as overlaying potential funding and financing mechanisms for the public transport scheme.

5.1 Key Financial Model Assumptions

The financial analysis of the proposed investment program in Timor-Leste's public transport system examines the capital expenditure (CAPEX), operational expenditure (OPEX), replacement capital expenditure (REPEX), and potential revenue streams to test the scheme's viability and funding needs.

The following metrics and assumptions were used to prepare the indicative financial assessment:

Table 5-1: Key Financial Model Assumptions

Capital expenditure	**Mid-life renewal**	**Replacement**
Bus facilities	Year 15 at 50% initial capex	Year 30 full replacement
ITS	None	Year 15 full replacement
Climate resilience facilities	Year 15 at 50% initial capex	Year 30 full replacement
Bus facilities at transit hub	Year 5 at 50% initial capex	Year 10 full replacement
Climate resilience facilities at transit hub	Year 15 at 50% initial capex	Year 30 full replacement
Operating expenditure		
• Infrastructure O&M • ITS O&M • Other direct costs • Salaries		
General assumptions		
• 24-month construction from 1 July 2027 to 30 June 2029 • 6-month testing phase from 1 July 2029 to 31 December 2029 • 30-year operational period starting on 1 January 2030 up to 31 December 2059		

5.2 System Revenue

Total system revenues amount to USD 81.7 million nominal cumulative over the forecast period, consisting of fare revenues of USD 63.0 million, and non-fare revenue (kiosk rental, station advertising and on-street parking) of USD 18.7 million nominal cumulative. The breakdown for the cumulative amounts for system revenues is presented in the chart below:

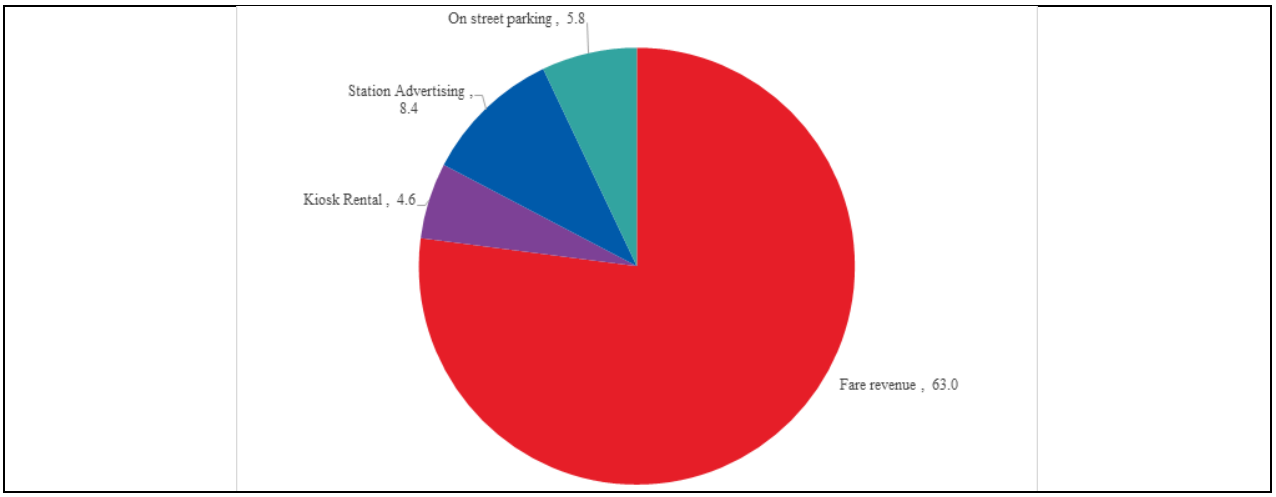


Figure 5-1: System Revenues, Cumulative, Nominal, in USD Million

5.3 CAPEX

CAPEX consists of the development of civil infrastructure, namely:

Table 5-2: Key Financial Model Assumptions

CAPEX item	Amount in USD million, Cumulative Over Forecast Period, Nominal [A]
Bus Facilities at Terminal	12.1
ITS at Terminal	2.3
Climate Resilient Facilities at Terminal	2.4
Bus Facilities at Transit Hub	0.4
Climate Resilient Facilities at Transit Hub	0.3
Total CAPEX	**17.5**

Note:
[A] This is a nominal number (i.e. after taking into account inflation of 2.6% p.a.) based on a real number (i.e. before inflation) as presented in Section 4.1 CAPEX. We have assumed 2025 is the base year (inflation index = 1), and 2026 onwards will start inflating by 2.6% p.a.

The profile of the CAPEX spend over the 12-month construction period are as follows (note that Year 2027 and Year 2029 figures are half-yearly amounts, given the construction start and end dates).

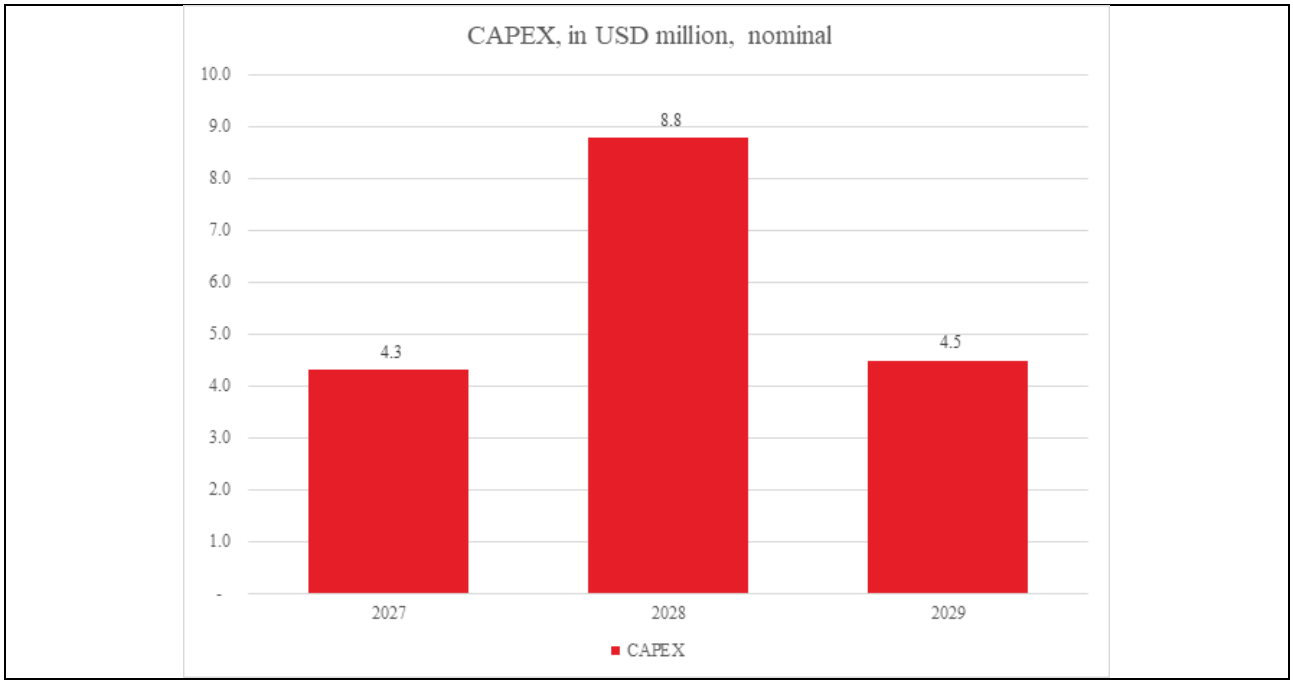


Figure 5-2: CAPEX Profile Over 12-Month Construction Period, for Civil Infrastructure

5.4 REPEX

REPEX consists of the midlife renewals and replacements of civil infrastructure in accordance with the timing internals as described in the financial model assumptions section in Section 5.1. Note that only for the purpose of this initial financial analysis, we have not factored in major maintenance reverse accounts to smooth-out the REPEX profile.

The REPEX profile over the forecast period is presented below:

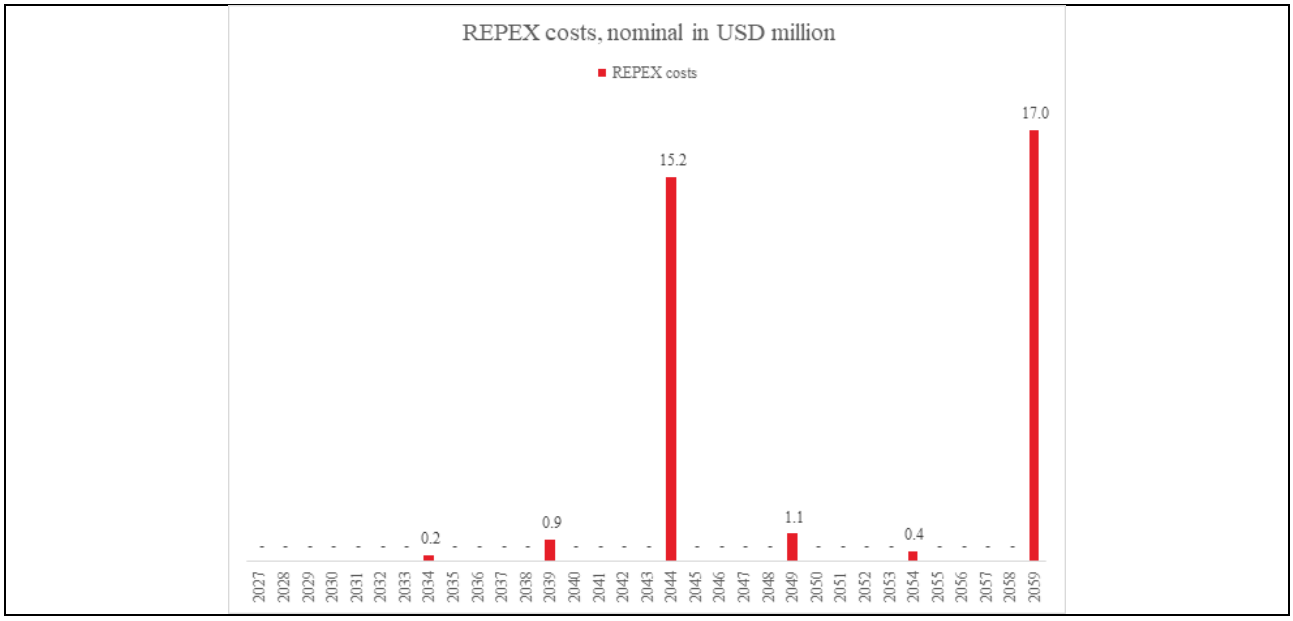


Figure 5-3: REPEX Profile Over the Construction and Operations Period, Nominal Values in USD Million

5.5 OPEX

Cumulative OPEX, at nominal values (i.e. after taking into account inflation), is estimated to be USD31.1 million over the operating period from 1 January 2030 up to 31 December 2059.

Table 5-3: Cumulative OPEX Overview

OPEX Item	Amount in USD Million, Cumulative Over Forecast Period, Nominal
Other direct costs	2.1
Salaries	17.2
ITS O&M	1.9
Infrastructure O&M	9.9
Total OPEX	**31.1**

The OPEX profile over the operations period is presented in the figure below:

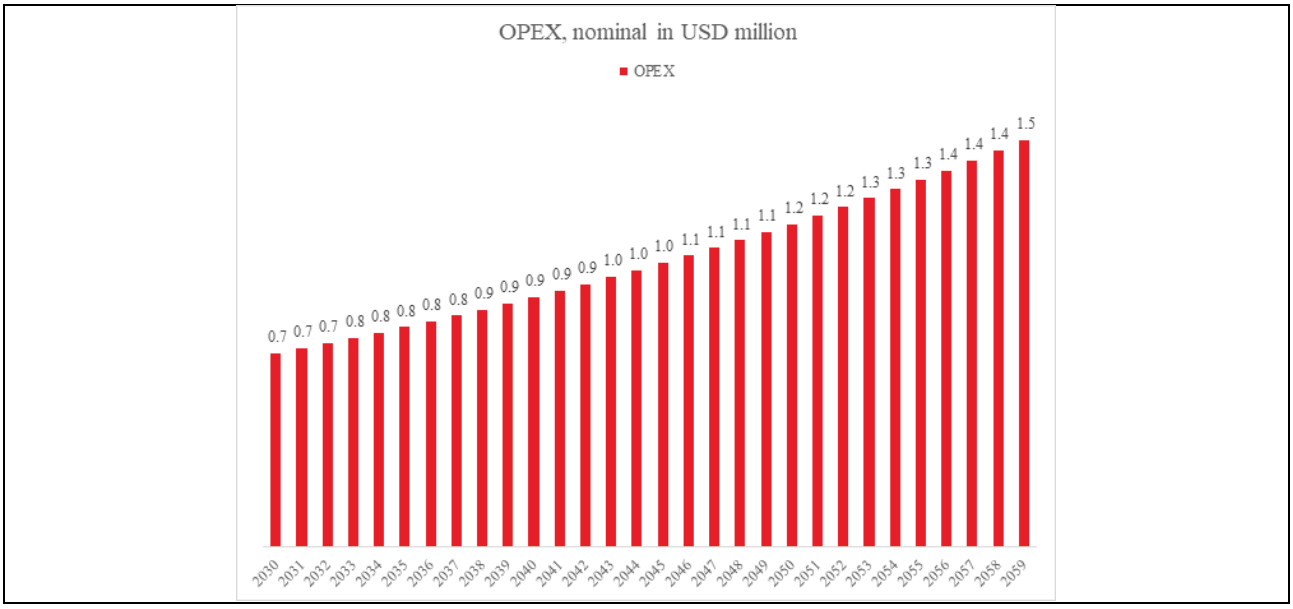


Figure 5-4: OPEX Profile Over Operations Period, Nominal in USD Million

5.6 Initial Viability Assessment

Given the system revenues, CAPEX, REPEX and OPEX for the public transport scheme, the initial finding is that the system revenues may not be sufficient to defray the costs for CAPEX, REPEX and OPEX.

Table 5-4: Initial Viability Assessment

Financial Statement Item	Amount in USD Million, Cumulative Over Forecast Period, Nominal
Fare revenues	63.0
Non-fare revenue	18.7
CAPEX	(17.5)
REPEX	(34.8)
OPEX	(31.1)
Surplus / (deficit)	**(1.8)**

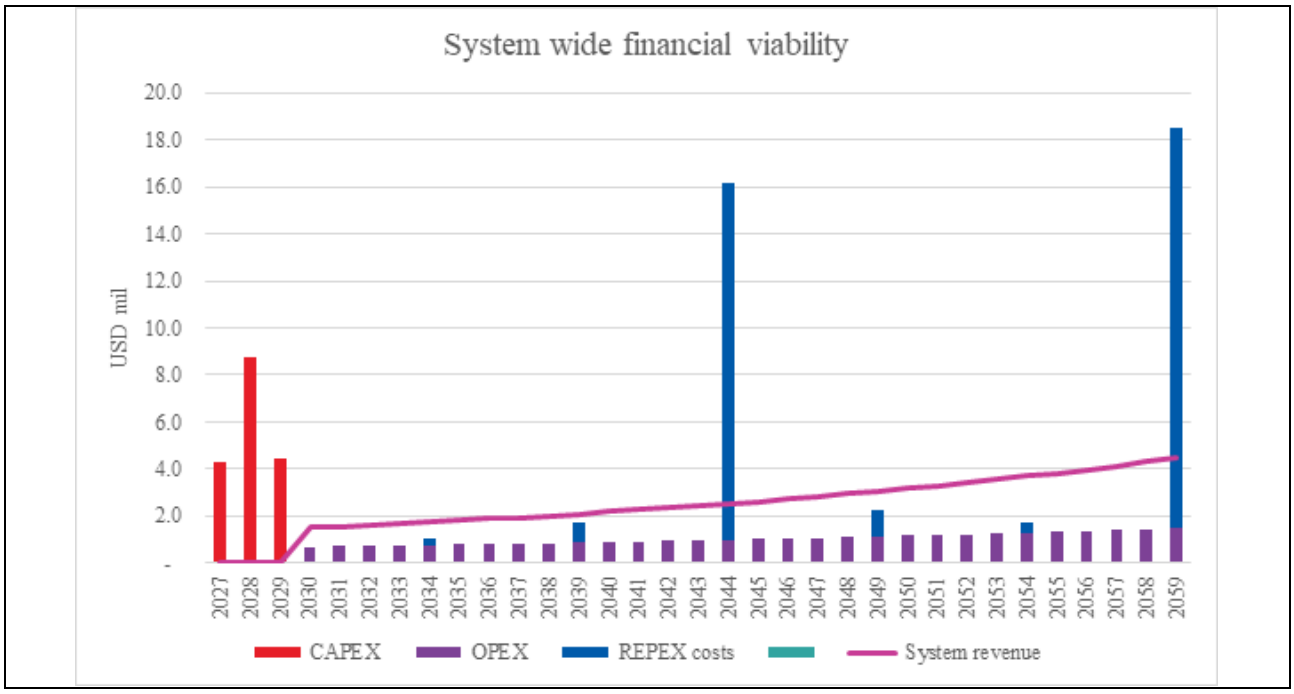


Figure 5-5: System Revenues, CAPEX, REPEX, and OPEX for the Entire Public Transport Scheme

5.7 Next Steps for Financial Assessment

Further detailed assessments will need to be performed over the financial viability assessment for the Timor-Leste Public Transport scheme, including:

- Detailed financial model build to overlay financing and funding mechanisms, including maintenance reserve accounts.
- Refinements of revenues, CAPEX, REPEX, and OPEX assumptions where applicable.
- Overlaying potential delivery model options into the financial model.

6. Economic Assessment

6.1 Background

The Public Transport Master Plan 2024 for Timor-Leste has identified key issues affecting the country's public transport system and outlines an investment program and achieve the plan's vision. A feasibility study of priority investment program was undertaken and included preliminary designs, route reorganization, technical assessments, project costing, environmental and social assessments, economic and financial assessments. The feasibility study evaluated ten public transport facilities proposed to be included in a project proposed to be funded by the ADB. An economic evaluation of the proposed project components was undertaken in accordance with the ADB Guidelines for the Economic Analysis of Projects.[41]

6.2 Economic Evaluation Approach

Economic analysis was carried out by estimating the incremental costs and benefits to the society under two scenarios, namely "without project" and "with-project" scenarios. The "without project" scenario represent the current state of public transport facilities and operations and the "with-project" scenario encompasses implementation of proposed project and the resulting improvement in operation of the public transport system. The capital and operation costs of the proposed project were estimated based on the project preliminary design and operational planning.

The project will improve mobility within and around the terminal facilities, improve time spent at various stages of public transport travel, encourage shift to public transport from private vehicles, improve passenger safety and experience at bus terminals and bus stops, improve public transport operation, reduce greenhouse gas (GHG) emission with improved vehicle circulation and create employment opportunities. The study estimated a five percent shift from private modes to public transport modes with the project improvements compared to without project situation. Potential benefits identified by the project are indicated in Table 6.1. Estimates of each of the identified benefit parameters were made both for the without and with project option over the analysis period. Analysis and estimates were made based on projected traffic, estimated changes in speeds and public transport usage and other project design aspects.

Table 6-1: List of Identified Project Benefits

No.	Potential Benefits	Description
1	Travel time and vehicle operating cost savings (vehicles)	Reduction in peak hour travel time spent for all vehicles due to speed improvements around the site (about 1 km around the site)
2	Travel time savings (passenger)	Reduction in peak hour travel time spent for all passengers due to speed improvements around the site
3	Travel time savings (pedestrians)	Reduction in peak hour travel time spent for pedestrians using the sidewalk in front of the terminal due to sidewalk improvements
4	Direct waiting time savings	Reduction in direct waiting time due to service improvements is expected in future with facility improvements
5	Perceived waiting time savings	Perceived waiting time savings due to facility improvements (better waiting experience)
6	Operation time savings for public transport within terminal	Reduction in total operating time within the terminal (including unloading, loading, layover as well as moving time from entry to exit)
7	Employment creation	Jobs created due to provision of commercial rental space
8	Vehicle operating cost (VOC) savings and GHG emission reduction	Reduction of VOC and GHG emissions due to expected shift from private vehicle to public transport and reduced driving in private vehicles
9	Accidents reduction	Reductions of accidents (including light injury, heavy injury and fatalities) due to mode shift and reduced driving

[41] Asian Development Bank. 2017. Guidelines for the Economic Analysis of Projects. Manila.

Economic viability can be expressed with a number of indicators incorporating the concept of discounting and two of these have been calculated from the annual cost and benefit streams; the Net Present Value (NPV) and the Economic Internal Rate of Return (EIRR). Normally the NPV and EIRR will give the same indications of viability. The NPV is the difference between the present value of costs and the present value of benefits. If the NPV is greater than zero the project is considered to be viable. The EIRR is the discount rate at which the present value of benefits equals the present value of costs, and thus provides a measure of the return on an investment that illustrates the rate of return more readily than the NPV criterion. If it exceeds the required discount rate then the project is considered viable. For the current project a discount rate of 9% is considered as per ADB guidelines.

The economic evaluation has been conducted on the basis of constant prices without taking the impact of inflation on prices into effect. Project costs and benefits are valued in 2024 prices. Costs and benefits are valued in monetary terms and expressed in economic prices to avoid distortions in the input prices of labor, materials, equipment and foreign exchange due to market imperfections by removing taxes and applying exchange rate and wage rate factors. Timor-Leste use United States Dollar (USD) as its currency and the evaluation was conducted using USD as the unit of currency. With all transactions conducted in Timor-Leste in US Dollar, SERF is taken as 1.0. Shadow wage rate factor of 0.6 for unskilled labor adopted in previous analysis were used.[42] An operational period of 30 years starting in 2030 following the construction completion in 2029 was considered for the analysis.

6.3 Economic Costs

The economic costs of the project comprise (i) capital investment for civil works including social and environmental mitigation measures, construction management and supervision and physical contingencies, and (ii) operation and maintenance cost over the life of the project. Construction and testing is expected to take two and half years starting from mid-2027 and complete in end of 2029. Traffic may be disrupted only in a limited way during the implementation and no additional road user cost due to disruption during construction was considered.

Financial costs are converted to economic costs in line with ADB guidelines. The project investment cost is given in Table 12.2. During operation, the project will incur operation and maintenance costs as well as renewal of facilities after a period of time. The operation and maintenance costs is estimated at $622,000 per year. Renewal or replacement of facilities will be required in the case of some of the bus facilities and systems and include renewal of bus facilities at Terminals in year 15, replacement of ITS facilities at year 15 and replacement of transit hub facilities every 10 years. These costs are added to the operation and maintenance costs

Table 6-2: Project Investment Costs (2024)

Intervention	Financial cost (excluding VAT), $m[a]	Conversion factor	Economic cost, $m
Civil works and IT systems including construction management	$13.69	0.97[b]	$13.28
Physical contingencies	$2.74	0.97[b]	$2.66
Total excl. VAT	$16.43		$15.94

Source: Consultants estimates
Note:
[a] Project cost based on preliminary designs (2024 prices)
[b] Considering 6% unskilled labor at a SWRF of 0.5

6.4 Economic Benefits

The project will provide several benefits as listed in Table 6.1. The main quantifiable economic benefits are vehicle operating cost (VOC) savings, savings in travel time, employment creation, improved safety for passengers and environmental benefits from reduced vehicle emissions. There are also potential for reduced wait times with increased bus frequency and improved perception of waiting time with improved facilities.

[42] Proposed Loans for Additional Financing Democratic Republic of Timor-Leste: Road Network Upgrading Sector Project, Report and Recommendation of the President to the Board of Directors, Asian Development Bank, Novemeber 2015

Benefits related to wait times are not considered in the analysis reduced wait times are related to bus operation and not enough information to value improved perception of wait time.

Vehicle operating cost savings. Unit VOC costs at different speed levels were estimated and used to arrive at the total vehicle operating cost in the without and wit project scenarios. To quantify unit VOC values, HDM-4 model developed for Tasitolu to Airport Junction road project in 2021 was used. The prices were updated to 2024 prices considering inflation.

Travel time cost savings. Travel time savings based on improved traffic operation have been monetized by applying values of time estimated for different categories of road users. Values of time was estimated from average household income data from surveys. The value of time estimated is given in Table 12.3. Non-working time is valued at 30% of working time.

Table 6-3: Adopted Values of Passenger Working and Non-Working Time

Vehicle Type	Value of Working Time ($/hour)	Value of Non-Working Time ($/hour)
Car/SUV	3.01	0.90
Bus & motorcycle	1.00	0.30

Source: Consultants estimates

The proposed project will lead to reductions in greenhouse gas (GHG) emissions due to mode shift, improved traffic operation and improved speeds. Emissions reductions were calculated by comparing emissions "without-project" and "with-project", with the emissions under the two scenarios calculated using emission factors. The reduction in GHG emissions was valued at US$ 57.0 per Ton in 2024 prices (2023 value of US$ 54.1 used for ADB projects increased by world inflation rate of 5.3% for 2024).[43] The economic cost of GHG emission is escalated at 2% per annum in real terms for the analysis period for benefit estimation.

The improved circulation in the terminals and the surrounding areas and reduced private vehicle travel is likely to have road safety benefits in terms of reduced traffic crashes and resulting fatalities, injuries and damages. The crash rate data also indicate a higher crash rate in the case of non-public transport modes and the shift to public transport modes reduce overall crash incidences. Road safety benefits are valued at seventy times the per capita income for fatalities and for injuries at 10 percent of fatality rate.[44] The valuation of crash related costs are escalated at 2% per annum in real terms.

The project will also create employment at the kiosks built at the public transport hubs and these are valued at a monthly minimum wage rate of USD 112. Each kiosk will employ 2 persons resulting in a total number of 248 jobs created across all at kiosks. The valuation of employment created are escalated at 2% per annum in real terms.

6.5 Results of Economic Analysis

An economic analysis of the proposed project investments was carried out following the Asian Development Bank's (ADB) guidelines. The analysis compared the incremental benefits with the initial investment costs and operation and maintenance costs over 30 years of operation. The main assumptions used are listed in Table 6-4.

Table 6-4: Main Assumptions for Economic Analysis

Assumption	Value
Price base year	2024
Discount year	2024
Currency of analysis	US dollar
Construction start year	2027
Construction end year	2029
First year of benefits	2030
Appraisal period	3 years of implementation and 30 years of operation
Numeraire used	Domestic price numeraire

[43] International Monetary Fund, World Economic Outlook Database, April 2024

[44] The unit value of fatalities and injuries was based on International Road Assessment Programme (iRAP). 2016. Star Ratings and Investment Plans: Data Analysis and Reporting Specification. London

Assumption	Value
Value of time (in work, 2022)	$3.01/hour (car passengers) $1.00/hour (bus passengers)
Value of time (non-work, 2022):	$0.90/hour (car) $0.30/hour (bus passengers)
GDP growth assumption	2024-2030: 5.5%; 2031-2040: 4.5% Beyond 2040: 3.5%
Shadow wage rate factor	0.5 (unskilled)
Shadow exchange rate factor	1.0
Conversion factor applied to construction	0.97
Conversion factor applied to taxes, duties, transfers	0.00

Source: Consultants' estimates

The results of the economic analysis are summarized in Table 6.5, expressed in terms of the key economic indicators: benefit–cost ratio, economic internal rate of return (EIRR), and net present value (NPV) at a 9% discount rate. The project economic analysis demonstrates economic viability with an EIRR of 17.7%. The cost and benefit streams for the overall project are provided in Table 6.6.

Table 6-5: Results of Economic Analysis

Project Description	EIRR (%)	NPV ($m)	Benefit-Cost Ratio
Public Transport Facilities	17.7	11.5	1.04

EIRR = economic internal rate of return; NPV = net present value
NPV uses a 9% discount rate

Sensitivity tests were carried out to determine the effect of variations in key input parameters. Table 6.7 shows the results of sensitivity tests which indicates overall project is economically viable even with significant adverse variations. Overall project EIRR is over the threshold of 9.0% if costs are increased and benefits are reduced by 28% each.

Table 6-6: Sensitivity Analysis Results – Overall Project

Case	EIRR %	NPV, $m	Switching value
Base case	17.7	11.5	-
Cost +20%	14.7	8.5	+78%
Benefits -20%	14.0	6.2	-44%
Emission, Accident and employment benefits reduced by 50%	14.0	6.0	-
Cost+20% & benefits -20%	11.4	3.3	+/-28%

EIRR = economic internal rate of return, NPV = net present value.
Switching value indicate the percentage change in variable which will result in an NPV of zero and EIRR becomes 9.0%.

Table 6-7: Cost and benefit streams (2024 domestic prices, $m, undiscounted)

Year	Incremental costs		Incremental benefits					Net Benefits
	Capital works	Recurrent works	VOC savings	Time savings	Emission reductions	Crash reduction	Employment creation	
2024	0.0							0.0
2025	0.0							-59.4
2026	0.0							-87.5
2027	2.39	-	-	-	-	-	-	(2.39)
2028	6.37	-	-	-	-	-	-	(6.37)
2029	7.17	-	-	-	-	-	-	(7.17)
2030		0.62	0.56	0.64	0.26	0.26	0.19	1.28
2031		0.62	1.12	1.30	0.53	0.54	0.38	3.25
2032		0.62	1.13	1.31	0.54	0.56	0.39	3.31
2033		0.62	1.14	1.32	0.56	0.58	0.40	3.37
2034		0.62	1.15	1.33	0.58	0.60	0.41	3.44
2035		0.62	1.16	1.34	0.60	0.62	0.41	3.50
2036		0.62	1.17	1.35	0.62	0.64	0.42	3.57
2037		0.62	1.17	1.36	0.64	0.66	0.43	3.64

Year	Incremental costs		Incremental benefits					Net Benefits
	Capital works	Recurrent works	VOC savings	Time savings	Emission reductions	Crash reduction	Employment creation	
2038		0.62	1.18	1.37	0.66	0.68	0.44	3.71
2039		0.62	1.19	1.39	0.68	0.70	0.45	3.78
2040		0.94	1.20	1.40	0.70	0.72	0.46	3.54
2041		0.62	1.21	1.41	0.72	0.75	0.47	3.93
2042		0.62	1.22	1.42	0.75	0.77	0.48	4.01
2043		0.62	1.23	1.43	0.77	0.79	0.49	4.09
2044		0.62	1.24	1.45	0.79	0.82	0.50	4.17
2045		4.68	1.25	1.46	0.82	0.85	0.51	0.20
2046		0.62	1.26	1.47	0.85	0.87	0.52	4.35
2047		0.62	1.27	1.49	0.87	0.90	0.53	4.43
2048		0.62	1.28	1.50	0.90	0.93	0.54	4.52
2049		0.62	1.29	1.51	0.93	0.96	0.55	4.62
2050		0.94	1.30	1.52	0.96	0.99	0.56	4.39
2051		0.62	1.31	1.54	0.99	1.02	0.57	4.81
2052		0.62	1.32	1.55	1.02	1.06	0.58	4.91
2053		0.62	1.33	1.57	1.06	1.09	0.59	5.01
2054		0.62	1.34	1.58	1.09	1.13	0.60	5.12
2055		0.62	1.35	1.59	1.12	1.16	0.62	5.20
2056		0.62	1.35	1.59	1.15	1.19	0.63	5.29
2057		0.62	1.36	1.60	1.18	1.22	0.64	5.37
2058		0.62	1.36	1.61	1.21	1.25	0.65	5.46
2059		0.62	1.37	1.62	1.24	1.28	0.67	5.55
							EIRR (%)	**17.7**
							NPV ($ million)	**11.46**

EIRR = economic internal rate of return, NPV = net present value.
Source: Consultants' estimate

7. Environmental Safeguards

7.1 Overview

A total of ten (10) bus terminal sites have been proposed and some of these sites have been visited by the ADB Environmental Safeguards staff and Environmental consultants (under ADB's Technical Assistance) between November 2022 and April 2024. During these visits, initial scoping and sensitive receptor mapping were conducted and based on initial screening, the project has been categorized as 'B' as per ADB SPS, 2009 and hence, an Initial Environmental Examination (IEE) study will be prepared.

A brief summary of the project settings at each of the proposed ten sites is provided in the table below:

Table 7-1: Environmental Settings at Ten Proposed Bus Facility Sites

Site Name	Environmental Setting
Dili Convention Center	• DCC is mainly used for hosting important international and national events. • DCC main building is under the protection of the Secretary of Art and Culture as a Heritage Building. Changes to the surrounding landscape requires coordination with the relevant entity. • The location sits on a flood prone area. The surrounding area is historically known as peatland and was converted for offices during Indonesian occupation. Thus, land elevation earthwork is recommended. • The site features small gutters and narrow u-ditch drainage. The drainage system is poorly maintained. Rainy season causes transitionary flood and the stormwater recedes within hours. Flood height is unknown. Recommending further investigation. • Sensitive receptors in the area include the residents, road users, pedestrians, and operating microlet and commuters, government office (MOTC), and Dili Municipal Stadium.
Becora Terminal	• Site located in an urban setting with different types of residential and commercial structures located around the site with a dry riverbed present along the western boundary of the site. • Bedois Church and a Catholic private school is located at approx. 270 m north of the existing terminal. The only access to the church and the school is through the only entrance and exit of the proposed terminal. • The entrance and exit also serves as the main access for the communities living in the lower sections of Camea village. • The riverbank of Beoids River was severely damaged during the cyclone Seroja on 4 April 2021. The streambank has been repaired. But damage to the bridge remains. • The river does not host any aquatic species. Narrow floodplain in Dili's watershed characterizes strong currents of the rivers, which can easily cause riverine inundation. Besides the rivers Dili are ephemeral and inhabitable for aquatic species. • The sensitive receptors identified were the local residents, businesses (i.e., kiosks), churches, students, commuters, and general road users of the main road exposed to high risk of traffic accidents.
Tibar Terminal	• Site located in a rural setting consisting of hilly terrain although site is located on flat land with some sparse vegetation consisting of trees and shrubs located around the site and some scattered settlements around the site.
Manleuana Terminal	• The site is located within the Manleuana market. The market contains business such as sealing vegetables, clothes, and plants. • The site currently is accessed by microlet as the only means of public transportation to the site. • The location is not within any protected area. And the surrounding area has been disturbed due to recent land use change. • In previous years, the surrounding areas were used primarily for rice padding, but in the recent decade the area has experienced extensive land use change towards residential and real estate businesses. • The sensitive receptors in the area include the Canossa School (near the entrance to the market in the east), Externato de Sao Jose School (along the access road to the market), local residents, businesses in the market, commuters, and the microlet.
Hera Terminal	• The site is located on hilly terrain with considerable vegetation on the site and also around it consisting of trees and grasses along with scattered settlements around the terminal site. • Nearest protected area is the nationally declared (land and sea hybrid) Marine Protected Area (MPA) in the north, namely Cristo Rei.

Site Name	Environmental Setting
Aldeia Samalakuliba Terminal	• Site is located in a rural setting in a primarily barren plot of land with minimal vegetation located in its surroundings and only some commercial structures located near the site.
Maliana	• Site located in an urban setting with different types of residential and commercial structures located around the site.
Suai	• Site located in a semi-urban setting consisting of hilly terrain with commercial and residential settlements located along the eastern boundary of the site with the western boundary of the site consisting primarily of trees and vegetation with some scattered settlements.
Lospalos	• The site is located on hilly terrain with considerable vegetation on the site and also around it consisting of trees and grasses along with scattered settlements around the terminal site.
Viqueque	• Site located in an urban setting with different types of residential and commercial structures located around the site.

However, during the detailed scoping activities, if any areas of special importance/sensitivities are identified, the project category will be re-assessed at that stage and the detailed scoping and baseline data collection along with stakeholder consultations will be conducted during preparation of the required IEE study as per ADB SPS, 2009 requirements.

The proposed works for the bus terminal development are generally expected to be site specific and of short duration, and any potential impacts are expected to be reversible and short term in nature mainly occurring during the construction stage. The expected works shall mainly consist of the following activities:

- Earth works for land leveling and vegetation removal, wherever necessary
- Masonry, civil and metal works for development of bus terminal structures
- Electrical works for lighting, etc.
- Painting and finishing works

The potential impacts to be assessed during the different project phases are summarized in the table below:

Table 7-2: Potential Environmental Impacts by Project Phase

Project Phase	Potential Impact
Design / Pre-Construction	• Lack of integration of IEE/EMP requirements into construction bid documents • Relocation of existing utilities • Identification of locations for labor camps and ancillary facilities • Traffic issues • Seismic impacts
Construction	• Degradation of air quality • Noise / vibration • Occupational health and safety and labor conditions • Community health and safety • Traffic issues • Biodiversity impacts • Construction camps/Camp site • Wastewater generation • Solid waste generation • Disposal of spoil/demolition waste • Communicable diseases • Site restoration
Operation	• Air quality, noise and vibration from buses and other large commuter vehicles • Waste generation at bus terminals • Community safety risks from accidents due to bus and large commuter vehicular movement • Climate change related impacts such as flooding at Dili Convention Center, Becora transportation hub etc. **Positive impacts** • Employment generation • Increased tourism and development of business avenues

Project Phase	Potential Impact
	• Increased passenger convenience and travel safety in better vehicles.

The next steps to prepare one consolidated IEE study for the proposed ten bus terminal sites are as follows:

- Detailed scoping will be conducted of the finalized sub-project sites and re-screening to assess any areas of special importance or significance, potentially ecological significance and for reconfirmation of the project category as per ADB SPS, 2009.
- Accredited laboratories will be engaged for baseline development of key environmental parameters (air, noise and water quality) and for conducting any specific studies/surveys as required.
- Detailed and meaningful stakeholder consultations will be conducted to fulfil ADB SPS, 2009 requirements.
- Impact analysis of various potential impacts likely to arise during various project phases with appropriate mitigation measures and monitoring requirements also provided.
- Preparation of draft IEE study for internal circulation and finalization for disclosure, including an Environmental Management Plan (EMP).
- Checking of Autoridade Nacional de Licenciamento Ambiental (ANLA) requirements to ensure Timor-Leste national requirements are also met in parallel with ADB requirements.

8. Gender Equality and Social Inclusion Assessment

This section provides an overview of the initial Gender Equality and Social Inclusion (GESI) Assessment for the project. The project is covered by the Effective Gender Mainstreaming (EGM) category, wherein the project outputs should be designed to directly improve women's access to social services, and/or economic and financial resources and opportunities, and/or basic rural and urban infrastructure, and/or enhancing voices and rights, which contribute to gender equality and women's empowerment.

The gender analysis will identify key gender issues in Timor-Leste, particularly the differing needs of men and women in terms of access, control, and utilization of the transport infrastructure and services. The gender impacts of the project will also be part of the assessment, and measures to address these gender gaps and impacts will also be recommended.

The assessment will be based on the gender analysis, data collection, and results of a participatory process of multi-stakeholder consultations through key information interviews (KIIs) and focus group discussions (FGDs). Perception surveys will also be utilized to gather information on the acceptability of the project, while covert observations at existing transport facilities will also be conducted to gather information on passenger behavior, usage of available facilities, and impacts of the unavailability of necessary facilities.

The project needs to ensure that specific gender design features are included in the majority, or more than 50% of project outputs and/ or components, to facilitate and ensure women's participation and access to project benefits. Most of these outputs/ components should have at least three (3) gender design features and targets.

8.1 Approach and Methodology

This gender analysis is guided by ADB's Framework Policies and Strategies on Gender and Development (GAD), ADB's Gender and Transport Toolkit (2013), and ADB's Handbook on Poverty and Social Analysis (2001).

The initial data used in this GESI analysis were derived from the results of the passenger transport survey conducted in April 2023 and from online secondary information from the following:

- Preliminary Gender and Inclusion for Timor-Leste (Grameen Foundation, et. al., December 2021)
- Timor-Leste Gender Equity and Social Inclusion Analysis and Action Plan (USAID Health Systems Sustainability Activity, 2021)
- Gender Equity Strategy of UNDP Timor-Leste (2022-2025) (UNDP Timor-Leste, 2023)
- Timor-Leste Country Gender Assessment (ADB, 2014)
- Timor-Leste Labour Force Survey (2021) Summary Report

The data will be further validated through the proposed conduct of several activities including key informant interview (KII), focus group discussion (FGD), perception survey, and direct observations as presented in the table below:

Table 8-1: GESI Data Gathering Approach

Method	Key Activities to be Conducted	Participants	Location	Date
Desk Review	Secondary data collection	- Related literature - Documents from the government of Timor-Leste - Data from previously conducted transportation survey (April 2023)	Online	Ongoing
Direct Observations	Covert observation of passengers at current condition	- Passengers - Drivers	Existing transport facilities and public transport vehicles	December 2024

Method	Key Activities to be Conducted	Participants	Location	Date
Key Informant Interview	Interview with relevant stakeholders	- Representatives from the Transportation Departments - Civil Society Organizations - NGOs - Other relevant government and non-government organizations dealing with gender, disability and other social inclusion	Venue of KII/ FGD to be coordinated with relevant stakeholders	December 2024
Focus Group Discussion	Signing of consent form Perception Survey Actual FGD	- Relevant government offices/units - Women and girls from these sectors: Disability, Urban Poor, LBTQIs, Elderly - Women leaders of people's organizations / representative of other sectors mentioned - Women leaders of civil society groups or business organizations, NGOs		

8.2 GESI-Related Policies and Plans

The following presents the GESI-related policies in Timor-Leste which are fundamental to ensure alignment of the project design and programs with the plans of the government. These will be further reviewed to identify the gaps between the existing policies and the need to address current GESI issues and concerns.

8.2.1 National GESI-Related Policies and Plans

The Constitution of Timor-Leste guarantees the equality and security for all its citizens and prohibits discrimination based on gender and other factors.[45] These are particularly stated in Sections 16, 17, and 63 promoting the equality and exercise of the same rights for all. The Constitution specifically states that "*No one shall be discriminated against on grounds of color, race, marital status, gender, ethnical origin, language, social or economic status, political or ideological convictions, religion, education and physical or mental condition."* Men and women have equal rights and duties in all aspects of *"family, political, economic, social, and cultural life"*, allowing for non-discrimination based on gender when it comes to holding political positions.

The Constitution also protects the rights of senior citizens and disabled citizens in Sections 20 and 21, respectively. Senior citizens are entitled to special protection by the state and are presented with opportunities to actively participation in the community. The disabled sector also shares the same rights as other citizens.

According to Grameen Foundation, et. al. (2021) in their Preliminary Gender and Inclusion Analysis for Timor-Leste, a civil society working group called "Women and the Constitution" has heavily influenced the drafting of Timor-Leste's Constitution. Particularly, the "Women's Charter of Rights" by the working group served as an instrument in streamlining the country's gender issues in various policy debates. This helped increase women's participation in the politics and promoted the importance of gender equality.

Timor-Leste's Code of Business Registration (2006) is considered gender-neutral, as well as other laws related to property rights, marriage, and the country's Labor Code which promotes anti-discrimination in employment.

To further promote anti-discrimination in Timor-Leste, the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) was endorsed by the parliament in 2003. This human rights treaty requires the incorporation of principles of equality of men and women in the legal system of the country and to abolish discriminatory laws. It also entails the establishment of public institutions to ensure protection of women against discrimination and ensures the elimination of all acts of discrimination against women. In 2016, the Equal Renumeration and Discrimination (Employment and Occupation) Conventions by the International Labour Organization (ILO) were also ratified.

While the country has no separate law on gender equality, a legal and policy framework regarding gender-based violence (GBV) is implemented by the government. Law No. 7/2010 Against Domestic Violence (LADV) has been passed in 2010 to establish a legal framework for the prevention of domestic abuse and to

[45] Constitution of the Democratic Republic of East Timor: https://timor-leste.gov.tl/wp-content/uploads/2010/03/Constitution_RDTL_ENG.pdf

provide protection and assistance for the victims of abuse.[46] The law considers physical violence, sexual violence, psychological violence, and economic violence as forms of domestic violence. Under this law, the government is directed to promote and develop a National Plan of Action for the prevention of domestic violence and ensure that proper assistance to victims is provided. The National Action Plan against Gender-Based Violence (NAP-GBV) was then developed as an extension of the government's commitment to end GBV in the country through multi-sector implementation and in accordance with the international conventions. The current NAP-GBV 2022-2032 was launched in November 2022 and aims to prevent GBV through its long-term plan of action. As compared to the previous plan (NAP-GBV 2017-2021) which covered five (5) years, the current NAP-GBV 2022-2032 will run for ten (10) years to enable the government and its partners to evaluate the changes and to rectify or improve where necessary. The NAP-GBV 2022-2032 support three (3) key principles:

1. Prevention of violence against women and girls;
2. Provision of essential services for victims of GBV; and
3. Legal assistance and access to justice.

The process of Coordination, Monitoring, and Evaluation is applied across all sectors to ensure the effective implementation of the three (3) pillars. In addition, the NAP-GBV 2022-2032 considers the provision of services related to violence against women with disabilities and LGBTQI (Lesbian, Gay, Bisexual, Transgender, Queer, and Intersex) members.

In February 2024, the National Action Plan (2024-2028), also known as NAP 1325, was launched by the Timor-Leste Government with the support of United Nations (UN) Women. The NAP 1325 is the second generation of action plan for the country and the successor to the NAP 1325 (2016-2020). The NAP 1325 is a five-year strategy to implement the UN Security Council Resolution 1325 on Women, Peace, and Security. It promotes gender equality and aims to centralize the role of Timorese women in peace and state-building by putting focus on four (4) pillars: *Participation, Prevention, Protection, and Peacebuilding*.

8.3 ADB's Country Gender Assessment for Timor-Leste (2014)

The second country gender assessment (CGA) of ADB for Timor-Leste was published in 2014 to present the current gender gaps, identify gender-related barriers to achieving national goals, and recommend specific strategies to strengthen gender mainstreaming in the country. The CGA provides information for awareness-raising and to promote capacity building for gender mainstreaming across the government. Several recommendations have been discussed in the report to guide the representatives and government officials in mainstreaming gender in developing and implementing national policies and plans. The following recommendations are summarized in the 2014 CGA and status of these:

Table 8-2: ADB's CGA Recommendations (2014)

ADB's Recommendations (CGA, 2014)	Status of Implementation
Strengthen mechanisms for gender mainstreaming and policy implementation: - Capitalize on existing mechanisms to increase cohesiveness between sectors, clarify roles and responsibilities, and ensure greater accountability for policy implementation. - Assure that gender issues are considered in all four (4) strategic sectors – government, civil society, donors, and international agencies.	Plans indicated in the latest NAP 1325 suggest a collaborative approach to mainstreaming gender. A mechanism to implement and monitor the progress is provided in the plan, which also suggests the creation of a steering committee composed of officials from the Director General level or national directors from relevant ministries, civil society organizations, and technical staff from development partners.
Produce practical definitions, guides, and ongoing support for government officials and other stakeholders to mainstream gender: - Practical guidance in local languages that are suitable to the national context shall be provided to support officials in mainstreaming gender.	Part of the NAP 1325 involves the plan to help capacitate institutions through provision of training materials. The Law Against Domestic Violence mandates *Chefes de Suco* and *Chefes de Aldeia* to attend

[46] Law No. 7/2010 Law on Domestic Violence: https://mj.gov.tl/jornal/lawsTL/RDTL-Law/RDTL-Laws/Law%207-2010.pdf

ADB's Recommendations (CGA, 2014)	Status of Implementation
	training and information sessions related to domestic violence.
Take urgent action to address data quality issues: - Administrative data shall be well-organized, ensuring that these are also sex-disaggregated. - The General Directorate for Statistics and other ministries shall collaborate to ensure that gender-related statistics are produced, disseminated, and utilized effectively.	While improvements to data collection were made, there are still areas for improvement as some data that are vital in decision-making are unavailable.
Establish learning and development plans for all Secretary of State for the Promotion of Equality (SEPI) staff that incorporate both technical and general skills and are consistent with capacity development projects: - Implement leadership and management trainings with top- to mid-level managers on a regular basis. - Provide annual training and development plan for all staff.	Specialized training and assistance are provided to SEP by international organizations.

8.4 Gender Equality and Social Inclusion Analysis

This section presents an initial assessment of the prevailing gender and social inclusion issues in Timor-Leste based on secondary data and results from the initial transportation survey conducted in April 2023 at existing transport facilities. This includes sex-disaggregated data and consideration of gender and social inclusion issues to highlight constraints and opportunities in relation to the project.

These will be further assessed and validated once FGDs, KIIs, and direct observations are completed. The analysis will thoroughly investigate safety and accessibility issues of various modes of transportation; current employment and livelihood conditions; cases of gender-based violence, sexual exploitation, abuse and harassment (GBV-SEAH); travel patterns; other social impacts of the project on different sectors of the population; and capacity of the local and national government and other stakeholders in gender mainstreaming and social inclusion in transportation projects. In alignment with ADB's Gender and Transport Toolkit (2013), the aforementioned components will help understand the differences between men and women and between each sector which will be the central points in determining entry points to make the project design more gender-inclusive.

8.4.1 Key Gender Issues

The following discussions present the identified key gender issues based on the current available secondary information and results of the conducted passenger surveys last April 2023.

8.4.1.1 Women's Triple Roles and Multiple Burdens

The multiple roles and burdens of women adversely impact their ability and capacity to join the labor force. Women's roles are typically found in production, reproduction, and community work, which is collectively termed as "triple roles". Productive roles are described as roles performed by both men and women which involves the conduct of activities that produce goods and services. Reproductive roles are typically those required to perform unpaid work involving childbearing, caring, and other domestic tasks that are aimed to ensure the family's well-being. The reproductive roles are usually performed by women. Community work

Customary law, which presents unequal opportunities and rights to men and women, is still practiced mainly in rural areas where a large part of the population resides. Studies such as The Preliminary Gender and Inclusion for Timor-Leste (Grameen Foundation, et. al., December 2021) show that Timorese women generally perform most of the informal work, childrearing, and household works. This was confirmed through the Women and Girls Empowered (WAGE) local partners of Grameen Foundation through their FGDs with the women weavers in Maubara – Liquiçá as results show that Timorese women, particularly women entrepreneurs, are assigned to most of the household chores (i.e., childrearing, preparing meals, cleaning) while also engaged in income-generating activities. The FGDs also revealed the typical day of a Timorese female entrepreneur as presented below in the table below:

Table 8-3: Typical Day of a Timorese Entrepreneur

Women's Roles	Men's Roles
5:00AM-6:00AM: prepare breakfast and help husband and children get ready for the day **6:00AM-8:00AM:** wash the dishes and clean the house **8:00AM-11:00AM:** business activity **11:00AM-1:00PM:** prepare lunch for the family, wash the dishes **1:00PM-1:30PM:** 30 minutes of rest **1:30PM-5:00PM:** business activity **5:00PM-7:00PM:** prepare dinner for the family, feed the farm animals **7:00PM-8:00PM:** wash the dishes, clean the house **8:00PM and onwards:** some women continue their weaving at night	Perceived to be economically responsible for the family.

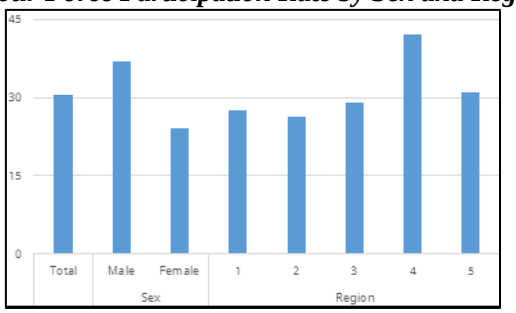
Source: The Preliminary Gender and Inclusion for Timor-Leste (Grameen Foundation, et. al., December 2021)

The proposed KIIs, FGDs, and direct observations for the project aims to validate and understand women's roles and burdens. This information will influence the transport plan and design to cater to the needs of all passengers.

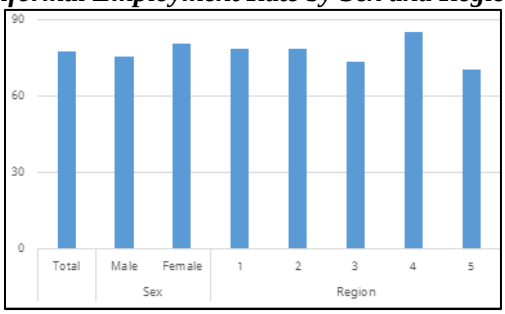
8.4.1.2 Women's Low Economic Participation Rate

As mentioned, customary law prevents the equal distribution of opportunities between men and women, and this may also be attributed to the traditional patriarchal practices in Timor-Leste. The Timor-Leste Labour Force Survey in 2021 revealed in the figure below that women (24.2%) have a lower labour force participation rate then men (36.9%). This can be attributed to women's lack of access to opportunities and education, as well as the need to perform their domestic responsibilities as compared to men. However, in terms of the employment rate in the agricultural industry, women (31%) had a higher employment rate than men (24.2%).

Labour Force Participation Rate by Sex and Region



Informal Employment Rate by Sex and Region



Source: Timor-Leste Labour Force Survey, 2021

Figure 8-1: Women's Low Economic Participation Rate

The results from the same survey also revealed that women (80.4%) have a higher informal employment rate than men (75.3%) (see the figure above). This may indicate that women have worse working conditions as those who are engaged in informal jobs are likely deprived from wage protections, safe working conditions, and leaves with compensation.

Women who are engaged in micro and small enterprises (MSEs) also face greater issues that hinder the development and upscaling of their businesses compared to men as these relate to the existing social challenges and increased risk of gender-based violence (GBV), particularly experienced by poor women in the rural areas. According to the Preliminary Gender and Inclusion for Timor-Leste by Grameen Foundation, et. al., (2021), poor women in rural areas face challenges that are related to the existing gender norms and barriers that hinder their autonomy, mobility, and access to/ control over productive resources.

Results from the proposed KIIs and FGDs will help reveal specific aspects of the project that may enable the promotion of women's economic participation. Potential programs to address this issue may also surface from the recommendations of various stakeholders.

8.4.1.3 Travel Patterns

The ADB Gender Toolkit: Transportation (2013) describes the gender differences in travel patterns, with women having a more complex travel pattern as compared to men due to their gender roles. Women likely practice "trip chaining" which is defined as doing combined trips and frequent trips at shorter distances for

varying purposes (e.g., taking children to school enroute to their workplace in the morning, going to the market enroute to their houses in the afternoon).

Travel patterns can also be influenced by sociocultural practices (e.g., men usually escort women or the elderly when travelling). According to ADB's Country Gender Assessment in Timor-Leste (2014), customary practices discourage women from traveling long distances. The practice of *barlake* (bride price) also affect women's mobility as walking alone at night is perceived to risk the reputation of women and her family, thereby reducing the *barlake.* In rural areas, women may face forced mobility (e.g., collection of firewood or water) in situations when essential resources that are vital to carry out their daily gender roles are lacking in their area.

As shown in the graphic below, the transport survey results conducted last April 2023 revealed that there are more male respondents (523) who travel alone as compared to female respondents (434). The travel pattern of females is usually described as travelling alone (434) as compared with travelling with companions or someone they need to care (total of 334). The number of females (334) who travel with either a companion or someone they need to care for are generally higher than males (259) which may indicate that more women experience limitations to their mobility than men.

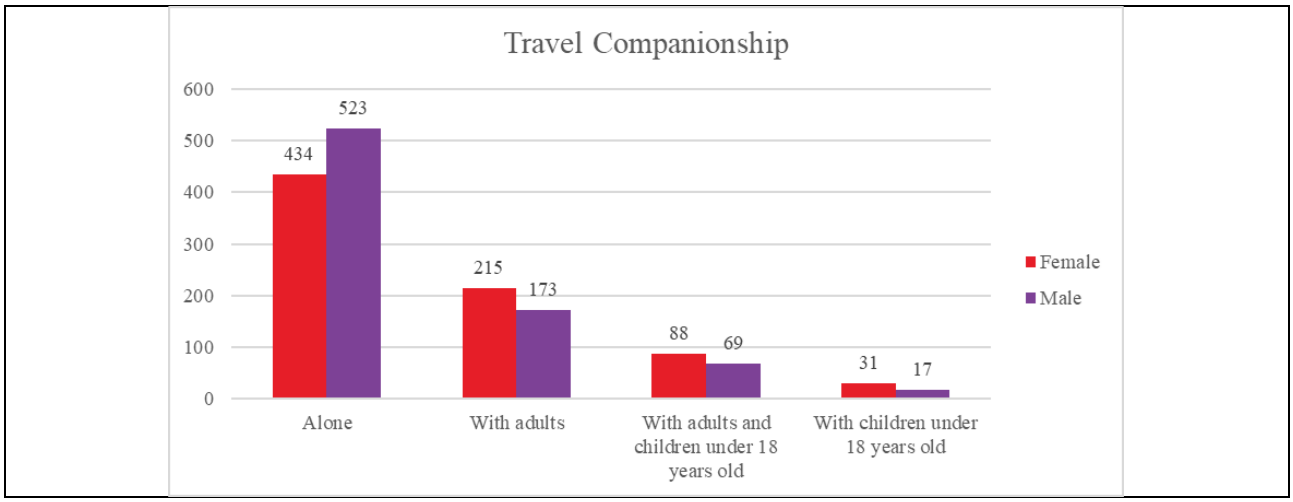


Figure 8-2: Travel Companionship by Sex, 2023 (No. of Respondents)

The planned KIIs FGDs and direct observations are aimed to help understand women's travel patterns which may be used to inform the design of transportation facilities in addressing the identified concerns (e.g., safety and security).

8.4.1.4 Transport Modes

Differences in the modes of transportation of men and women may be caused by the gendered travel pattern which can be seen in the April 2023 transport survey results. The figure below shows that most respondents rely on public transportation (526 females; 434 males) than private transportation (210 females; 328 males), noting that the proportion of men compared to women who use private transportation than public transportation is generally higher.[47] Additional primary information to support this initial data on mode of transportation such as number of women versus men who has license to drive may help understand women's travel mode choice to identify specific features that should be considered in the design to maximize potential benefits for women, as well as the LGBTQI+, children, senior citizens, and persons with disabilities.

[47] Note that public transport interviews conducted for the Public Transport Master Plan in April 2023 were carried out at selected bus terminals, markets, and malls. Thus, representation of respondents by transport modes in this figure may not correspond to overall travel trends by gender. Follow-up consultations such as KII will be conducted to support initial findings on transport use and travel characteristics by social groups.

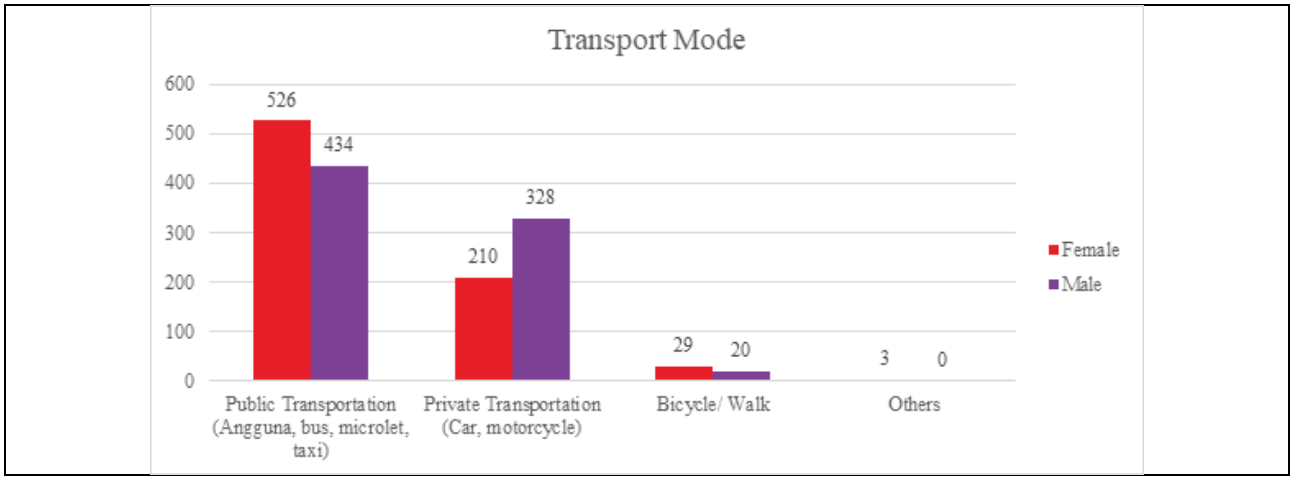


Figure 8-3: Transport Mode by Sex, 2023 (No. of Respondents)

8.4.1.5 Transport Facility Accessibility and Acceptability

Transport infrastructure may be improved to ensure that it is inclusive to all types of users. Improvements such as user-friendly ramps, pedestrian sidewalks, and access roads among others may help contribute to enhance the experience of the commuters. These improvements shall be made to address the needs of the vulnerable users, including women, LGBTQI+, children, the elderly, and persons with disabilities.

The April 2023 transport survey revealed several findings on the acceptability of the respondents to using public transportation. Generally, most respondents would change to public transport if sidewalk facilities were improved, while there is also a notable number of respondents still prefer their current mode of transportation (see the figure below).

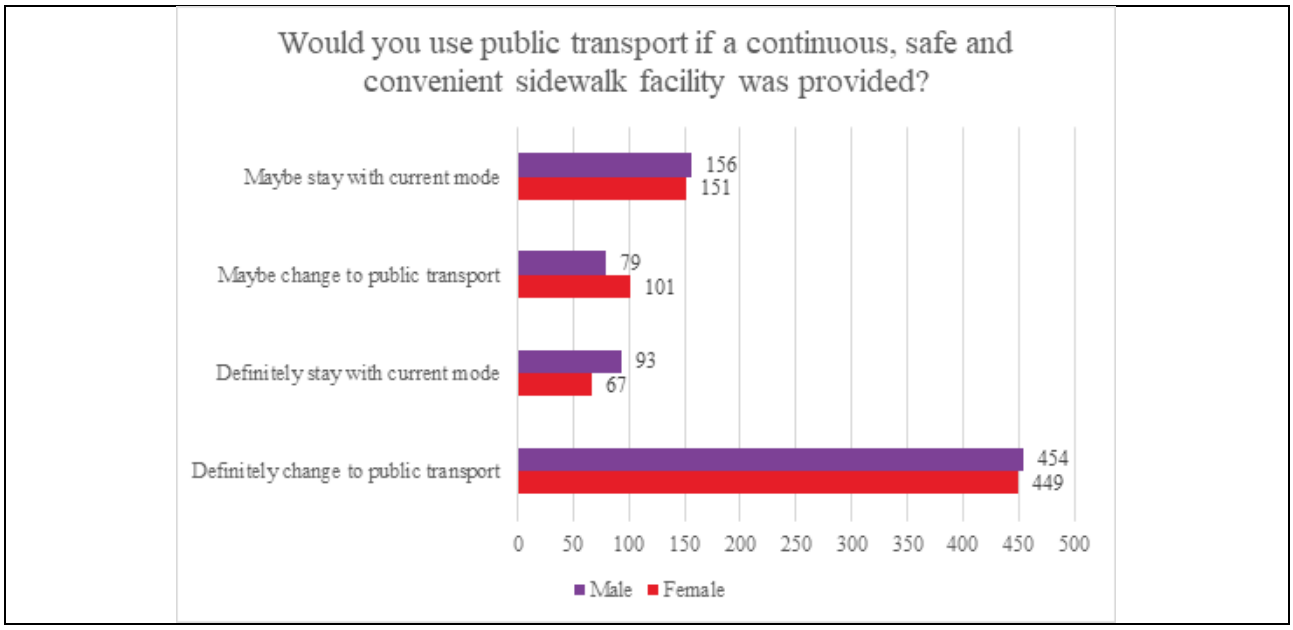


Figure 8-4: Acceptability of safe and convenient sidewalk facility, 2023 (No. of Respondents)

While most respondents prefer to change to public transportation if the walking distance was less than 500m, the number of respondents who are unsure or would prefer to stay in their current mode of transportation is generally high as presented in Figure 8-5. The analysis is similar when respondents were asked regarding their acceptability to change if the public transport system would not require them to transfer to another route (see the same figure).

The primary data from the KIIs, FGDs, direct observations, as well as perception surveys will help understand the varying opinions of the different sectors with regards to the acceptability and access to improved transportation facilities and design.

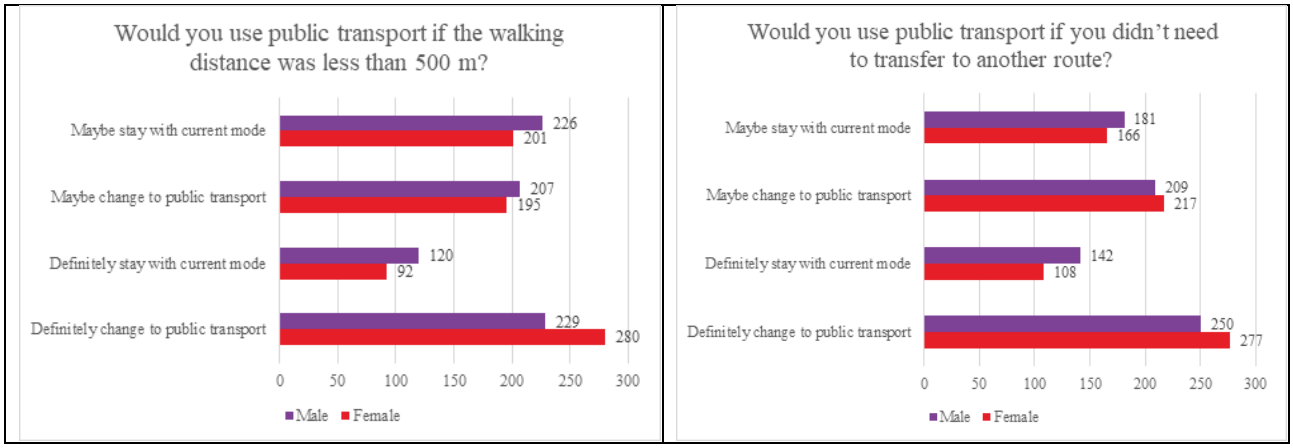


Figure 8-5: Acceptability of walking distance & transfers, 2023 (No. of Respondents)

8.4.1.6 Gender-Based Violence (GBV)/ Violence Against Women and Children (VAWC)

The Preliminary Gender and Inclusion for Timor-Leste (Grameen Foundation, et. al., December 2021) discussed the prevalence of physical or sexual abuse experienced by Timorese women based on the 2016 study wherein 47% of women have experienced these types of violence by their intimate partner. Domestic violence is also experienced by women as described in the same study. The local WAGE partners confirmed that the percentages may be lower now, however, this may be hard to validate as cases of domestic violence are usually underreported.

The project shall be able to provide accessible, inclusive, and safer facilities to ascertain that the vulnerable sector will generally feel safe in commuting during both peak and off-peak hours. The primary data will help support and understand the prevalence of GVB and VAWC, specifically in transport facilities and along the streets. The development of responsible infrastructure to cater the needs of the vulnerable sector can be informed through the proposed FGDs and KIIs.

8.5 Gender Equality and Social Inclusion Action Plan

The results of the complete and comprehensive GESI analysis will help shape the GESI Action Plan (GESI-AP). The plan will present the project's GESI performance indicators and will particularly provide the following:

1. Gender performance indicators of the project Design Monitoring Framework (DMF);
2. Additional gender performance indicators that will help achieve the project's gender-related objectives and targets; and
3. Activities, resources, responsibilities, and timelines for implementation and monitoring to ensure women and men participate and benefit as intended by the project.

8.6 Best Practices on Innovative Measures on GESI

ADB's Gender and Transport Toolkit (2013) has presented several gender entry points to guide transport projects in contributing to gender equality and women empowerment. As stated in the toolkit, a complete gender analysis will be needed to inform the project design of specific interventions to make transport infrastructure and services more responsive to the needs of both men and women. Examples of these interventions include, but are not limited to the following which the project may adopt depending on the results of the complete gender analysis:

Table 8-4: Sample Design Interventions

	Sample Intervention
Safety and security	Well-lit bus stations; separate toilets for male/ female; women-only waiting areas; reserved seating; panic buttons at stations (and buses); safe and accessible pedestrian facilities; security cameras in (all buses) and at all bus stations; adopt/ establish a partnership a digital mobile based app/platform for commuters as data aggregator for policy development and improvement of programs and services — to include prevention of GBV/ VAWC.

Sample Intervention	
Affordability	Ticketing systems for short trips; lower off-peak fares.
Employment	Consideration of alignment along transport corridors that are near or along work location of women or residential areas; set employment targets for women in all project phases; set targets to ensure women's participation in trainings.
Accessibility	Lower height of steps; appropriate height level of handrails; allocated space for baby carriages and shopping; larger capacity female toilets; group traveler ticketing.
Capacity building	Training of public transport staff and police on sexual harassment, response to observed situations of harassment, and how to address complaints from public user; build capacity of implementors on gender issues.

9. Institutional and Governance Arrangements

The 2024 PTMP conducted a comprehensive review of the existing institutional and legal framework (including a review of legal, regulatory, and policy framework governing public transport, assessment of the government's capacity to manage and operate the public transport system, etc.), best practice review on the operation and management of public transport facilities/services in comparable contexts, a gap assessment on institutional / capacity arrangements, recommendations on an operational mode/framework for public transport facilities, and a roadmap for capacity development in line with the proposed operational framework.

The feasibility study builds upon the previous work documented extensively in the 2024 PTMP and focuses on achieving the following objectives:

- Identify key entities and their relevant roles to public transport in particular bus terminals / facilities
- Propose responsibility matrix by entity for bus terminal/facilities development and improvement (i.e., construction, operation, maintenance, and management of bus facilities, as well as fee collection and traffic / safety enforcement)

9.1 Key Entities and Relevance to Public Transport

Based on a review of current roles and responsibilities and the proposed institutional arrangements in the 2024 PTMP, key entities and their relevant responsibilities pertain to public transport are summarized in the table below:

Table 9-1: Key Entities and Relevance to Public Transport

Entity	Key Responsibilities	Public Transport Relevance
Ministry of Transport and Communications (MOTC)	- MOTC's key responsibilities among others include (i) develop policies and draft regulations; (ii) implement and enforce legal and regulatory activities; (iii) coordinate and promote the management, maintenance, and improvement of transport infrastructure; (iv) propose and execute policy guidelines for urbanism, infrastructure, road networks, buildings, and public works; (v) create and implement the legal and regulatory framework for construction; (vi) conserve and repair bridges, roads, river, and sea with a focus on flood control; (vii) prepare and develop the implementation of the national road plan / land development plans, and (viii) coordinate transportation and encourage complementarity between different modes of transport.	- MOTC will be a key stakeholder in planning and guiding the implementation of public transport facilities. - Of note, design and implementation of transport infrastructure works was transferred to the Ministry of Public Works (MPW) in 2018.
National Directorate of Land Transport (DNTT)	- The DNTT operates under the jurisdiction of MOTC and has prime responsibility for land transport management and operations (including issuing driver and vehicle licenses, permits, and ensuring compliance with vehicle conditions). It also oversees essential aspects such as line markings, signage, and road furniture to promote safe navigation throughout the national road system. - DNTT is further responsible for identifying and establishing intercity bus stops, implementing protective measures, and determining the locations of bus laybys. To execute these measures, DNTT collaborates closely with the National Directorate for Roads Bridges and Flood Control (DRBFC), which falls under the Ministry of Public Works. This coordination facilitates the effective implementation of safety and traffic control measures, with DNTT defining the required road safety protocols and traffic control measures before DRBFC carries out their implementation.	- DNTT has prime responsibility for identifying and ensuring the provision of bus facilities including terminals, bus stops, laybys, waiting areas, and appropriate signage (with MPW / DRBFC responsible for actual implementation).
Ministry of Finance (MOF)	- MOF is the central government agency responsible for designing, executing, coordinating, and evaluating the	- MOF will be a key stakeholder in the financing of public

Entity	Key Responsibilities	Public Transport Relevance
	planning and monitoring of the annual budget and public finances. - MOF plays a crucial role in controlling the project budget flow, managing public finance, and coordinating development project funding with other line ministries. - Additionally, MOF is involved in negotiating and managing public-private partnerships (PPP), ensuring financial assessments and risk sharing for the sustainability of projects. - Its expertise in financial matters contributes to the effective implementation of transport initiatives.	transport infrastructure projects and operations and will be a key negotiator if there are any facilities or other initiatives that are to be implemented through PPPs.
Ministry of Interior (MOI)	- MOI is the central government agency entrusted with designing, executing, coordinating, and evaluating policies related to internal security, migration and border control, civil protection, and police cooperation. - The MOI plays a vital role in ensuring the safe operation of road vehicles, with a particular emphasis on enforcement through the national police. - The Government of Timor-Leste has set up the National Directorate of Road Safety (DNSR) under MOI to spearhead its initiatives in improving road safety. - DNSR collaborates closely with DNTT, National Police of Timor-Leste (PNTL), and other government entities responsible for road safety regulations, as well as engaging with a wider group of stakeholders dedicated to reducing road accidents.	- MOI, in conjunction with DNSR coordinate road traffic safety and enforcement – which includes the safe operation of public transport vehicles on the roads and managing traffic concerns or unsafe conditions to maintain a safe public transport system and transport network.
Ministry of Justice (MOJ)	- MOJ is the central government agency entrusted with ensuring the implementation and functioning of justice, law, human rights, and land and property-related matters. - Within the MOJ, the General Directorate of Land and Property (Direção Geral das Terras e Propriedades or DGTP) is responsible for executing, coordinating, and evaluating policies concerning land and property. - This includes the administration and management of immovable property for both public and private domains, maintaining an information system on state property, and providing geospatial information for effective land control. - The MOJ and DGTP play a crucial role in upholding legal frameworks and safeguarding land and property rights within the transport sector.	- As the regulatory framework and capacity to regulate the public transport system develops in Timor-Leste, MOJ will have a role in evaluating and upholding legal frameworks. - Additional DGTP within MOJ will coordinate land requirements for public transport facilities.
Ministry of Planning and Territory (MOP)	- MOP is the central government body responsible for the design, management, and evaluation of urban planning policies aimed at promoting economic acceleration and social development through strategic planning, integrated planning, and rationalization of financial resources. - The ministry also oversees the implementation of Strategic Development Plans, with a particular focus on infrastructure, urban planning, mining, and spatial planning. - MOP holds authority over the national planning agency and the Major Projects Secretariat. Collaboration between DNTT and MOP is essential for the successful implementation of the National Road Plan. - Within MOP, the General Directorate of Territorial Planning (GDTP) is responsible for spatial planning and the implementation of national spatial planning policies, encompassing territorial, urban, and coastal planning, as well as geospatial and cartographic information management	- MOP will coordinate strategic integrated planning that integrates public transport and broader Urban Master Plans – they play a crucial role in ensuring integration between public transport and the urban environment. - MOP also set broader urban policy targets which can be aligned with public transport.
Agência de Desenvolvimento Nacional (ADN) or National	- Established under Decree Law 2011, ADN operates under the authority of the Prime Minister, while being supervised by the Minister for Planning and Investment. - Its primary responsibilities encompass the review of capital development projects, assessing their cost benefits through	- ADN will be a key stakeholder in the delivery of any major public transport facilities and major

Entity	Key Responsibilities	Public Transport Relevance
Development Agency	comprehensive analysis. ADN also plays a pivotal role in monitoring project implementation and execution by employing a quality certification system. - These endeavors contribute to the efficient utilization of financial resources, fostering national development, and promoting economic activities at both the national and local levels.	infrastructure relating to the public transport system, playing a monitoring and certification role as the projects proceed.
Major Projects Secretariat (MPS)	- Established under Decree Law No. 8/2011, MPS provides technical and administrative support to the Council for the Administration of the Infrastructure Fund (CAFI). - Its key roles include conducting preliminary and formal evaluations of projects for funding from the Infrastructure Fund, considering both technical and financial aspects. MPS also handles project scheduling and returns, performs secretarial duties during CAFI meetings, drafts meeting minutes, and prepares releases on behalf of CAFI. - Additionally, MPS reports its activities to the Council of Ministers monthly, ensuring effective project management and communication.	- MPS will provide support to CAFI for any major public transport facilities or infrastructure projects – including evaluation of projects for their benefits.
Ministry of Public Works (MPW)	- MPW is the central government agency tasked with the design, implementation, coordination, and evaluation of policies (approved by the Council of Ministers) in various areas, including public works for roads, bridges, flood control, urban planning, housing, water supply distribution/management, sanitation, and electricity. - Within the road sector, MPW serves as the primary agency responsible for studying, planning, and executing construction projects for the protection, conservation, and repair of roads and bridges. - Under MPW, the DRBFC is specifically responsible for the planning and development of the national road network, encompassing national roads, municipal roads, urban roads, and rural roads. - As part of road construction, MPW is also responsible for providing facilities along the roads that can be utilized for public transport services. - Note that DNTT controls the provision of facilities including terminals in Dili and in municipalities outside Dili, on route laybys and waiting areas and appropriate signage. - In addition to terminals, DNTT also holds the responsibility of identifying and designating on-route stops for each route. - Once the need for these stops has been specified, DNTT collaborates with DRBFC to design the on-route stops into new road construction or upgrades or retrofit existing roads that lack adequate public transport facilities with the necessary on-route stops.	- MPW will implement road-based public transport infrastructure initiatives such as bus stops or bus lanes. - They will coordinate closely with DNTT and MOTC who will provide planning input, however MPW will ultimately deliver the initiatives and maintain on-road initiatives. - MPW are also responsible for general road quality, which is an important aspect of public transport reliability.
National Procurement Commission (NPC)	- Established under Decree Law 14/2011, NPC operates under the Minister of Planning and Investment. - Its primary responsibility is to manage all public procurement exceeding a value of US$1 million. - The NPC has a twofold mandate: (i) to provide procurement services to line ministries and other public entities involved in major infrastructure projects, and (ii) to ensure transparency in the state procurement process. - Following a thorough review and approval, the NPC assumes responsibility for overseeing capital procurement activities.	- NPC will be responsible for the procurement of suppliers (both designers and construction contractors) for the delivery of public transport projects, providing a transparent assessment of proposals.
National Police of Timor-Leste (PNTL)	- The National Command of Operations, under the General Command of PNTL, is responsible for making decisions and executing actions related to public security.	- PNTL play an integral role in managing road safety. Public transport

Entity	Key Responsibilities	Public Transport Relevance
	- Within the National Command of Operations, there are various units and services, including the Traffic and Road Safety department. - The Traffic and Road Safety Unit has a specific mission to ensure order and public security in various areas such as roads, ports, airports, and transport terminals. - They are responsible for policing access roads, protecting passengers and goods in different modes of transportation, enforcing laws and regulations related to vehicle and pedestrian movement, organizing traffic flow, preventing road accidents, conducting road surveillance, defining road signage and markings, promoting road safety campaigns, and educating citizens about traffic laws.	is a key mode within the road-based transport system in Timor-Leste and therefore PNTL should be actively involved in policing public transport operators and other road users to ensure passenger safety
Municipality	- Municipality of Dili has unique roles over existing Taibessi Terminal where they operate/maintain the terminal and collect fees (such as entry and parking). Apart from this, the municipality is also responsible for collecting parking levies.	- Municipality may play a vital role in collecting fees for bus terminal operation and management, though coordination with DNTT and other relevant agencies required.

9.2 Proposed Responsibility Matrix

The table below summarizes the roles and responsibilities for key entities relating to key public transport functions in particular for bus terminals/facilities (i.e., planning, constructing, operating / maintaining, managing, collecting fees/levies) – using the Responsible, Accountable, Consulted, and Informed framework as follows:[48]

- **Responsible** – Those who do the work to achieve the task (others can be commissioned or delegated to assist or support);
- **Accountable** – Those who approve/sign off, either technical or budgetary terms, on key outputs, performance, or desired outcomes;
- **Consulted** – Opinions are sought throughout the planning and delivery stage or may be involved in implementation/operation. Likely to be two-way communication; and
- **Informed** – Those who are kept up to date on progress, on a specific or general basis on completion of the task or function. Likely to be one-way communication.

[48] The overarching institutional framework and assessment was conducted in Section 3.5 in the 2024 PTMP.

Table 9-2: Proposed Responsibility Matrix for Envisioned Bus Terminal Functions

Key Functions Related to Public Transport	Description	MOTC	DNTT	MOF	MOI	MOJ	MPW	MOP	AND (Under MOP)	MPS (Under MOP)	NPC	PNTL	Muni-cipality	Notes
Vision and Strategy	- Formulation of public transport vision, strategies, and plans	R	A	C	C	C	C	C	C	C	C	-	C	- MOTC has prime responsibilities over planning and guiding the implementation of public transport facilities
Budget & Financing	- Planning and monitoring of annual budget and finances	A	A	R	-	-	-	-	-	-	C	-	C	- MOF plays a crucial role in controlling the project budget flow and managing public finances - MOF involved in negotiations if initiatives are implemented through public-private partnerships (PPP) - Coordination with NPC required for procurement
Facility Planning	- Planning of bus terminals and investment plans	R	A	C	C	C	C	C	C	C	C	-	C	- Primary planning roles of bus terminals fall under MOTC / DNTT with various inputs from other ministry lines
Facility Design and Construction	- Design and construction of bus terminals	R	A	I	I	A	A	I	I	I	I	-	I	- Coordination with MPW required over road-based public transport infrastructure - Coordination with MOJ required over land requirements & property rights for public transport
Facility O&M and Management	- Operation, maintenance and management of bus terminals	A	R	-	C	-	C	C	-	-	-	-	C	- Coordination between ministries / departments required over safe operation and managing traffic concerns - Coordination with MOP may be required in ensuring integration between bus terminals and surrounding urban environment - Coordination with MPW may be required in ensuring quality access roads
Road-Based Planning	- Planning of on-street interchange (as part of road infrastructure)	R	A	C	C	C	A	C	C	C	C	-	C	-
Road-Based Infrastructure Provision	- Design and construction of on-street interchange (as part of road infrastructure)	R	A	I	I	A	R	I	I	I	I	-	I	- Close coordination required between MOTC and MPW over provision of on-street public transport facilities - Coordination with MOJ required over land requirements & property rights for public transport

Key Functions Related to Public Transport	Description	MOTC	DNTT	MOF	MOI	MOJ	MPW	MOP	AND (Under MOP)	MPS (Under MOP)	NPC	PNTL	Muni-cipality	Notes
Road-Based O&M and Management	- Operation, maintenance and management of on-street interchange (as part of road infrastructure)	A	R	-	C	-	C	C	-	-	-	-	C	- Coordination between ministries / departments required over safe operation and managing traffic concerns - Coordination with MPW may be required in ensuring quality bus stops/shelters, bays, and other passenger amenities.
Fare Collection [A]	- Collection of fees / levies for bus terminal O&M and management	A	R	C	-	-	-	-	-	-	-	-	R	- Regulatory / policy changes may be required to institute new fare collection schemes - Coordination with other entities such as operators and municipality (as warranted) may be required to manage collection of levies from fare revenue, commercial rental, advertisement, and on-street parking.
Traffic Management and Enforcement	- Enforcement of traffic and road safety	C	R	-	A	-	C	-	-	-	-	C	C	- Coordination required between DNTT, DNSR, PNTL, and other government entities responsible for traffic and road safety
Monitoring and Outcomes	- Monitoring of bus terminal O&M and management against target performance and outcomes	A	R	-	-	-	-	-	-	-	-	-	C	- No monitoring mechanism in place currently - Monitoring the performance of the public transport system and measuring outcomes against policy goals and contractual agreements
Supplier Procurement	- Procurement of services and goods	A	C	C	-	-	-	-	-	-	R	-	C	- Coordination with NPC required over procurement

Abbreviations: R – Responsible; A – Accountable; C – Consulted; and I – Informed.

Notes:

[A] Roles and responsibilities of entities in regard to fare collection will be further fine-tuned upon reflecting feedback from the government agencies.

10. Options Analysis

This section presents an options analysis to address observed issues and explore other potential solutions (besides developing new bus facilities) to support informed investment decisions. Such options include:

- **Option#1: Regulation and Enforcement** – This option explores the potential of enhancing safe operations in the terminal through better regulation and enforcement.
- **Option#2: Innovative O&M Contracting** – This option aims to address the lack of quality maintenance at the terminal through innovative O&M contracting.
- **Option#3: Retrofitting Facilities** – This option considers cost effectiveness of retrofitting existing bus terminals/facilities compared to building new facilities. Retrofitting involves modifying existing structures to meet current standards and accommodate new technologies, while new construction entails building from the ground up.

These options are analyzed to address the key operational and facility/amenity issues observed at the bus terminal/facilities (as identified in Section 1.4). Each option is evaluated based on its applicability to the issues with rating of **High**, **Moderate**, and **Low** along with implications for the evaluation.

A summary of options analysis and evaluation are presented in Table 10-1, with a matrix of issues and options with evaluation highlighted in Table 10-2. Of note, Option#1 (Regulation and Enforcement) and Option#2 (Innovative O&M Contracting) can both address operational and infrastructure issues to some extent through proper enforcement and operation/maintenance compliance as part of O&M contracting. However, these two options cannot address infrastructure issues thus should be treated as complementary to support infrastructure investments. Option#3 (Retrofitting Facilities) can address operational and infrastructure issues partially but not as a whole. Existing sites (such as Becora) lack essential facilities (such as designated loading/unloading bays, layover spaces, circulation areas) and passenger amenities in compliance with standards. It is considered more cost effective to build new facilities ensuring operational efficiency, safety, and better passenger experience at the core of bus facility schemes/design.

Table 10-1: Summary of Options Analysis and Evaluation

Option	Overall Applicability	Implications
Option#1: Regulation and Enforcement	High	Regulations and enforcement are effective for addressing operational issues like safety, queuing, and access control but limited in addressing physical infrastructure gaps directly. Furthermore, a regulatory framework and enforcement mechanisms to enforce safe and efficient operations are currently not in place.
Option#2: Innovative O&M Contracting	High	Contracting combines operational improvements with maintenance and incentivizes compliance, though fully addressing physical issues requires building / upgrading facilities.
Option#3: Retrofitting Facilities	Moderate	Retrofitting directly addresses infrastructure gaps, particularly for facility/amenity issues. However, existing sites (such as Becora) lack essential facilities (such as designated loading, unloading, and layover spaces) and passenger amenities in compliance with standards (no standards exist currently). It is considered more cost effective to build new facilities as a whole ensuring operational efficiency, safety, and better passenger experience.

Note: Evaluation of applicability is based on a 1-3 scoring scale (1 = Low, 2 = Moderate, 3 = High). No weighting is assumed. A total composite score for this overall applicability is 36 where Low is given to scores lower than 12, Moderate between 13 and 24, and High between 25 and 36. The total composite score of each option is as follows: Option#1 = 28 (High), Option#2 = 29 (High), and Option#3 = 20 (Moderate).

Table 10-2: Matrix of Issues and Relevance of Options Analysis

Issue Type	Key Issues	Current Situation	Option#1: Regulation and Enforcement	Option#2: Innovative O&M Contracting	Option#3: Retrofitting Facilities
Operational	Safety of Passengers	Current operation around the terminal (i.e., loading/unloading at the perimeter parking space, clockwise operation with doors on the left) require passengers to walk through circulation areas for boarding/alighting a vehicle and cross active roadways creating potential conflicts with vehicles.	**High** – Laws / regulations can mandate designated pedestrian and vehicle circulation areas and enforce compliance of operators/ drivers to enhance safety.	**Moderate** – O&M contracts can incorporate safety improvements and monitoring mechanisms, but implementation depends on operators and agencies.	**Low** – Retrofitting existing facilities (only Becora with some facilities) may improve some physical areas, but it doesn't address enforcement or operational behavior directly as vehicle and passenger functions are not physically separated currently.
	Unsafe Operations within Terminal	Vehicles spaces (loading, unloading and layover) are not orderly designed with some vehicles making back-up movements to enter/leave the space	**High** – Enforcement can ensure orderly vehicle movement and eliminate unsafe practices such as backing into spaces.	**High** – O&M contracts can incentivize proper vehicle operation (or penalize) through performance-based criteria.	**Moderate** – Retrofitting can redesign layouts/design to reduce unsafe operations, but this depends on enforcement for maximum impact.
	Layover / Queuing for Passengers on Circulation Areas Within Market	No designated space for each mode is provided at existing terminals which may be confusing to passengers and also results in potential conflicts between modes.	**Moderate** – Regulations can assign designated spaces for each mode, but enforcement may be challenging as *keliling* is a common practice to collect more passengers (as revenue directly linked to number of passengers).	**High** – Contracts can include requirements for clear queuing systems with designated spaces for each mode (along with penalties for occupying circulation areas for pickup/drop-off).	**Moderate** – Retrofitting can help create designated queuing areas (and loading / unloading areas), but it requires significant upfront investment (and no less cost efficient compared to building new facilities).
	Bus Facilities Used by Mixed Modes	Non-designated vehicles (such as private vehicles, motorbikes) are allowed to enter the site which add more congestion to the site and results in delays to microlet/regional bus.	**High** – Enforcement can restrict access for non-designated vehicles other than permitted public transport vehicles to reduce congestion and delays.	**Moderate** – Contracts can include access control provisions (such as signage, gate control), but enforcement may still be required.	**Low** – Physical retrofits can help limit access, but operational enforcement is still necessary to prevent violations.
	Lack of Maintenance/ Cleaning Inside Terminal	The passenger waiting areas, floor, and the facility are not regularly cleaned with discarded trash and litter observed around the facility (thus leading to unattractive waiting environment) and have limited maintenance based on their deteriorated conditions.	**Moderate** – Regulations can mandate minimum maintenance standards, but compliance may vary. Monitoring mechanism need to be instituted to ensure such compliance.	**High** – O&M contracts can include regular cleaning and maintenance requirements with penalties for non-compliance.	**Low** – Retrofitting doesn't directly address lack of maintenance and cleaning issues.
	Vehicles Blocking Bus Stop Hindering Efficient Operation	Trucks and other non-public transport vehicles were observed parking in the designated bus stop/ loading areas, blocking public transport vehicles from directly accessing the stop. This also forces passengers to access the vehicles from outside the bus stop area (and possibly enter the active roadway).	**High** – Enforcement can penalize non-public transport vehicles parking at bus stops, ensuring safe and efficient operation for public transport and creating an accessible environment for passengers.	**Moderate** – Contracts can include monitoring and reporting mechanisms to address blockages, but impact is limited as blockage of such designated space by private vehicles is beyond control of operators/drivers. Strict enforcement is required.	**Low** – Retrofitting bus facilities/stops won't prevent vehicles from blocking them unless coupled with enforcement.

Issue Type	Key Issues	Current Situation	Option#1: Regulation and Enforcement	Option#2: Innovative O&M Contracting	Option#3: Retrofitting Facilities
Facility / Amenity	Dirt Surfacing and Lack of Pedestrian Crossing Markings	The facility has unpaved sections (e.g., access roads near the entry gate, potholes within the site) which affect passenger experience and operation efficiency. In addition, the surfacing can be muddy during rain, soiling clothes of pedestrians / users passing by	**Moderate** – Regulations can mandate minimum standards for pavement (such as concrete) and provision of crossings, but this requires direct investment in infrastructure.	**Moderate** – O&M contracts can include maintenance of pedestrian crossings, but this doesn't address initial infrastructure gaps.	**Moderate** – Retrofitting can directly address unpaved surfaces and add well-designed pedestrian crossings (with access for all elements), improving safety and experience of passengers. However, this needs to be integrated with overall bus terminal / facility improvements.
	Limited Provision of Passenger Amenities	There is limited provision of passenger amenities creating unattractive waiting environment. Some sites such as Becora have buildings with covered facilities, but these are poorly maintained and not safe/comfortable for passengers.	**Moderate** – Regulations can mandate minimum standards for amenities, but this requires direct investment in infrastructure.	**High** – Contracts can incentivize provision and maintenance of passenger amenities, ensuring a more attractive environment for passengers.	**Moderate** – Retrofitting can improve amenities, but cost constraints and maintenance issues need to be considered. However, this needs to be integrated with overall bus terminal / facility improvements.
	No Road Markings for Vehicle Navigation & Pedestrian Crossing	There is limited provision of road markings to navigate vehicles in an orderly manner and safe crossing environments for pedestrians. This endangers both drivers as well as passengers accessing the site.	**Moderate** – Regulations can mandate minimum provisions / standards for road markings for vehicles and crossings for pedestrians, but this requires direct investment in infrastructure.	**Moderate** – Contracts can include performance-based incentives to maintain visible road markings and strict compliance of drivers to follow marked areas for vehicles.	**Moderate** – Retrofitting can directly create proper markings and crossings, leading to immediate safety improvements. However, this needs to be integrated with overall bus terminal / facility improvements.
	Deteriorating Roads on Access Road	Access roads leading to/from the terminals are deteriorating with poor maintenance (as many potholders observed) affecting vehicle operation and posing safety issues.	**Moderate** – Regulations cannot address physical deterioration, but this requires direct investment in infrastructure.	**Moderate** – O&M contracts can include requirements for road repairs and maintenance. Demarcation of responsibilities between bus terminal operators and road agencies must be clarified.	**Moderate** – Retrofitting directly addresses road deterioration, improving safety and operational efficiency. However, this needs to be integrated with overall bus terminal / facility improvements.
	Minimal Provision of Lighting & Covered Facilities	While there is limited provision of lighting within the waiting area, lighting is dim in the parking lot where the majority of vehicles load/unload. This can cause visibility and safety issues when passengers cross active circulation areas.	**Moderate** – Regulations can require a minimum standard for lighting and covered facilities, but this requires direct investment in infrastructure.	**High** – Contracts can include provisions for lighting upgrades and maintenance of covered areas, improving the user experience.	**Moderate** – Retrofitting can immediately address these deficiencies by installing proper lighting and covered facilities (with immediate impact on user safety and security). However, this needs to be integrated with overall bus terminal / facility improvements.
	Lack of Access-for-All Facilities (i.e., Ramps for Disabled People)	Access-for-all facilities such as tactile paving, ramps, wheelchair facilities are also lacking in particular considerations for disadvantaged social groups such as elderly and disabled people.	**Moderate** – Regulations can mandate inclusive design, but this requires direct investment in infrastructure.	**Moderate** – Contracts can include incentives to maintain access-for-all facilities, but retrofitting is still required initially.	**Moderate** – Retrofitting can directly address physical barriers to accessibility, improving inclusiveness for disabled users. However, this needs to be integrated with overall bus terminal / facility improvements.

11. Risk Assessment

This section provides an overview of potential risks to implement the project – including technical risk (based on site assessment and facility design/scheme study), financial uncertainties, safeguard risks (including environment and social), legal and institutional risks, and other unforeseen events. Such risks are assessed by site or as a whole project depending on the scale/applicability of risks.

11.1 Risk Assessment Framework

A risk assessment framework to guide evaluation of potential risks to implement the project is summarized as below:

- **Technical Risk**s – this risk entails site-level operational/facility design considerations (i.e., terminal facilities, passenger amenities, loading/unloading space, etc.) in compliance with standards.
- **Legal / Regulatory Risks** – this legal/regulatory risk is applicable to the project as a whole as introduction of new laws, amendments, and orders can impact the scope/timeline of the project (including unclear ownership of lands which could increase the project cost).
- **Institutional / Governance Risks** – this institutional risk is applicable to the project as a whole as changes in the government administration could impact the scope/timeline of the project (including any changes/updates to responsibilities of government agencies involved in public transport).
- **Financial Uncertainties** – this risk is partially discussed in Section 5 (Financial Viability Assessment) that looks at financial viability of the project based on capex, opex, and repex as well as the government budget to support the project.
- **Social Risks** – this social risk includes due consideration of affected people and socially disadvantaged groups at the site level ensuring their voices are incorporated in the project design.
- **Other Unforeseen Events** – other unforeseen events may include natural disasters (in particular Dili is located on low-lying areas facing the ocean with multiple river channels in the city), pandemic, etc.

11.2 Revenue

11.3 Risk Assessment, Mitigation Strategies, and Contingency Plan

The results of risk assessment are presented in the table below. In short, by proactively addressing these risks through careful planning and stakeholder engagement, the feasibility project can enhance its resilience and improve the likelihood of successful completion. Regularly reviewing and updating risk management strategies will also be crucial as the project progresses.

Table 11-1: Risk Assessment, Mitigation Strategies, and Contingency Plan

Risk Category	Implications	Mitigation Strategies	Contingency Plan
Technical Risks	• Inadequate design may lead to operational inefficiencies, user dissatisfaction, and non-compliance with standards. • Potential delays and increased costs due to redesigns or modifications.	• Conduct comprehensive site assessments and engage with experienced architects and engineers to ensure compliance with all relevant standards (both local and international if no such standards available in local context).	• Prepare budget for potential cost changes (contingency) if initial plans do not meet operational or regulatory requirements. • Prepare alternative design options if needed to accommodate any future changes during detailed engineering design stage.

Risk Category	Implications	Mitigation Strategies	Contingency Plan
Legal / Regulatory Risks	• New laws or amendments may extend project timelines and increase project costs. • Changes in design, site boundary, or location may involve land ownership issues. • Possible legal challenges could arise, delaying project approval and implementation.	• Establish a compliance monitoring system to ensure adherence to legal requirements throughout the project lifecycle. • Develop a clear land acquisition plan (as warranted), including negotiations with landowners and securing necessary permits in advance.	• Establish clear roles / responsibilities among relevant government agencies over terminal construction, O&M, management, etc. • Allocate a buffer in the project timeline and budget to address potential legal challenges and land acquisition delays.
Institutional / Governance Risks	• Changes in government administration may result in shifting priorities or responsibilities, impacting project continuity and support. • Potential for reduced funding or changes in oversight that may affect project scope.	• Identify key stakeholders and decision-makers within government agencies to facilitate communication and collaboration. • Engage in advocacy efforts to maintain project visibility and support within changing political contexts.	• Develop a communication plan to manage stakeholder expectations and maintain transparency throughout the project lifecycle.
Financial Uncertainties	• Fluctuations in capital and operational expenditures can threaten financial viability and lead to project delays and increased costs. • Dependence on government budgets may introduce uncertainty in funding availability.	• Utilize financial modeling and forecasting to identify potential funding gaps and plan accordingly. • Explore multiple funding avenues, such as public-private partnerships, grants, or alternative financing to minimize reliance on a single source.	• Establish a financial reserve or seek alternative funding sources to mitigate potential shortfalls. • Explore private sector participation in bus terminal O&M, management, etc.
Social Risks	• Ignoring the needs of affected populations can lead to community opposition, project delays, and reputational damage. • Failure to engage socially disadvantaged groups may exacerbate inequities.	• Implement a robust community engagement strategy to involve local residents and affected groups in the planning process. • Conduct social impact assessments to identify and address the needs and concerns of vulnerable populations. • Establish channels for ongoing feedback from the community to ensure their voices are heard throughout the project.	• Create a social impact mitigation plan that includes resources for addressing community concerns and grievances.
Other Unforeseen Events	• Natural disasters, pandemics, or other unexpected events can severely disrupt project timelines and increase costs.	• Conduct a detailed risk assessment to identify potential natural disasters specific to the project area and plan accordingly. • Incorporate resilience measures into the design.	• Allocate a buffer in the project timeline and budget to address climate change impacts. • Prior to bus terminal operations, develop an emergency response plan that includes safety protocols, communication strategies, recovery plan, training, etc.

12. Phasing Plan

This section presents a phasing of the selected ten bus facilities to ensure successful implementation of the project considering various elements such as government plan/priorities, strategic importance, site conditions, budget and financial situation, government capacity, etc. As a starting point, the ten facilities are delineated into two phases, Phase 1 (2027-2028) and Phase 2 (2028-2029), with 2030 assumed as full opening of all bus terminals/ on-street interchanges across the country. Note that this initial phasing plan will be further reviewed and fine-tuned based on stakeholder feedback.

Table 12-1: Phasing Plan of Ten Bus Facility Sites

#	Facility Site	Proposed Phase	Rationale / Note
1	Dili Convention Center	Phase 1 (2027-2028)	• This site sits at the heart of Dili City and is currently used by various microlet routes. Improving this site first will have a strategic importance to the public as it can bring immediate and tangible benefits to users. The initial investment cost is lower given on-street interchange.
2	Becora Terminal	Phase 1 (2027-2028)	• Becora is an existing site and serves as the east gateway to municipalities in the east such as Becora. Improving this site is a stepping-stone to developing other facilities in the east.
3	Tibar Terminal	Phase 2 (2028-2029)	• Tibar Terminal will serve as the west gateway connecting municipalities in the west. Surrounding areas have not been developed as of today and future developments may impact its location. The site is assumed as public land but is not secured at this stage. Thus, this site can be developed at a later stage (Phase 2) to ensure integration with surrounding environments to maximize synergy effects.
4	Manleuana Market	Phase 1 (2027-2028)	• Manleuana will serve as the south gateway and its land is already secured by the government. Given strategic importance of this site (adjacent to Manleuana Market) and potential to create revenues from surrounding environments, this site can be designated as Phase 1.
5	Hera Terminal	Phase 2 (2028-2029)	• Hera Terminal is the second east gateway terminal (outside of Dili City area) and will accommodate reginal buses in the future. This can be developed after Becora Terminal.
6	Aldeia Samalakuliba	Phase 1 (2027-2028)	• This site in Baucau is a major bus terminal connecting populace in the eastern municipalities to Dili. Among regional sites, this location should be prioritized to ensure improving regional connectivity between Dili and Baucau / other municipalities in the east.
7	Maliana	Phase 2 (2028-2029)	• An on-street interchange is proposed at this regional site. Given the strategic importance of developing Dili as a transport hub for regional connectivity, this site can be developed at a later stage (Phase 2), though its priority depends on the government decision given lower cost investment.
8	Suai Market	Phase 2 (2028-2029)	
9	Lospalos Bemoris	Phase 2 (2028-2029)	
10	Viqueque City Center	Phase 2 (2028-2029)	

Note: Priority between Tibar Terminal and Manleuana Terminal can be reversed based on government priorities and plans.

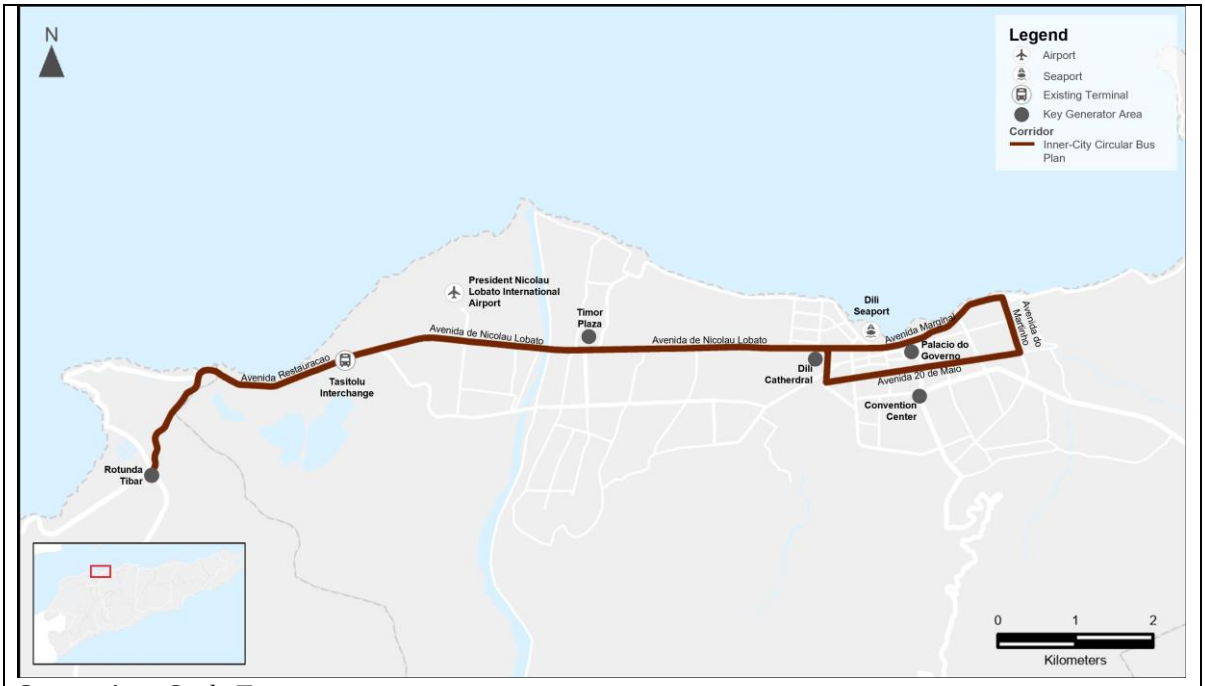
13. Supporting Public Transport Reform Programs

As noted in Section 1.4 in the rationale/objectives of this study, this feasibility study report includes six supporting public transport reform programs (coupled with the main bus terminal/facilities development and improvement) to develop and expand a quality public transport system for the Timorese with a focus on Dili, the capital of Timor-Leste. These supporting public transport reform programs include: (i) Dili Pilot Bus Project; (ii) Public Transport Fare and Fare Structure Modelling; (iii) Traffic Management Study to Improve Public Transport Operations; (iv) Stringent Emission Standards for Public Transport Vehicles; (v) Hybrid Courier Service Model; and (vi) Microlet Operation Framework. For each program, the section consists of observed issues, approaches, key findings, proposed enhancements, and indicative cost estimates to pave the way for modernization of Dili's public transport system.[49]

13.1 Dili Pilot Bus Project

13.1.1 Background

During the ADB Mission in April/October 2024, the Minister of MOTC expressed the interest in introducing a pilot bus program along the major east-west corridor (Ave. de Nicolau Lobato) connecting Rotunda Tibar with the city center (as shown in Figure 13-1). This pilot program is expected to result in reduced congestion, safer travel, scheduled services, improved facilities, and more importantly this will be a showcase to demonstrate a modern and innovative transport system to residents of Dili. A preliminary pilot bus assessment was conducted building upon the previous work conducted during the preparation of the 2024 PTMP.



Source: Arup Study Team
Notes: The route alignment is indicative based on the Minister's concept.

Figure 13-1: Proposed Pilot Bus Corridor

13.1.2 Objective of the Pilot Bus Project

As noted in Section 1.4 (Rationale and Objectives), the objectives of this pilot bus program are highlighted as follows:

- **Public Willingness to Travel on City Bus** – Currently city bus doesn't exist in Dili, with many residents relying on microlet or other modes of travel such as motorbikes and private vehicles. A major objective of this pilot program is to seek and test public's willingness to travel on city bus which will

[49] High-level assessment was conducted in this report. Further investigations and separate working papers will be prepared after this report.

offer a new travel experience to citizens with scheduled services, modern transport system, enhanced passenger amenities, etc. If the pilot demonstrates positive reception and demand, there is opportunity for scaling up the service with more routes and services, ensuring the project meets the needs of the community.

- **Creating Momentum for Attractive Public Transport System** – The on-going bus terminal development project has created genuine interest in the government to create reliable, efficient, and attractive public transport system to the Timorese. By focusing on service improvements such as this pilot bus project (complementary to bus terminal development), this momentum can lead to increased investment and wider improvements in the overall public transport services and infrastructure – fostering a culture that values public transport.

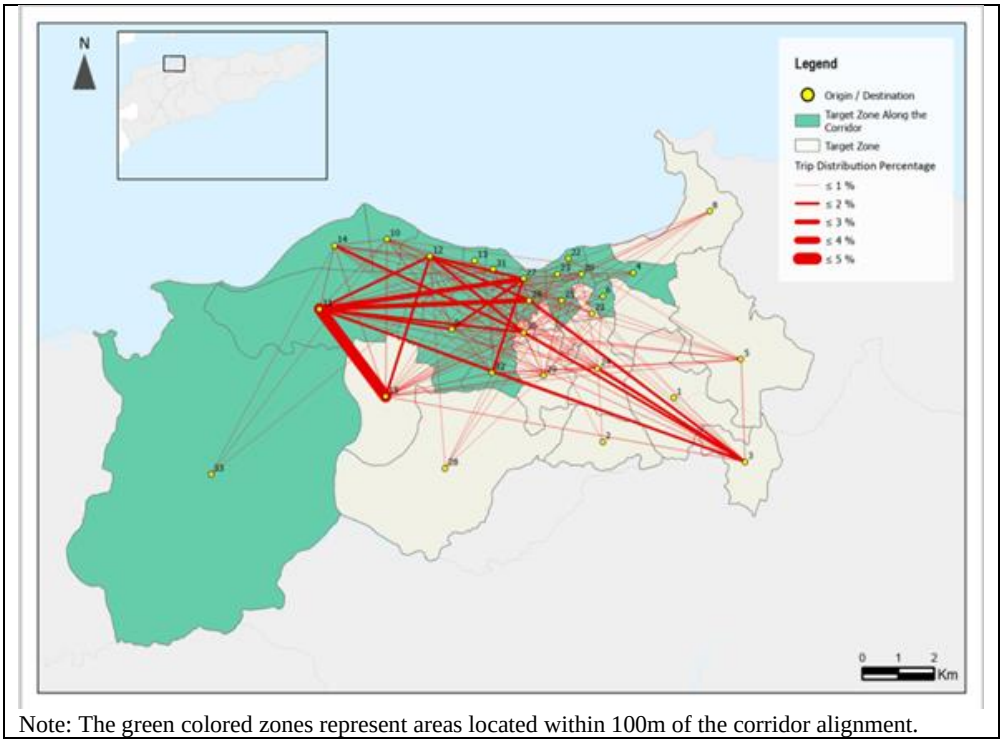
- **Promoting Shift from Private Vehicles to Public Transport** – There is growing population in Dili coupled with higher trip demand, additional vehicles on the road and congestion, etc. Dili city has yet turned into a car-oriented society and there is a huge potential to transform the city into a public transit friendly one where residents have alternative travel options over private vehicles. This project will set the stage to create safe, convenient, inclusive, and accessible public transport for all.

13.1.3 Origin-Destination Travel Patterns

As part of the comprehensive public transport survey conducted in 2023, origin-destination data of some 800 respondents traveling in Dili city were collected.[50] This data was reviewed to support and inform the corridor alignment and pilot bus routing (in addition to other considerations such as government preference, future terminal locations). Of note:

- Some 80% of trips are concentrated along the corridor, with Inside Corridor – Inside Corridor accounting for some 41% of the trips, Inside Corridor - Outside Corridor at 25%, and Outside Corridor - Inside Corridor at 15%.

- Outside Corridor trips only represent some 20% of the trips in Dili with most trips concentrated to/from Becora.



Note: The green colored zones represent areas located within 100m of the corridor alignment.

Figure 13-2: Origin-Destination Travel Patterns in Dili

[50] The overall survey in Dili collected some 1,100 data. Of this, Dili city accounts for some 800 based on the assumed city boundary covering from Liquica in the west (where the west gateway terminal Tibar Terminal is proposed) and Becora in the east before the hill (where existing microlet operation ends). Other zones are assumed as part of the wider Dili Metropolitan Area.

13.1.4 Corridor Extent and Road Profile

The proposed corridor is 25.6 km (both ways), connecting future Tibar Terminal in the west to the city center in the east. After departing Tibar Terminal, the corridor proceeds along several major roads (such as Ave. de Nicolau Lobato) passing thorough Airport Interchange (on-street) and ends the eastbound trip at Tourism Information Center on Ave. Marginal. After this point, the corridor heads to the south along Estr. De Bidau the turns right and continues along R. Jacinto de Candido before turning right at Rua Abilio Monteiro. The corridor then returns to the major road (i.e., Ave. Nicolau Lobato) and continues to the west before ending at Tibar Terminal (as illustrated in Figure 13-3).

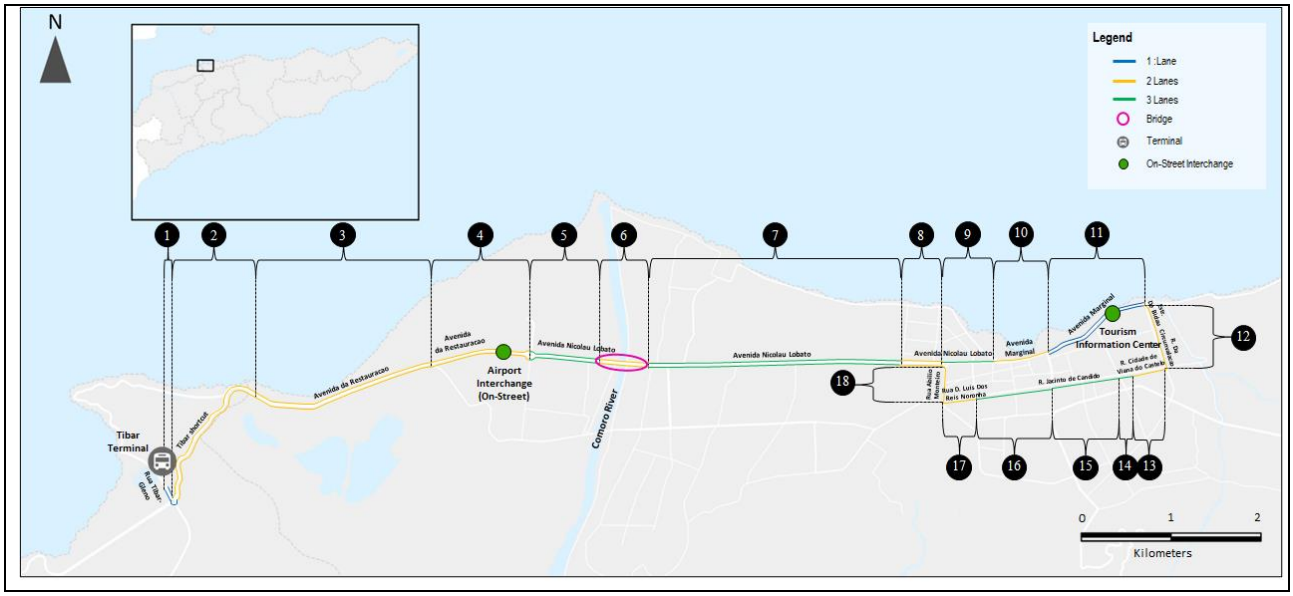
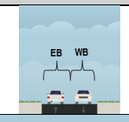
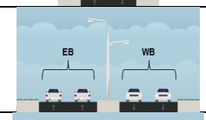
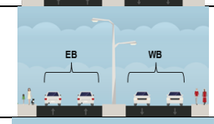
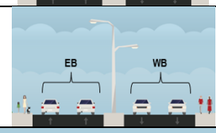
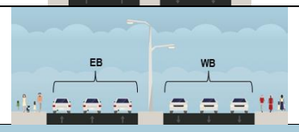
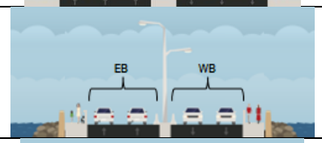
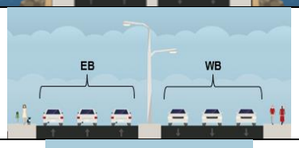
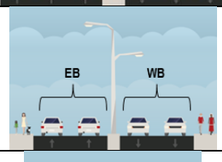
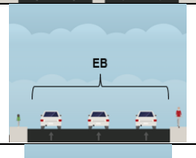
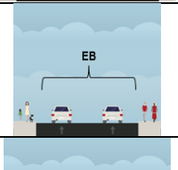
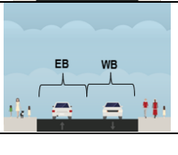


Figure 13-3: Corridor Profile of the Pilot Bus

Much of the corridor operates on national roads, with 2-3 lanes per direction (with some sections in city center on district roads with 1 lane per direction). The corridor passes over a bridge with viaduct over Comoro River with other sections lying mostly on flat roads. The road profile of the corridor is shown in Table 13-1. Of note:

- The corridor can be split into 18 types of road segments. Of these, road segment#7 along Ave. de Nicolau Lobato constitutes some 22% of the entire corridor (two-way), followed by road segment#3 (Avenida da Restauracao) at 16.5% and road segment#2 (Tibar Shortcut) at 13.5%.
- 37% of the corridor has a configuration with 3 lanes or more per direction, with 57% having two lanes and only 6% on one lane.
- 96% of the corridor is classified as having exclusively at-grade and the remaining 4% on elevated viaduct (or bridge).

Table 13-1: Road Profile and Right-of-Way of Dili Pilot Bus Corridor

Road Segment #	Road Name	Type	Total Width of Road (m)	EB/SB					Median		WB/NB					EB/SB Corridor Length	WB/NB Corridor Length	Total Corridor Length	Roadway	Road Direction	Indicative Cross-Section Schematic
				Road Shoulder	Parking Area	# of Lanes	Average Width of Each Lane	Total Width of EB Road	Width of Median	Facilities	# of Lanes	Average Width of Each Lane	Parking Area	Road Shoulder	Total Width of WB Road						
1	Rua Tibar-Gleno	At-Grade	11	2.5	0	1	3	5.5	0	-	1	3	0	2.5	5.5	152	152	304	Two-way	EB/WB	
2	Tibar Shortcut	At-Grade	20.5	2.5	0	2	3.25	9	2.5	Streetlight	2	3.25	0	2.5	9	1729	1729	3,458	Two-way	EB/WB	
3	Avenida da Restauracao	At-Grade	21.5	2.5	0	2	3.5	9.5	2.5	Streetlight	2	3.5	0	2.5	9.5	2102	2102	4,204	Two-way	EB/WB	
4	Avenida da Restauracao	At-Grade	21	2.5	0	2	3.5	9.5	2	Streetlight	2	3.5	0	2.5	9.5	1142	1142	2,284	Two-way	EB/WB	
5	Avenida Nicolau Lobato	At-Grade	22	0.75	0	3	3	9.75	2.5	Streetlight	3	3	0	0.75	9.75	793	793	1,586	Two-way	EB/WB	
6	Avenida Nicolau Lobato	Bridge	15.5	0.75	0	2	3	6.75	2	Streetlight	2	3	0	0.75	6.75	502	502	1,004	Two-way	EB/WB	
7	Avenida Nicolau Lobato	At-Grade	21.5	0.75	0	3	3	9.75	2	Streetlight	3	3	0	0.75	9.75	2805	2805	5,610	Two-way	EB/WB	
8	Avenida Nicolau Lobato	At-Grade	14	0.5	0	2	3	6.5	1	Streetlight	2	3	0	0.5	6.5	488	488	976	Two-way	EB/WB	
9	Avenida Nicolau Lobato	At-Grade	13	1	0	3	4	13	0	-	0	0	0	0	0	563	0	563	One-way	EB	
10	Avenida Marginal	At-Grade	10	1	0	2	4.5	10	0	-	0	0	0	0	0	614	0	614	One-way	EB	
11	Avenida Marginal	At-Grade	10	0.5	0	1	4.5	5	0	-	1	4.5	0	0.5	5	1267	0	1,267	Two-way	EB/WB	

Road Segment #	Road Name	Type	Total Width of Road (m)	EB/SB					Median		WB/NB					EB/SB Corridor Length	WB/NB Corridor Length	Total Corridor Length	Roadway	Road Direction	Indicative Cross-Section Schematic
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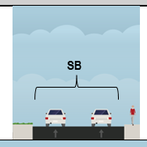
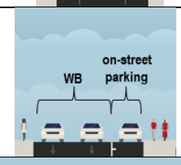
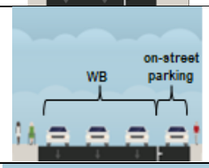
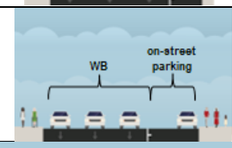
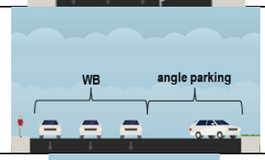
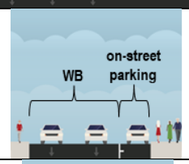
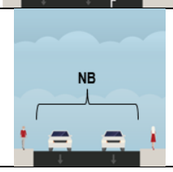
12	Estr. De Bidau - R. da Circunvalacao	At-Grade	9.75	1.75	0	2	4	9.75	0	-	0	0	0	0	0	749	0	749	One-way	SB	
13	R. Cidade de Viana do Castelo	At-Grade	9	0	0	0	0	0	0	-	2	3	2.5	0.5	9	0	410	410	One-way	WB	
14	R. Cidade de Viana do Castelo	At-Grade	12	0	0	0	0	0	0	-	3	3	2.5	0.5	12	0	109	109	One-way	WB	
15	R. Jacinto de Candido	At-Grade	14	0	0	0	0	0	0	-	3	3	4.5	0.5	14	0	742	742	One-way	WB	
16	R. Jacinto de Candido	At-Grade	18.5	0	0	0	0	0	0	-	3	3.25	7.25	1.5	18.5	0	871	871	One-way	WB	
17	Rua D. Luis Dos Reis Noronha	At-Grade	10	0	0	0	0	0	0	-	2	3.5	2.5	0.5	10	0	357	357	One-way	WB	
18	Rua Abilio Monteiro	At-Grade	9	0	0	0	0	0	0	-	2	4	0	1	9	0	443	443	One-way	NB	
															Total	**12,906**	**12,645**	**25,551**			

13.1.5 High-Level Comparative Assessment of Bus Technology Options

Three types of propulsion systems in use currently and emerging urban public transport vehicles are reviewed as below including: (i) conventional diesel buses (CDBs) powered by internal combustion engine (ICE) using diesel principally; (ii) hybrid bus combines a conventional internal combustion engine propulsion system with an electric propulsion system; and (iii) battery electric buses (BEBs) powered by electric motors.

- **Conventional Diesel Bus (CDBs)** – CDBs powered by ICE are the most widespread type of propulsion used for urban buses currently. Typical fuels include diesel as well as gas including compressed natural gas.
- **Hybrid Bus** – Hybrid buses combine a conventional internal combustion engine propulsion system with an electric propulsion system, improved fuel efficiency and reduced emissions compared to CDBs.
- **Battery Electric Bus** (BEBs) – BEBs are fully electric buses with battery-powered electric propulsion systems. Batteries are charged using different system including ultra-fast charging stations, overnight charging at depot, etc.

For this technology options assessment, a multi-criteria assessment (MCA) was used to identify a preferred vehicle type for Dili pilot bus. The MCA included themes, qualitative criteria, and weighted scoring to provide an approach to assess various vehicle types and propose the most advantageous propulsion type for Dili pilot bus. This MCA included a broad range of criteria guided by five overarching themes, (A) Operational, (B) Environmental Sustainability, (C) Financial Aspects, (D) Implementability, and (E) Climate Change.

Table 13-2: MCA Framework for Bus Technology Options

Themes	#	Criteria	Metrics	Scoring Scale (With 1-3 Scale Based on Evaluation of Low, Moderate, and High)		
				1	2	3
Operational	A1	Enabling Infrastructure	Provision of existing infrastructure to support operation	Low	Moderate	High
	A2	Ease of Maintenance	Relative ease of maintenance in the local context	Low	Moderate	High
	A3	Availability of Skilled Labor	Availability of skills labor including drivers, maintenance workers, service providers, etc.	Low	Moderate	High
	A4	Availability of Spare Parts	Relative ease of accessing spare parts	Low	Moderate	High
Environmental Sustainability	B1	Environmental Impacts	Extent of environmental impacts such as emission factors.	High	Moderate	Low
Financial Aspects (Lifecycle Costs)	C1	Capital Costs	Total capital costs including vehicles, infrastructure, systems, etc.	High	Moderate	Low
	C2	O&M Costs	Annual O&M costs	High	Moderate	Low
Implement-ability	D1	Required/Proven Technology	Proven experience of operating such vehicle types in the local context	Low	Moderate	High
Climate Change	E1	Susceptibility to Floods	Extent of vulnerability / susceptibility to floods	High	Moderate	Low

Notes:

1. Each of the five themes is weighted equally (thus each is weighted 20% each in the overall scoring).
2. Scoring for each criterion is based on a 1-3 Likert scale, with 1 being the worst performing option and 3 being the best performing score.
3. Each metric is assessed qualitatively based on the Study Team's best knowledge from the previous projects in the region as well as publicly available sources (where warranted).
4. As some themes may have multiple criteria, each criterion also has a weight (thus if the theme weight is 20% and the theme has 4 criteria, then each criterion is assumed to contribute 5% to the cumulative score) – and thus the criterion score is multiplied by this 5% factor to give the total score by criterion.
5. All scores are then added together to give the cumulative score by option – with 3.0 points being the highest score possible.

Table 13-3: MCA Results for Bus Technology Options

Themes	#	Criteria	Metrics	Scoring Scale (1 to 3 Scale, where 1 Worst Performing and 3 Best Performing)			Scoring		
				1	2	3	CDB	Hybrid	BEB
Operational	A1	Enabling Infrastructure	Provision of existing infrastructure to support operation	Low	Moderate	High	3	3	1
	A2	Ease of Maintenance	Relative ease of maintenance in the local context	Low	Moderate	High	3	1	1
	A3	Availability of Skilled Labor	Availability of skills labor including drivers, maintenance workers, service providers, etc.	Low	Moderate	High	3	1	1
	A4	Availability of Spare Parts	Relative ease of accessing spare parts	Low	Moderate	High	3	1	1
Environmental Sustainability	B1	Environmental Impacts	Extent of environmental impacts such as emission factors.	High	Moderate	Low	1	2	3
Financial Aspects	C1	Capital Costs	Total capital costs including vehicles, infrastructure, systems, etc.	High	Moderate	Low	3	2	1
	C2	O&M Costs	Annual O&M costs	High	Moderate	Low	1	2	3
Implement-ability	D1	Required/ Proven Technology	Proven experience of operating such vehicle types in the local context	Low	Moderate	High	3	1	1
Climate Change	E1	Susceptibility to Floods	Extent of vulnerability / susceptibility to floods	High	Moderate	Low	3	2	1

Key findings of the MCA results are as follows:

- **A1: Enabling Infrastructure –** CDBs can operate with existing infrastructure and Hybrid Buses do not require upgrades to existing infrastructure. However, BEBs require e-bus chargers and charging infrastructure (such as generators, transformers, etc.) requiring significant upgrades to the current operating environment.
- **A2: Ease of Maintenance –** CDBs have been used and operated widely in Dili with extensive experience and expertise in vehicle maintenance. In contrast, Hybrid Buses and BEBs are not commonly used in Dili thus maintenance is considered challenging.
- **A3: Availability of Skilled Labor –** Skilled labor for CDB is far more accessible compared to Hybrid Bus and BEB given CDB is the main mode of transport (such as microlet and regional bus). Additional training would be required for such personnel to operate/maintain and repair Hybrid Bus and BEB.
- **A4: Availability of Spare Parts –** Given the predominant market/use of CDBs, spare parts are relatively easy to obtain for CDBs. In contrast, spare parts for rather newer technologies such as Hybrid Bus and BEB in Dili would be difficult to obtain.
- **B1 - Environmental Impacts –** CDBs typically emit higher GHG emissions and pollutants of all options. Hybrid Buses emit less due to the use of a combination of an internal combustion engine and an electric motor with higher efficiency. BEBs emit less GHG and contribute to improving air quality.
- **C1: Capital Costs –** CDBs have lower upfront investment cost compared to Hybrid Buses and BEBs, with typically lower cost for fleet, less infrastructure requirements (as BEB require e-bus charging, etc.), and other system requirements to support diesel bus operation.
- **C2: O&M Costs –** CDBs have higher fuel cost and maintenance cost expenses compared to other two options. BEBs have lowest O&M costs in the long run due to lower energy cost (though depending on local context) and fewer moving parts, reducing overall maintenance needs.

- **D1: Required/Proven Technology –** CDB is proven technologies widely used in Dili such as operation and maintenance of microlet and regional bus. Hybrid Bus and BEB are considered emerging technologies with less experience/knowledge of local players in these technologies.
- **E1: Susceptibility to Floods –** CDB is less susceptible to flood damages compared to hybrid and electric buses due to their simpler mechanical systems, and BEB is most vulnerable to floods due to their high reliance on electrical components. Water exposure can damage the battery system requiring maintenance and replacement.

All metrics are scored to generate a composite score based on the above assessment and scoring framework, with results presented in the table below. Of note, CDB performs the best with a score of 2.4, followed by Hybrid Bus at 1.7 and BEB at 1.6.

Table 13-4: MCA Overall Results and Scoring

Themes	#	Criteria	Metrics	Scoring Scale (1 to 3 Scale, where 1 Worst Performing and 3 Best Performing)			Scoring Without Weighting			Weighting (%)		Scoring With Weighting		
				1	2	3	CDB	Hybrid Bus	BEB	Themes	Criteria	CDB	Hybrid Bus	BEB
Operational	A1	Enabling Infrastructure	Provision of required infrastructure to support operation	Low	Moderate	High	3	3	1	20%	5%	0.15	0.15	0.05
	A2	Ease of Maintenance	Relative ease of maintenance in the local context	Low	Moderate	High	3	1	1		5%	0.15	0.05	0.05
	A3	Availability of Skilled Labor	Availability of skills labor including drivers, maintenance workers, service providers, etc.	Low	Moderate	High	3	1	1		5%	0.15	0.05	0.05
	A4	Availability of Spare Parts	Relative ease of accessing spare parts	Low	Moderate	High	3	1	1		5%	0.15	0.05	0.05
Environmental Sustainability	B1	Environmental Impacts	Extent of environmental impacts such as emission factors.	High	Moderate	Low	1	2	3	20%	20%	0.20	0.40	0.60
Financial Aspects	C1	Capital Costs	Total capital costs including vehicles, infrastructure, systems, etc.	High	Moderate	Low	3	2	1	20%	10%	0.3	0.2	0.1
	C2	O&M Costs	Annual O&M costs	High	Moderate	Low	1	2	3		10%	0.1	0.2	0.3
Implement-ability	D1	Required/Proven Technology	Proven experience of operating such vehicle types in the local context	Low	Moderate	High	3	1	1	20%	20%	0.60	0.20	0.20
Climate Change	E1	Susceptibility to Floods	Extent of vulnerability / susceptibility to floods	High	Moderate	Low	3	2	1	20%	20%	0.60	0.40	0.20
Composite Score							**23**	**15**	**13**	**100%**	**100%**	**2.40**	**1.70**	**1.60**
Preferred Option												✓		

13.1.6 Preliminary Service Plan

Based on this Minister's concept, a preliminary assessment on service (i.e., headway, span of service, operating times, and required vehicles) and infrastructure (i.e., bus stops and depot sizing) was conducted to estimate indicative investment costs for introducing a new bus service on this east-west corridor as summarized below:

Table 13-5: Key Service Elements of Pilot Bus Program

Item	Assumptions [A]
Route Distance (Roundtrip)	25.6 km
Proposed Operating Times	6:00AM – 6:00PM
Proposed AM Peak Period	7:00AM – 9:00AM
Proposed PM Peak Period	4:00PM – 6:00PM
Max Trips/Hour (Weekday)	6
Assumed Roundtrip Travel Time (including 15% Layover Time)	~90 mins
Assumed Travel Speed	~20 km/hour
Expected Daily Vehicle Kilometers	~2,700 km
Expected Daily Vehicle Hours	~160 hrs
Vehicle Type	9m (Euro 4/5 Diesel City Bus)
Vehicle Seat Capacity	35 passengers
Required Number of Vehicles (Without Spare)	10
# of Bus Stops (Estimated based on 400m Spacing)	59
Estimated Daily Ridership	~2,520

Notes:
[A] This service parameters are indicative only.

13.1.7 Preliminary Infrastructure Plan

Provision of bus facilities (beside terminal) is essential to support operation of the pilot bus program – including bus stops, bus lanes, depot, and other auxiliary facilities (such as sidewalks, ITS, etc.) Key findings are as follows:

- **Bus Stops** – A total of 59 bus stops are proposed along the pilot bus corridor including on-street interchange at the Airport (with enhanced bus stops to accommodate passengers arriving from the airport with luggage). A potential location for layover (given the route is proposed as a loop) is identified on Rua Jacinto Candido (near Timor-Leste National Police Headquarters).

- **Bus Lanes** – A total of 7.0km of bus lanes are proposed along Ave. de Nicolau Lobato (two-way road, three lanes per direction) to improve speed and minimize congestion, thus enhancing the overall performance and reliability of the pilot bus program.

- **Depot** – The existing depot (with approximate area of 800m^2) is identified within 1km of the bus corridor (on R. de Tali Laran) as shown in the red location in the map below. This depot site is currently used by bus drivers/operators to clean vehicles and conduct daily maintenance of vehicles. Based on the review of the site, this site can accommodate some six regional buses and lacks adequate maintenance facilities such as washing/drying facilities, fueling, workshop, storage space, parking and administrative offices to support robust maintenance of bus fleet.

- **Terminal** – The pilot bus program is proposed to start/end at Tibar Terminal in the west of Dili.

- **ITS** – Innovative measures such as ITS are also proposed to improve travel experience of passengers with potential measures including on-board bus technology, displays at select bus stops, back-end system, etc.

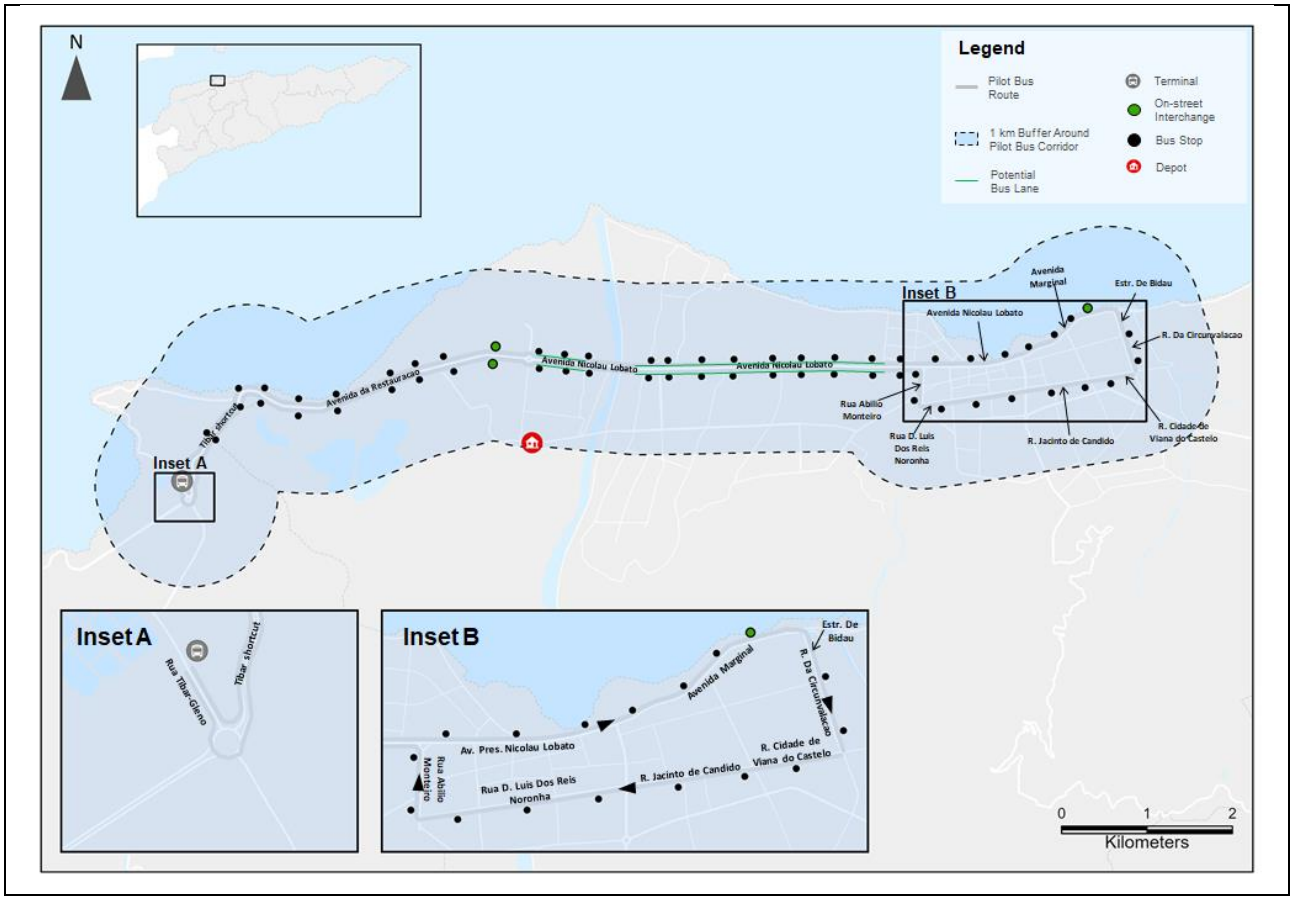


Figure 13-4: Proposed Location for Bus Stops, Bus Lanes and Depot

13.1.8 Cost Estimate for Pilot Bus Project

Based on the proposed schemes above, the total capital cost is estimated at about US$9.0 million including bus fleet, bus stops, bus lanes, depot and ITS (with details shown in Table 9-2). Annualized OPEX is estimated at about US$1.3 million including vehicle operating expenses, labor, and bus infrastructure and ITS O&M (with details shown in Table 9-3).

Table 13-6: Capex of Pilot Bus Project

CAPEX (US$)						
#	**Cost Item**	**Final Quantities**	**Unit**	**Unit Cost**	**Total Cost**	**Notes**
1	9m Bus	10	bus	88,0000	880,000	Assume to be Euro V City Bus (with 10% contingency considering import, customs taxes)
2	Bus Stops	59	number	44,700	2,637,300	Based on 400m stop spacing (roundtrip distance = 25.3km)
3	Bus Lanes	7,000	length(m)	355	2,485,000	Assumed on the curbside lane (3.5km on 3 lanes / direction) on Ave. Nicolau Lobato
4	Depot	1	lumpsum	200,000	2,000,000	Assume to build a new depot to accommodate larger fleet
5	ITS	1	lumpsum	1,000,000	1,000,000	Assumed cost includes on-board technology on bus fleet, selected bus stops, back-end system
Total					**9,002,300**	
Total (Rounded to Nearest Ten Thousand)					**9,010,000**	

Notes:
1. Other capital costs such as additional sidewalk/crossing improvements and costs for land acquisition/resettlement are not included as these require further assessment under a separate technical study. Terminal cost is included in the main feasibility study cost for bus terminals and on-street interchange.
2. Diesel unit cost in Jakarta is IDR2 billion (exchange rate of USD1 = 15,500 as of December 2023).
3. Bus stop cost includes bus stop/shelter cost with passenger amenities such as sidewalks, light, tactile paving, etc. (at US$37,000 per unit) plus US$8,000 for solar panel installation.

Table 13-7: Opex of Pilot Bus Project

CAPEX (US$)						
#	**Cost Item**	**Final Quantities**	**Unit**	**Unit Cost**	**Total Cost**	**Notes**
1	Annual Bus Operation O&M	10	Lump Sum	100,000	1,000,000	Includes vehicle-related, labor, and non-bus related O&M costs. Proportionally estimated based on vehicle weight of 9m/12m bus.
2	O&M for Bus Stops	2%	%	-	44,000	Assumed as 2% of CAPEX
3	O&M for Bus Lanes	2%	%	-	50,000	Assumed as 2% of CAPEX
4	O&M for Depot	5%	%	-	100,000	Assumed as 5% of CAPEX
5	O&M for ITS	5%	%	-	50,000	Assumed as 5% of CAPEX
Total					**1,253,000**	
Total (Rounded to Nearest Ten Thousand)					**1,260,000**	

Notes:

1. Annualized O&M costs include vehicle-related operating costs (fuel, maintenance, etc.), personnel/labor, as well as indirect bus operating costs (such as admin, indemnity, etc.) - assumed as USD130,000 per bus based on the benchmarking of regional experience and benchmarking of other similar projects.
2. Annualized O&M costs for bus infrastructure are assumed as follows: bus stops (2% of capex), depot (5% of capex) and ITS (5% of CAPEX) based on regional experience and benchmarking of other similar projects.

13.2 Public Transport Fare and Fare Structure Modelling

13.2.1 Fare Collection Systems

13.2.1.1 Issues

Currently, microlets in Dili run on a straightforward flat-fare structure, with each ride costing US$0.25 (per adult). Microlets also offer concessionary fares are offered to students, who pay 40% less than the full fare at just US$0.15 per ride. Overall, the cost of public transportation is considered to be rather low. To pay for the fare, passengers simply pay the required amount of cash directly to the driver before alighting, and, if the driver is renting the vehicle, the driver will share the earnings with the vehicle owner as agreed upon.

While this simple fare structure has the merit of easy to understand and generally affordable, it has also engendered a host of issues that make it desirable for changes, including:

- **Driver Earnings Are Directly Tied to Fare Collected from Passengers Carried**: The foremost concern of the current individual fare collection scheme lies in the fact that a driver's daily income (excluding portion paid to the vehicle owner if renting the vehicle) depends on how many passengers they are able to carry in a day, which strongly incentivizes strategies that maximize passenger carriage. While this may seem to be a beneficial correlation where market-driven forces may encourage the drivers to improve their attractiveness to the passengers by providing better services, it is also a double-edge sword that incurs a host of common practices that are counter-productive and not necessarily in the interest of the passengers. This may include "*keliling*" (cruising around town to collect passengers rather than directly proceeding to the destination), resulting longer waiting time, neglecting services to areas with less passenger demand, and shunning away student riders as they pay a lower fare.

- **Flat Fare System Is Not Flexible**: A flat-fare system inherently and implicitly penalizes passengers who only ride a short distance along the route compared to those riding a longer portion, while it also reversely discourages operators from taking on longer-distance routes as they can run fewer trips (and thus carry fewer passengers) in a day compared to shorter routes. Thus, flat-fare system is typically succeeded by a distance-based or zone-based fare scale in other countries once their public transport has developed to a certain scale to minimize these inherent biases and encourage more passenger-oriented practices.

- **Concessionary Fare Offered to Students Only**: Lastly, currently concessionary fares for student when riding microlets are offered on the basis that students are an economically weak demographic who also do not yet have access to private transportation options such as private cars and motorcycles until they have reached the suitable age; this is logical further given that Timor-Leste's population skews overwhelmingly towards the younger spectrum (the medium age of Timor-Leste is 20, and

around 40% of its population is under 15).[51] Nevertheless, this is not in contradiction to the offering of the same concessionary treatment to other socially disadvantaged demographic groups, such as seniors and the disabled people. This may seem an impractical consideration today, given the current conditions of public transport in Dili (as seniors and disabled people are unlikely to utilize microlets conveniently), but as the entire country slowly ages past its youth population boom and its quality of public transport continues to improve, it needs to align its treatment of these other minor groups by also incorporating them into social equity policies such as the fare paid for public transport.

13.2.1.2 Approaches

To address the issues mentioned above, an overhaul of the fare structure is recommendable in order to tackle the root causes based on two overarching principles:

1. **De-link Driver Performances from Earnings**: As the flat fare collection encouraged ingenuine driver behaviors that prioritize growing revenue but sometimes working against the interests of the passengers, removing this direct linkage of driver earnings from passengers carried could serve as a straightforward solution to the problem. Instead, drivers may be paid on a salary basis while fare revenue is centrally collected and distributed to drivers and vehicle owners at agreed-upon ratios.
2. **Introduce More Flexible Fare Options**: The flat fare scale may be amended to allow for greater flexibility by varying the fare payment based on one or more adjustable factors, such as the social group status of the passenger, the distance traveled, or the time period of travel (by offering lower fares during off-peak period). It is also possible to introduce more options beyond just single-ride ticketing, such as a multi-ride or monthly pass package. This will help ensure that the fare pricing is more adaptable and convenient to the daily experience of the passengers.

13.2.1.3 Proposed Enhancements

Based on the two principles stated, the following three enhancements are proposed:

1. **Introduce Integrated Fare Collection:** As part of the overall effort to improve coordination among microlet services, a single centralized fare collection system may be established to tie in the revenue stream of a collective of microlet operators (including the drivers and owners) to complete the de-linking of driver earning from passenger volume. This system will keep all the revenue earned from the operators and then reconcile the total revenue pool back to the operators at intervals using a transparent agreed-upon formula, which may involve factors such as the number of trips operated or the distances traveled by each vehicle. Such a central “clearing house: system is already common practice in many parts of the world wherever operators form collectives to grow their network together and could encourage many other additional benefits, such as a stronger brand recognition, better coordinated service timetables, and better purchasing power for major asset upgrades, etc.
2. **Explore More Robust Fare Pricing:** Distance-based fare pricing is the most common form of fare structure after flat fares around the world, with its major benefit being the flexibility in accommodating passengers travelling a variety of distances while ensuring economic equity. Distance-based fare is also more beneficial to operators of longer-distance routes since they are able to recoup more of the operating cost from the farebox revenue. In addition, time-variant fare pricing may be considered when lower fare is offered during the off-peak period to incentivize more off-peak travels and lessen the passenger load during the peak traveling time period. Lastly, operators may also explore the option to offer multi-ride or monthly passes, which will reduce the hassle of paying for fare every ride and may potentially encourage more riders to regularly use microlets and grow the system patronage.
3. **Expand Concessionary Fare Scheme:** Lastly, it is worth examining whether the existing concessionary fare scheme can be expanded to other vulnerable social groups for better protection, such as the seniors and the disabled. While these groups may not constitute a major portion of the ridership, the concessionary fare scheme may still bring in overall social benefits by lowering the financial barriers to access public transport and creating a more equitable environment to travel

[51] Source: https://www.cia.gov/the-world-factbook/countries/timor-leste/

13.2.2 Fare Structure Modelling

13.2.2.1 Issues

Currently, all public transportation services in Dili (including microlets and regional buses) run on cash-based payment, which is typical for low-intensity systems operating with minimal formal regulations and operating guidance. The obvious advantage of a cash-based system lies in its simplicity as cash is already the dominant way of paying in everyday life for the people of Dili and there is no additional technology required to maintain its functions. Since microlets operate on a fixed full fare of US$0.25 per ride, a US quarter coin suffices to pay for the full fare without needing to break changes, but this same convenience does not extend to students who have to prepare exact changes for US$0.15 instead. While this relatively simple fare system ensures that paying for public transportation in Dili is not too much of a troublesome experience for passengers today, there are still major downsides to relying on cash payment for a combination of several factors, from both the passenger and the operators' points of views:

- **Payment Collection is Inflexible**: Cash payment is a de-centralized and inflexible way of fare collection, as each driver is only responsible for the fare collected onboard their vehicle, which works well given that most microlet operations are individual-based; however, this becomes a major obstacle when trying to establish some form of drivers' collectives, to implement a more advanced form of fare policy/structure, or to introduce cross-route or even cross-mode ticketing and fare discounting. For the goal of moving towards a new type of fare structure, it is likely that the current cash-based payment will not be able to provide the level of flexibility and adaptability necessary for this move.

- **No Insight on Passenger Travel Pattern**: Cash payment does not facilitate the collection of passenger's boarding data, which is crucial to understand the travel pattern and to provide insight on route organization or suitable locations to open new routes, and while passenger interview surveys may be able to fulfill this function, they are costly, time-consuming, and only provide a snapshot in time that may not hold true if the specific circumstances during the survey has changed. In comparison, a digitalized fare collection system (e.g., card- or mobile-based) could automatically collect such information on a daily basis, giving a full picture on passenger travel patterns with minimal effort.

- **Reduced Operational Efficiency**: Cash handling can become an operational obstacle if the passenger does not carry the exact change and particularly if the driver also cannot break the change. This is currently not a major deficiency of microlet/regional bus operations as the time lost on cash handling is small compared to the other observed issues such as "keliling". Nevertheless, once public transport operation evolves to a degree that such other issues are minimized, cash handling hassles can lead to prolonged dwell time during boarding and alighting activities and be considered a more potent obstacle to better operations.

- **Risk of Theft**: As the collected cash are physically stored onboard the vehicle, it becomes susceptible to theft or accidental loss and may constitute a considerable risk for revenue loss.

- **Hygiene Concern**: Cash payment requires frequent physical contact, which becomes a median for the spread of contagious diseases. Other contactless forms of payment would eliminate this public health risk.

13.2.2.2 Approaches

While cash payment serves as the most barebone and prototypical method of fare collection for public transport around the world, many other countries have long since evolved their systems to more modernized formats to better suit the ever-changing needs of the passengers. As Timor-Leste continues to grow its society at a rapid rate, it becomes an imperative to also modernize its public transport system quickly by introducing more complex and capable fare collection systems that are already widely adopted elsewhere. A few of the most mainstream fare collection systems (including the current cash-based system) are examined below with their major advantages and disadvantages listed:

Table 13-8: Comparison of Fare Collection Systems

Fare Collection System	Description	Advantages/Disadvantages
Cash-based Fare Collection 	Collect cash directly from passengers, typically into a farebox or through the driver.	**Advantages**: • The current established way of fare payment • Simplest to maintain and implement **Disadvantages**: • As noted above
Ticket-based Fare Collection 	Issue physical paper or plastic tickets to passengers, which are purchased from ticketing machines or ticket counters and validated before boarding.	**Advantages**: • Low minimum technology requirement, with printed tickets sold by human cashiers at ticket counters a possible quick and low-cost implementation strategy • More advanced solution available by installing automatic ticketing machines that accept a variety of payments and provide further data-collection and fare revenue pooling capabilities. • Reduce vehicle dwell time if ticket validation is done offboard (i.e., by inspectors at stations) and remove the fare validation burden from the driver. **Disadvantages**: • May be technologically demanding to set up and maintain depending on the level of complexity chosen for the system • Opens potential for counterfeit ticketing that could impact revenue. • May cause queueing delay if ticketing booths/machines are under-supplied.
Card-based Fare Collection 	Utilizes contactless smart cards or bank cards that passengers tap on electronic validators for quick and secure fare payments.	**Advantages**: • Quickens boarding with minimal dwell time. • Automatic fare collection and processing in the backend system and reduce driver's burden to validate fare. • Enables the maximum flexibility in devising more complex fare structures, such as distance-based pricing, multi-ride pass, concessionary rebates, promotional discounts, time-variant fare, and fare capping, etc. • Provides a digital record of the ride, which is transparent to the passenger and leaves traceable and anonymized passenger origin-destination data for the operator. **Disadvantages**: • High upfront capital cost and long-term operating costs as card systems are technologically sophisticated and require frequent maintenance. Time and resource requirement to train staff on the technical know-how may also be intensive. • Card loss (theft or accident) may incur a large financial risk to the passenger • Requires setting up physical points of topping-up • Requires large-scale education effort to transition passengers to adopting the digital method of fare payment.
Mobile-based Fare Collection 	Allows passengers to use mobile apps to purchase and store digital tickets or passes, which are validated by scanning QR codes or showing the digital ticket to drivers or inspectors.	**Advantages**: • Similar to card-based systems in terms of quickening boarding, automatic fare collection, enabling flexibility in complex fare structures, and keeping track of passenger O-D. • Works completely within mobile devices, which has a high and growing prevalence **Disadvantages**: • Relatively lower upfront capital cost and long-term operating costs compared to card systems since minimal physical asset is required, but may still be technologically sophisticated and require frequent maintenance. Time and resource requirement to train staff on the technical know-how may also be intensive. • Requires internet connectivity to function, which can be detrimental in areas with poor internet reception or with high mobile data usage cost • Requires large-scale education effort to transition passengers to adopting the digital method of fare payment.

To better compare these options and understand how they may provide an upgrade over the current cash-based system in the context of the Dili, the following table presents an overview of key differences between the options from both the passengers' and the operators' points of view in view of Dili's current context:

Table 13-9: Evaluation of Fare Collection Systems Options

	Cash-Based Collection	Ticket-Based Collection	Card-Based Collection	Mobile-Based Collection
Passenger Considerations				
Personal Device Requirement	None	None	Medium (Physical card required)	Medium (Smartphone required)
Internet Requirement	None	None	None	High (Internet Connectivity Required)
Difficulty for Public Adoption	Already In Use	Low (Similar to cash)	Medium (Top-up and Card Purchase Required)	High (Smartphone Apps Know-how Required)
Ease of Frequent Use	Low (Requires Exact Change Each Ride)	Medium (Multi-ride Pass May be Available)	High (One Tap Per Ride)	High (One Mobile Ticket per Ride)

	Cash-Based Collection	Ticket-Based Collection	Card-Based Collection	Mobile-Based Collection
Passenger Considerations				
Passenger Hygiene	Contact with Unhygienic Cash	Contact with Unhygienic tickets	Contactless	Contactless
Operator Considerations				
Asset Investment Cost	None (Existing)	Low (Basic Infrastructure Required)	High (Extensive Card System Infrastructure Required)	Medium (Robust Backend Infrastructure Required)
Technical Training	None (Existing)	Low (Basic Staff Training Needed)	High (Card System Development Skills Needed)	High (Mobile App Development Skills Needed)
Ease of Maintenance	None (Existing)	Low (Basic Maintenance Only)	High (Card System Maintenance Needed)	Medium (Mobile App System Management Needed)
Operational Efficiency	Low (Onboard Cash Handling Required)	Medium (Ticketing Booth Queueing May Occur)	High (Minimal Onboard Check Required)	High (Minimal Onboard Check Required)
Fare Regime Flexibility	Low (Fare is Fixed per Ride)	Medium (Flexible Fare Could be Handled at Ticket Booth)	High (Automatic Implementation of Flexible Fare Rules)	High (Automatic Implementation of Flexible Fare Rules)

Note: **Red** = "Low", **Orange** = "Medium", **Green** = "High" score for each metric

13.2.2.3 Proposed Enhancements

Given the above comparison, it can be seen that while the card-based and mobile-based solutions are the most advanced and modernized options widely used around the world currently, they have a relatively high investment cost and technical sophistication requirement that may be challenging to quickly introduce into the Dili environment. Therefore, the **ticket-based system** is proposed as the more preferrable option since it needs relatively little infrastructure and technical training. In coordination with the ongoing efforts to modernize bus terminals across Timor-Leste, ticketing booths can be installed inside the new bus terminals and staffed, establishing a few centralized fare collection points that could further facilitate and support the fare structure reforms mentioned previously (including the distance-based pricing, multi-ride pass, and data collection efforts etc.) It is worthwhile to note that although the mobile-based solution is not recommended at the current stage, it is a fast-evolving solution with active innovation taking places, and so it may be possible for more low-tech and low-cost mobile ticketing solutions to emerge on the market in the next few years that may be considered suitable to the Dili context.

13.2.3 Cost Estimate for Fare Collection System

Based on the proposed enhancements identified above, further assessment on developing more detailed specifications of a fare collection system suitable to the context of Timor-Leste is essential based on best practices and successful experiences in comparable cities to Dili. A lumpsum of US$1.0 million is assumed for such consulting services in this cost estimate.

13.3 Traffic Management Study to Improve Public Transport Operations

13.3.1 Traffic Issues Overserved in Dili

Several traffic issues were identified based on the review of site conditions and field observations, which are categorized into four types, including inefficient circulation, traffic signals and junctions, pedestrian access and parking.

Table 13-10: Observed Traffic Issues in Dili

Issues	Description	Example
1-Way Circulation	• Longer travel time to pass through the city center • Congestion clustered at specific locations • Potential risk for accidents (due to sudden changes of traffic lane # and directionality	

Issues	Description	Example
Signals & Junctions	• Traffic signals can be optimized to facilitate traffic flows and minimize delays • Unsignalized junctions with high traffic volume/bottlenecks requiring traffic signals • Road capacity and channelization required to improve traffic flows and minimize delays	
Pedestrian Access	• Limited space for safe and comfortable walk experience for pedestrians • Lacking access-for-all facilities at junctions for disabled people	
Parking	• Sidewalk parking occupying the sidewalk partially or fully • On-street parking in prohibited areas • On-street parking on the curbside (not designated for parking) lane reducing lane capacity • Double parking in one or more lanes	

13.3.2 Proposed Approach to improving Traffic Condition in Dili

Addressing the traffic issues above in Dili can bring a significant impact to the city's overall traffic efficiency and quality of life of Timorese. A summary of five approaches to improving traffic conditions as follows:

- **One-way/Two-Way Street Conversions -** Converting streets between one-way and two-way traffic flow involves a series of essential steps. Beginning with community engagement to gather input and address concerns, the process moves on to conducting thorough traffic and safety assessments. Adjusting infrastructure to accommodate the new traffic pattern is crucial, followed by updating signage and markings to guide road users effectively. These steps are vital for ensuring a smooth transition, improving traffic flow, enhancing safety, and maximizing the benefits of the street conversion.

- **Traffic Signal Optimization & ITS –** the improvement can include switch the signalized junction to signalised junction or optimizing traffic signals through Intelligent Transportation Systems (ITS) involves adjusting signal timing to match traffic patterns, synchronizing signals for smoother traffic flow. These measures enhance overall traffic efficiency, reduce congestion, and improve safety by dynamically responding to real-time traffic conditions, ultimately creating a more seamless and effective transportation network.

- **Intersection Optimization -** involves implementing geometric enhancements such as lane adjustments and junction improvement, provision of overpasses or underpasses to separate conflicting traffic streams. These strategies aim to streamline traffic flow, reduce congestion, and enhance safety at critical junctions. By integrating these measures into intersection design and infrastructure planning, cities can create a more efficient and safer transportation network for all road users.

- **Active Mobility Enhancement -** Enhancing active mobility involves implementing measures such as safe and efficient crossing facilities and dedicated safety sidewalks and bike lanes. By prioritizing well-designed crosswalks and signalized intersections, cities can ensure the safety of pedestrians and cyclists at key junctions.

- **Roadside Management -** Efficient roadside management strategies encompass measures like illegal parking detection through advanced technologies, progressive charging schemes to regulate parking duration, and the implementation of parking meters and smart parking systems. By leveraging these tools, cities can mitigate congestion, optimize parking space utilization, and enhance the overall urban mobility experience for residents and visitors. The parking meters will be the preferred measures to improve the roadside parking condition in the short-term.

13.3.3 Proposed Enhancement in Dili

13.3.3.1 Refined Circulation (One-way/Two-Way Street Conversions)

As mentioned in the previous section, one-way circulation has been observed in the Dili, which will cause the detour of the transport, reduce the efficiency and increase the traffic volume in the road network. Two-way road will have better accessibly, so the road sections consider as the main corridor will change from one-way road to two-way operation road.

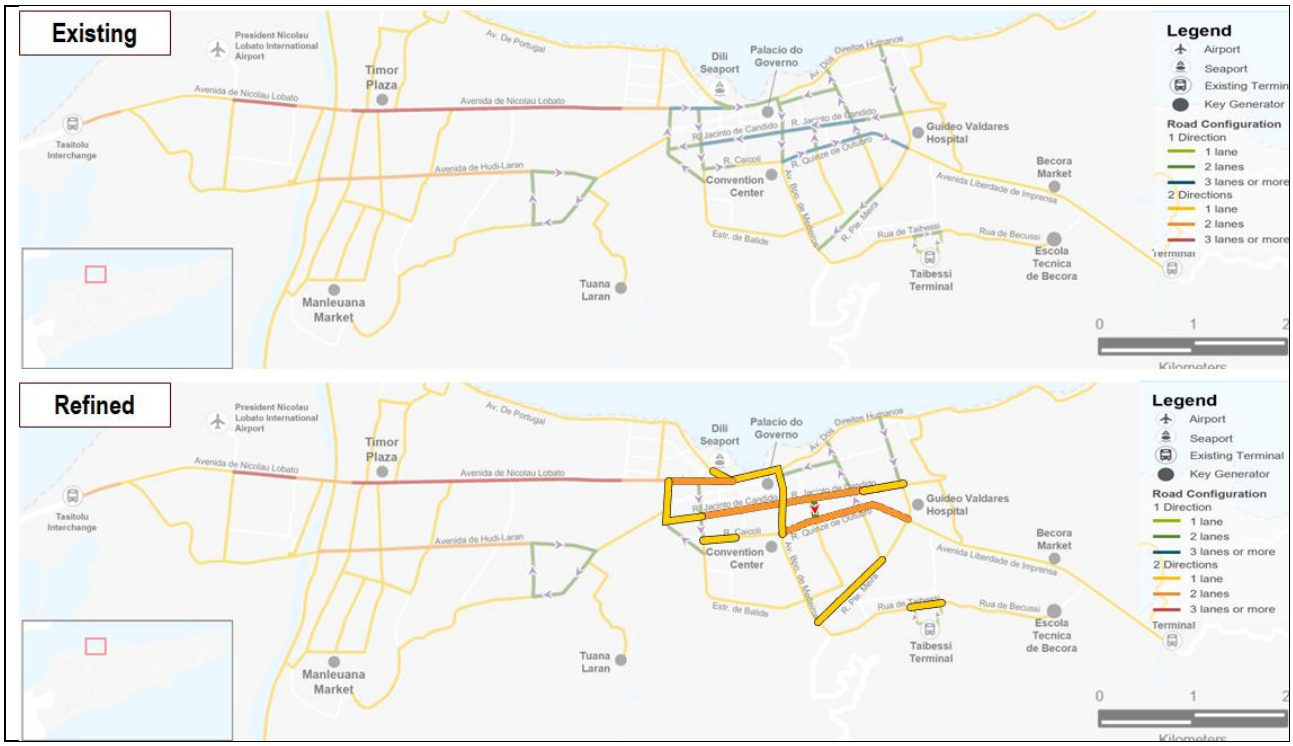


Figure 13-5: Refined Circulation (One-way/Two-Way Street Conversions)

13.3.3.2 Traffic Signal Optimization, Intersection Optimization & Active Mobility Enhancement

According to the Dili Masterplan Report, a total of eight intersections (of major 17 intersections across the city) exceeded the maximum level of service or considered congested based on the LOS standard below (i.e., LOS ≥0.85):

Table 13-11: Level of Service for Traffic Congestion Performance

Level of Service (LOS)	VCR	Description
A	>0.0 to ≤0.19	Free flow, low volume, high speed
B	>0.20 to ≤0.44	Stable flow, slightly limited speed
C	>0.45 to ≤0.74	Stable flow, speed controlled by traffic
D	>0.75 to ≤0.84	Flow Starts unstable, slow speed, the volume is close to capacity
E	>0.85 to ≤1.00	Unstable flow, low speed
F	>1.00	Flow stuck, very low speed ,volume over capacity, jammed for long duration

Source: Dili Masterplan Report

The intersections identified as exceeding the maximum level of service shows in map in below：

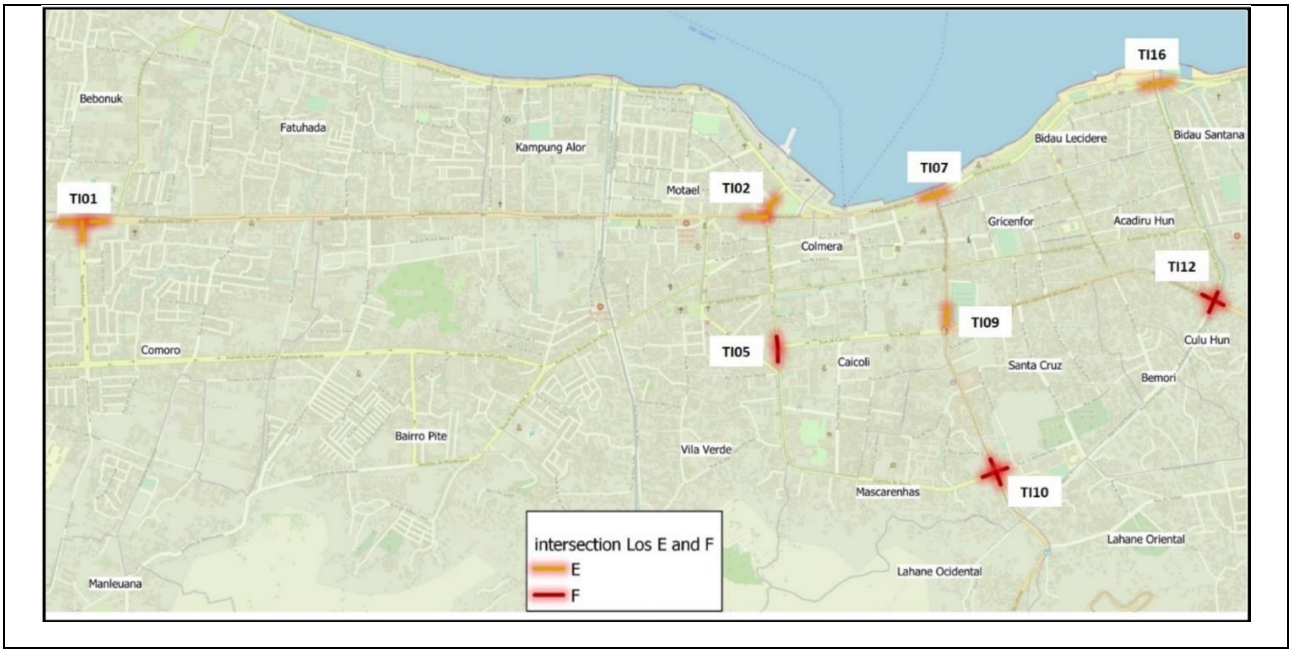


Figure 13-6: Intersections with LOS ≥ 0.85

All of the 8 intersections with LOS higher than 0.85 are assessed individually to show the main issues and preliminary improvement measures are summarized below:

Table 13-12: Traffic Enhancement by Intersection

No.	TI01
Type	Signalized
Location	Timor Plaza
LOS	E

Main Issues Identified:

- Traffic is heavy and road capacity at intersection not sufficient
- Pedestrians do not cross at the crosswalk.
- Development access at intersection will cause delay

Traffic Signal Optimization
- Adjust the Signal Timing
- Synchronizing Traffic Signals

Advanced Traffic Management Systems
- ITS system for city level

Intersection Optimization
- Intersection widening for additional lanes

Pedestrian and Cyclist Accommodations
- Provide safety crossing facilities for people (can be footbridge)

No.	TI02
Type	Signalized
Location	Jardim 5
LOS	E

Main Issues Identified:

- Roadside parking may cause delay at peak hour
- Traffic is heavy and road capacity at intersection not sufficient
- Some access near the intersection will cause delay

Traffic Signal Optimization
- Adjust the Signal Timing
- Synchronizing Traffic Signals

Advanced Traffic Management Systems
- ITS system for city level

Intersection Optimization
- Intersection widening for additional lanes

Pedestrian and Cyclist Accommodations

No.	TI10
Type	Signalized
Location	Estrada de Balide
LOS	F

Main Issues Identified:

- Road is too narrow at intersection
- On-street parking cause delay
- No sufficient sidewalk for pedestrian
- Development access close to intersection will cause delay

Traffic Signal Optimization
- Adjust the Signal Timing
- Synchronizing Traffic Signals

Advanced Traffic Management Systems
- ITS system for city level

Intersection Optimization
- Intersection widening for additional lanes

Pedestrian and Cyclist Accommodations
- Provide safety sidewalk

No.	TI05
Type	Unsignalized
Location	Faspol UNTL
LOS	F

Main Issues Identified:

- Junction is unsignalized
- Road is too narrow at intersection
- On-street parking cause delay

Traffic Signal Optimization
- Signalized Intersection

Advanced Traffic Management Systems
- ITS system for city level

Intersection Optimization
- Intersection widening for additional lanes

Pedestrian and Cyclist Accommodations

No.	TI07
Type	Unsignalized
Location	Palacio Governo
LOS	E

Main Issues Identified:

- Junction is unsignalized
- Loading/unloading activities at roadside may cause delay
- No pedestrian crossing at intersection

Traffic Signal Optimization
- Signalized Intersection

Advanced Traffic Management Systems
- ITS system for city level

Intersection Optimization

Pedestrian and Cyclist Accommodations
- Provide safety crossing facilities for people

No.	TI12
Type	Unsignalized
Location	Kuli-hun
LOS	F

Main Issues Identified:

- Junction is unsignalized
- Lack of safety pedestrian sidewalk and crossing

Traffic Signal Optimization
- Signalized Intersection

Advanced Traffic Management Systems
- ITS system for city level

Intersection Optimization

Pedestrian and Cyclist Accommodations
- Provide safety crossing facilities and sidewalk for people

No.	TI16
Type	Unsignalized
Location	Parte BJ Habibi
LOS	E

Main Issues Identified:

- Junction is unsignalized
- No pedestrian crossing at intersection

Traffic Signal Optimization
- Signalized Intersection

Advanced Traffic Management Systems
- ITS system for city level

Intersection Optimization

Pedestrian and Cyclist Accommodations
- Provide safety crossing facilities for people

No.	TI09
Type	Roundabout
Location	Rotunda Fransisco Xavier
LOS	E

Main Issues Identified:

- Road is too narrow at intersection
- Development access close to intersection will cause delay

Traffic Signal Optimization

Advanced Traffic Management Systems
- ITS system for city level

Intersection Optimization
- Intersection widening for additional lanes

Pedestrian and Cyclist Accommodations

13.3.3.3 Traffic Signal Optimization, Intersection Optimization & Active Mobility Enhancement

Based on the review of existing roadside activities and parking conditions, several parking conditions/issues were identified including on-street parking, illegal parking, and sidewalk parking. These parking conditions/ issues are plotted at street-level as shown in the map below

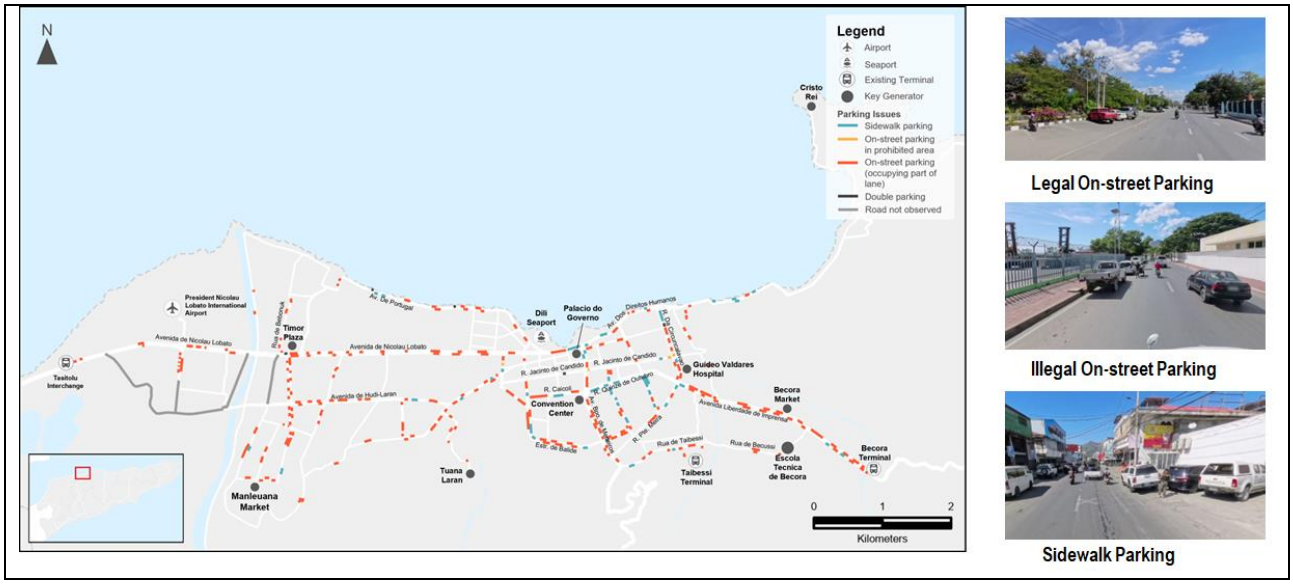


Figure 13-7: Existing Roadside Activity Conditions

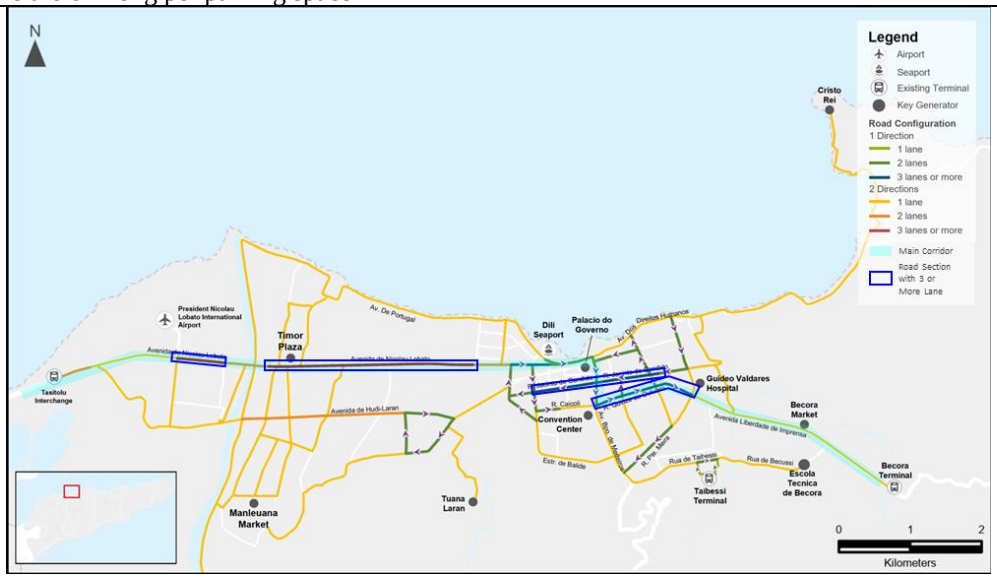
To standardized parking system, two principles are developed to improve the on-street parking:

- To minimise the impact on the traffic, the road with number of lane equal or more than 3 per direction can provide the on-street parking potentially
- The main east-west corridor of the city carries a large amount of travel traffic, and on-street parking is not recommended even if it is more than 3 lanes.

Potential locations for on-street parking provision are listed in the table below:

Table 13-13: Potential Locations for On-Street Parking Provision

Road Name	Length for 3 lane road segment (m)	Main Corridor	Parking Space
Av. Pres. Nicolau Lobato	3,520	Yes	0
Avenida Almriante Americo Tomas	650	Yes	0
R. Jacinto de Candido	1,730	No	288
R. Quinze de Outubro	1,390	No	232
Total Number of On-Street Parking			**520**
Note: Assume the 6m long per parking space			



13.3.4 Cost Estimate for Traffic Improvement Measures

The total cost of traffic improvement/management is estimated at US$4.5 million, with a breakdown of each cost presented in the table below:

Table 13-14: Cost Estimate for Traffic Improvement Measures

Cost Item	Unit Cost (US$)	Unit	Total Cost (US$)
Circulation Modification			
Circulation Modification	144,000	3	1,718,100
Junction Improvement			
Unit Cost of Adjust the Signal Timing	8,000	3	24,000
Intersection Signalization (3-arm)	144,000	3	432,000
Intersection Signalization (4-arm)	190,000	1	190,000
Geometric Improvement	100,000	4	400,000
Crossing Facilities Improvement (3-arm)	105,000	1	105,000
Crossing Facilities Improvement (4-arm)	140,000	3	420,000
ITS System for City Level	1,000,000	1	1,000,000
Parking Meter			
Parking Meter	900	260	234,000
		Total	**4,523,100**

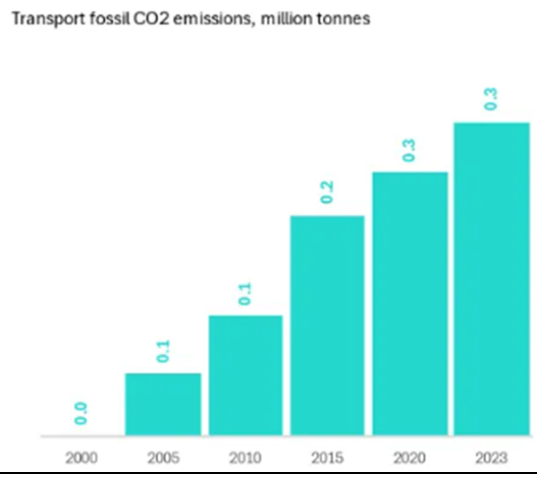
13.4 Stringent Emission Standards for Public Transport Vehicles

13.4.1 Issues Overserved in Dili

In 2023, the Transport sector in Timor-Leste emitted 0.3 million tonnes of CO2, making up 49% of total fossil CO2 emissions, with road transport contributing 85% of this total.[52] This sector saw a notable increase in CO2 emissions due to economic growth and vehicle increase.

In terms of public transport in Timor-Leste (in particular microlet which is daily city transport means for residents), around 41% of microlet fleet are over 10 years old, with an average age of 11.8 years, leading to higher maintenance costs and safety concerns with more GHG emission. Addressing these issues is crucial for reducing emissions, improving vehicle efficiency, and ensuring passenger safety and environmental sustainability in the transport sector of Timor-Leste.

Table 13-15: Transport CO2 Emissions in Timor-Leste (Left) and Microlet Vehicle Data (Right)



Fleet Age	# of Registered Vehicles (Country-Wide)	% of Total
Less Than 5 Years	176	11%
6 – 10 Years	775	48%
Over 10 Years	654	41%
Total	1,605	100%

Source: DNTT, 2023.

Age of Registered Microlet (2023)

[52] Source: https://safe.rbi-umbrella.com/doc/docview/viewer/docN4439076CD5CF90feee71d0ab21686003c35cb7357168b2e65028c557a88a3c52fafe7296c332

13.4.2 Approach

Under the condition discussed above, the direct measures to solve this issue is potential replacement of old microlet vehicles to new vehicles (From Euro 2/3 emission level to Euro 4/5 emission level) – which will bring GHG reduction in net production. The potential benefits of this measure including:

- **GHG reductions** – New vehicle significant contributions to GHG emissions reductions expected
- **Operational efficiency** – less breakdowns leading to higher reliability and services
- **Cost efficiency** – operation/maintenance cost/km reduced
- **Safety** – overall safety of vehicles improved (brakes, engine, tires, etc.) in compliance with vehicle standards

Several vehicle models are considered as the alternative vehicle of existing microlet, including Euro 4/5 van (similar size with microlet), Euro 4/5 standard bus (8-10m), E-bus (8-10m). A comparison of these vehicle model and existing microlet (taking Euro2/3 Van as reference for microlet) is summarized below:

Table 13-16: List of Vehicle Models by EURO Standards

Model	Euro 2/3 Van (Reference for Microlet)	Euro 4/5 Van	Euro 4/5 Bus	E-Bus
Example				
Energy	Diesel	Diesel	Diesel	Electric
Seating Capacity	14	14	~35	30~50
Energy Consumption	15L/100km	7.1L/100km	25L/100km	100KWh/km
CO2 Emission per 100 km	39kg	19kg	78kg	67kg
Unit Price (USD)	USD 5,500~	USD 9,000~	USD 78,000~	USD 200,000~
Vehicle # for the Replacement	-90	+90	+36	+25

Note: Energy consumptions and vehicle prices are for reference only and used for comparative analysis of different vehicle types.

A high-level multi-criteria assessment was conducted on these vehicle model, the criteria considered including:

- Crteria#1: Potential Emission Savings (Equivalent to Microlet Vehicle Size): Low (1), Medium (2), High (3) where lower CO2 emissions score higher
- Crteria#2: Required infrastructure: Low (3) if minimum infrastructure, Medium (2) if moderate infrastructure upgrade, High (1) if significant infrastructure investment
- Crteria#3: Capital Cost: Low (3) if up to USD10,000/Unit, Medium (2) if up to USD100,000/Unit, and High (1) if over USD100,000/Unit)
- Criteria#4: Whole Lifecycle Cost (including initial capital cost, fuel cost and maintenance cost): Low (3), Medium (2), High (1) where lower lifecycle costs score higher.

The high-level multi-criteria assessment is summarised below, with Euro 4/5 considered as a preferred model to replace existing microlet fleet.

Table 13-17: High-Level MCA of Vehicle Types

Criteria	Euro 2/3 Van (Reference for Microlet)	Euro 4/5 Van	Euro 4/5 Bus	E-Bus
Potential Emission Savings	Low (1)	High (3)	Medium (2)	Medium (2)
Required Infrastructure	Low (3)	Low (3)	Low (3)	High (1)

Criteria	Euro 2/3 Van (Reference for Microlet)	Euro 4/5 Van	Euro 4/5 Bus	E-Bus
Capital Cost	Low (3)	Low (3)	Medium (2)	High (1)
Whole Lifecycle Cost	Low (3)	Low (3)	High (3)	Medium (2)
Total Score	**10**	**12**	**10**	**6**

Note: No weighting is considered in this assessment.

13.4.3 Cost Estimate for Microlet Replacement

There are about 900 microlets in Dili area. Assuming 10% of existing microlets will be replaced by the selected Euro 4/5 Van. In summary, about 90 microlets will be replaced by 90 new Euro 4/5 Van. The total cost for procurement of new fleet is estimated at around US$0.97 million.

Table 13-18: Cost Estimate for Microlet Replacement

Cost Item	Unit Cost (US$)	Unit	Total Cost (US$)
Euro 4/5 Van	900	90	810,000
		Contingency (20%)	162,000
		Total	**972,000**

13.5 Hybrid Courier Service Model

13.5.1 Issues and Opportunity Observed of Courier Service

Existing issues surrounding logistics in Dili include limited logistics storage facilities (on-street/terminal used for selling, unloading, and loading) and the mixed-use of goods transport with passengers. These issues can lead to inefficiencies, safety concerns, and congestion in the transportation system.

Limited Logistics Storage Facilities

Mixed-Use of Good Transport with Passengers

Figure 13-8: Existing Issues on Courier Service

13.5.2 Proposed Approach for Hybrid Courier Service

To enhance logistics in Dili, utilizing a hybrid courier service can indeed be a viable solution, especially considering Dili's role as a hub for goods transport to and from rural areas and overseas. A hybrid courier service can combine the strengths of traditional courier services with modern technology and practices to optimize the transportation and delivery of goods.

Figure 13-9: Dili Acting as Destinations of Goods Transport

Implementing a hybrid courier service in Dili can significantly improve the logistics infrastructure, making the transportation of goods more seamless, reliable, and cost-effective, thus reinforcing Dili's role as a hub for goods transport to various destinations.

Hybrid Courier Services

Hybrid courier services blend traditional courier methods with modern technology to streamline deliveries, optimize routes, offer various delivery options, reduce environmental impact, ensure transparent communication, provide tailored solutions, manage risks, and establish collaborations for efficient and customer-centric delivery services.

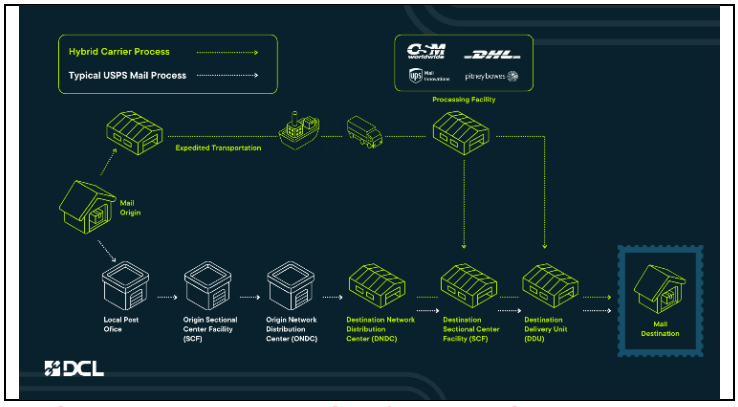


Figure 13-10: Example of Comparison Between Hybrid Carrier Process and Traditional Process

Within hybrid courier services system, the storage facility will be the kay facilities, act as a hub for storing and managing inventory. The storage facilities can play a main distribution role in the whole system and the storage facilities can be integrated with some bus terminal.

Figure 13-11: Example of Storage Facilities

Two types of storage facilities are proposed in Dili area to provide better facility foundation for hybrid courier services system, which is Gateway Storage Hub serve as a central point for goods entering and exiting Dili, acting as a key distribution center for the hybrid courier services system, and Regional Storage Hub meet storage and distribution needs within the Dili region and surrounding areas, supporting the last-mile delivery operations of the hybrid courier services.

Table 13-19: Type of Storage Facility

Type	Location and Role	Service Coverage Area	Facilities Scale and Typical Size
Gateway Storage Hub	Close to the logistic gateway like airport and port, with a major logistics distribution role	2km radius	Large Scale (Around 300 m^2 per site)
Regional Storage Hub	Close to industry area, commercial area and other key generator, with a logistic role to provide the local service	1km radius	Medium Scale (Around 100 m^2 per site)

The proposed location of storage facilities are shows in below map, with three gateway storage hub proposed in the vicinity of Present Nicolau Lobato International Airport, Dili Port and Port of Tibar Bay. Also six regional storage hubs are proposed in other districts, allowing for service to be provided to the whole Dili, with two of them having potential to be integrated with Manleuana Terminal and Tibar terminal.

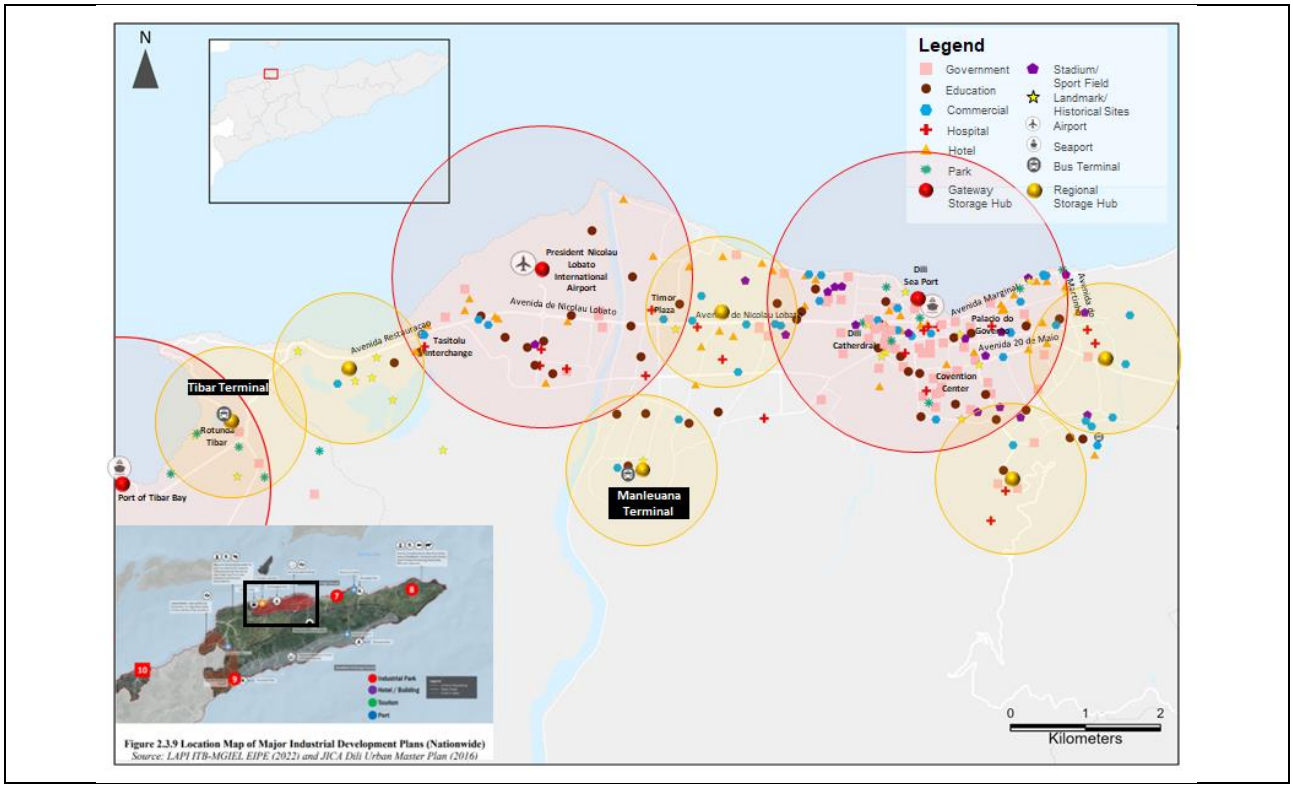


Figure 13-12: Proposed Location of Storage Facilities

13.5.3 Cost Estimate of Hybrid Courier Service

Based on the scheme above, the total cost is estimated at around US$0.68million.

Table 13-20: Cost Estimate for Hybrid Courier Service

Cost Item	Average Size Per Site (m^2)	Unit Cost per m^2 (US$)	Unit	Total Cost (US$)
Gateway Storage Hub	300	450	3	405,000
Regional Storage Hub	100	450	6	270,000
			Total	**675,000**

13.6 Microlet Operation Framework

13.6.1 Issues in Public Transport System

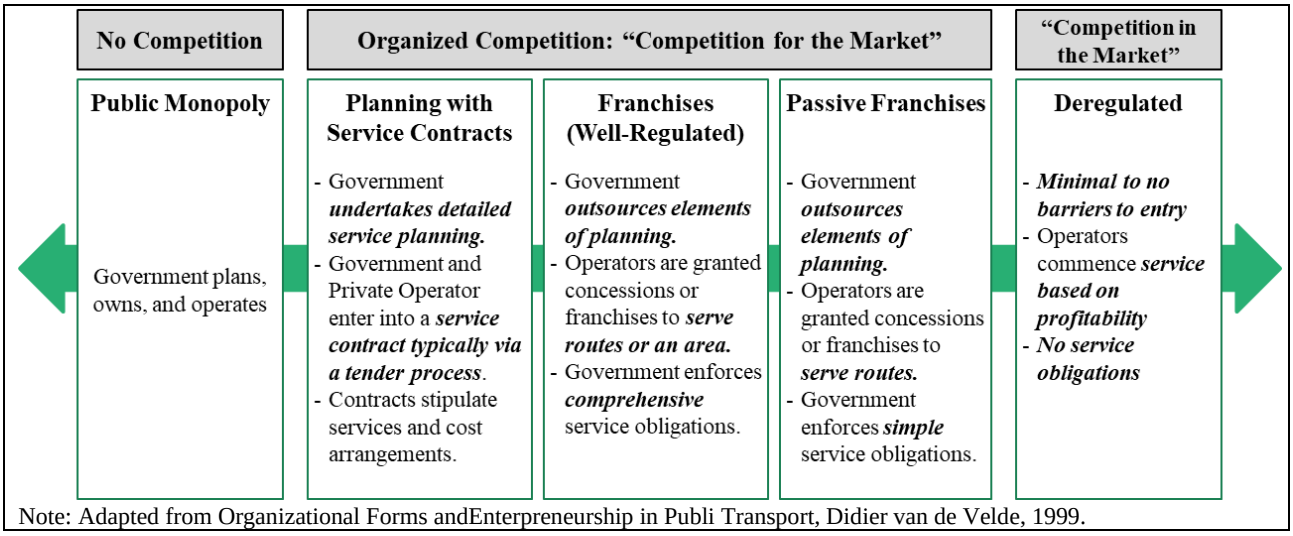
Effective management and operation of the public transport system requires a robust institutional framework – which is characterized by efficient coordination among key stakeholders and supported by enabling environment with clear regulations and policies, clear roles and responsibilities, and a strong capacity for planning, operation, and management. Existing institutional conditions and issues in public transport system are identified as follows:

- **Legal Framework is Unclear and Inconsistent** – The current legal framework governing public transport provides a starting point, with some key elements contained therein, however there is a general lack of specificity around roles and responsibilities for public transport planning and operations.
- **Limited Enforcement of Current Legal Framework** – There is limited enforcement of the legal framework in Timor-Leste, with DNTT being short on resources and not having adequate capacity building programs in place to support the resourcing and skills needed for enforcement of public transport standards.
- **Policy Framework Lacks Specificity on Public Transport** – The current policy framework lacks appropriate vision and objectives related to public transport, nor are targeted initiatives identified to improve the system.

- **Government is Under-Resourced with Limited Capabilities in Public Transport – T**he lack of budget allocated to DNTT limits the Directorate's ability to coordinate, manage and enforce standards for the public transport system. DNTT currently has inadequate staffing to perform a full suite of public transport functions required to operate a modern public transport network.
- **Limited Technical Expertise Among DNTT Staff** – Based on the human resource database of DNTT, there is limited direct expertise in public transport planning within the Directorate. Furthermore, qualified high-level policy-making staff who can perform analytical and critical initiatives are limited.
- **Limited Monitoring or Oversight of Public Transport** - Beyond licensing and route allocation, DNTT plays a limited role in the oversight, monitoring, evaluation, and enforcement of public transport service operations.
- **License Not Tied to Performance Incentives and Penalties** - Current public transport license conditions are basic and do not leverage the opportunity that DNTT has to implement more stringent requirements on operators to deliver a higher-quality public transport system for community benefit.
- **Dominant Informal Private Sector Resulting in Uncoordinated Service Operation** - The current network is operated by individual operators rather than a coherent and coordinated operator body. This sector is informal and creates challenges that stem from operator incentives, skills, and capacity. This results in difficulty enforcing scheduling, difficulty in ensuring equitable outcomes (such as for students) and is overall less reliable and punctual for passengers.
- **Economic Incentives Fall on Drivers** - The economic responsibility and incentive falls directly on drivers of vehicles, creating a range of issues for the reliability and safety of the network. Equity is disincentivized in service operations (i.e., drivers are not incentivized to pick up students due to reduced fares, or to serve lower patronage routes due to lower passenger revenue).
- **Service Schedule Not Prioritized for Maximizing Passenger Revenue** - Due to a combination of technical capacity of DNTT for public transport scheduling, and the current operator incentives of the network, there are no functioning schedules for bus or microlet services. Drivers prioritize waiting until vehicles are full before departing (as this directly impacts their revenue).

13.6.2 Benchmarking of Best Practice in Public Transport Regulatory and Institutional Frameworks

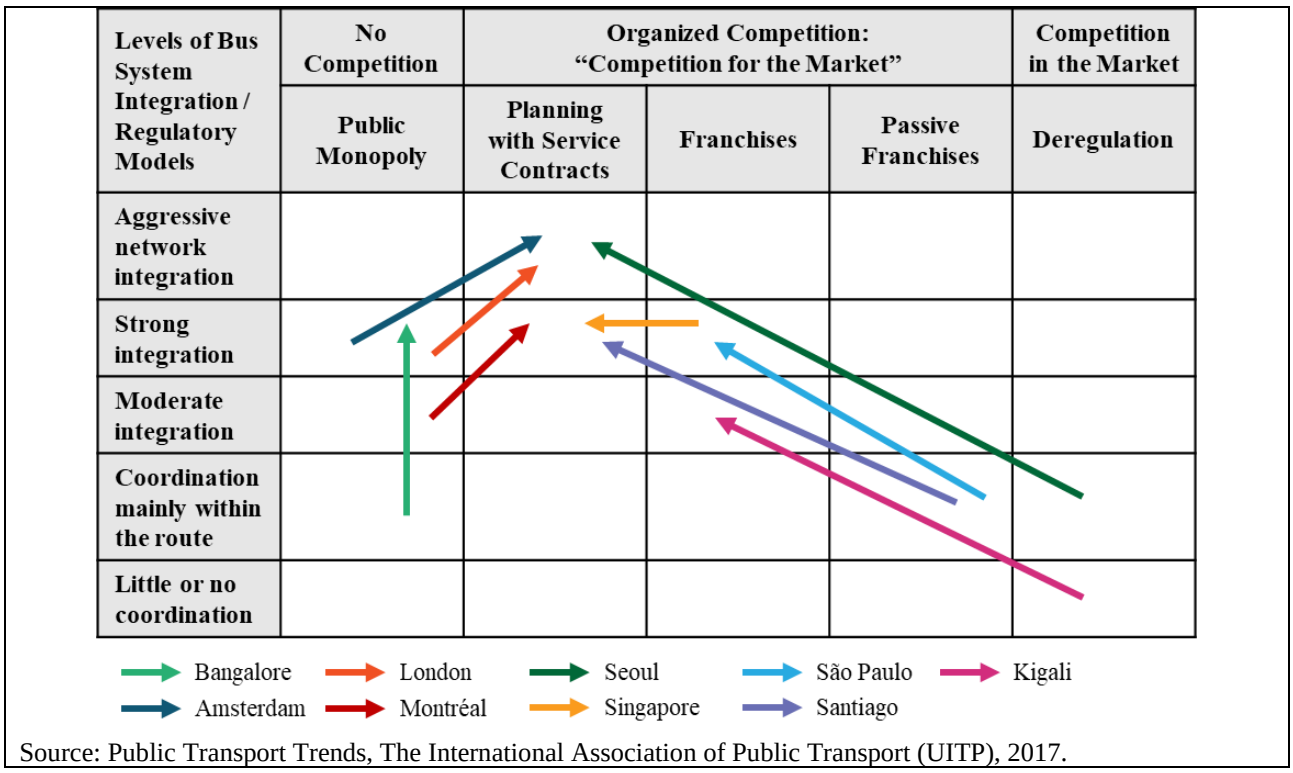
Public transport markets are organized depending on the extent and type of government and private sector involvement. Government-led regimes involve public monopolies or governments undertaking planning and dictating service obligations (i.e., service contracts and well-regulated franchises). Market-led regimes involve private sector determining services and operations based on profitability (i.e., passive franchises, deregulated markets). This is shown in the framework below:



Note: Adapted from Organizational Forms andEnterpreneurship in Publi Transport, Didier van de Velde, 1999.

Figure 13-13: Types of Public Transport Regulatory Models

Global trends relating to the regulation of public transport systems and resulting system integration have found: (i) governments increasingly take a larger role in planning and organizing public transport; (ii) a clear prevailing trend towards proactive planning of public transport with service contracts, which achieves stronger levels of system integration; (iii) public monopoly markets, mostly adopted in developed cities (i.e., Amsterdam, London, and Montreal), are shifting to allow privatization regulated by an incentive structure; and (iv) deregulated markets mostly adopted in developing cities due to limited institutional capacity for managing public transport are moving towards greater government organization and regulation (i.e., Kigali, Santiago, and Sao Paulo). This is shown in the figure below:



Source: Public Transport Trends, The International Association of Public Transport (UITP), 2017.

Figure 13-14: Trends in Regulatory Models vs Bus System Network Integration

13.6.3 Key Lessons Forward for Timor-Leste

Based on the review of existing institutional conditions and issues in public transport system as well as benchmarking of best practices on regulatory models, a number of key lessons for Timor-Leste are identified to establish a suitable operating framework for public transport (in particular microlet) as follows:

- **Service Contracts Increasingly Applied to Define Service Requirements for Operations and Remuneration** - Service contracts between the PTA and operators have been increasingly applied to define the service requirements for operations and renumeration that operators are entitled to.

- **Competitive Tendering Provides Opportunity to Ensure that Selected Operator Provides Optimal Offer in Market** - Tenders are evaluated mainly based on service quality proposals, ridership, price, and company track records. Transport for London (TfL), the regional transport authority in London, seeks value for money in its contracts. Initial screening requirements are integrated into the tender process to ensure larger, more experienced, and hopefully more capable candidates are considered. Singapore requires prospective operators possess experience with 250 or more buses, while Santiago limits potential bidders to corporations.

- **Contract Duration Depends on Market Maturity and Type of Contract** - Five-year contract length has been adopted by London and Singapore. In other locations, contract term is typically between 8 to 10 years, where new buses are required (both to allow the operators to recoup their initial vehicle investment, but also to coincide with the vehicle depreciation timeline.

- **Service Quality Indicators Must Be Integrated into Performance Measures Serving as Basis for Operator Remuneration Scheme to Enhance Overall Performance** - Service contracts are at a

minimum, based on operating performance in delivering the required bus-kilometers. Service quality indicators, including measures for on-time performance, bus frequency, driving behavior, vehicle maintenance, and safety compliance are increasingly included as performance standards.

- **Introduction of Incentive-Penalty Mechanisms Ensures Compliance with Performance Agreements** - Incentive payments and penalty charges may be structured based on the extent of compliance with or deviation from performance standards. Moreover, termination clauses must be stipulated within contracts to disqualify poorly performing operators.

- **Regardless of Contract Type, Advanced Monitoring Systems Are Essential to Establish Extent Operator Adheres to Obligations under Contract and Determine Operator Remuneration** - Monitoring is essential to ensure quality service and operations. For specific contract types, monitoring also is essential to assess compliance with service standards in the contract and serve as the basis for remuneration of the operator and/or tracking of performance incentives. Common monitoring mechanisms include intelligent transport system (ITS) devices (i.e., on-board vehicle tracking systems, fleet management systems, automated passenger counting (APC) systems, etc.) and user satisfaction surveys.

13.6.4 Cost Estimate for Microlet Operation Framework

To support the transition of current individual operators/drivers to a more organized/coordinated microlet operation framework (including associations), a number of soft components are proposed including institutional framework to develop microlet associations, cooperate branding & marking plan, public outreach campaign, and social development program. The total cost of these soft components is estimated at about US$0.77 million.

Table 13-21: Cost Estimate for Microlet Operation Framework

Cost Item	Quantity	Unit	Total Cost (US$)
Institutional Framework to Develop Microlet Associations	1	lumpsum	500,000
Cooperate Branding & Marketing Plan	1	Lumpsum	100,000
Public Outreach Campaign	1	Lumpsum	100,000
Social Development Program	10%	%	70,000
		Total	**770,000**

14. Total Investment Cost

The indicative total investment cost for the bus terminal/facility feasibility study as well as six supporting public transport reform programs is summarized in Table 10-1. To support the overall project, additional capacity building and development cost of US$1.2 million is added to the overall project cost (including US$1.0 million for capacity building for payment system operator/manager and US$0.2 million for capacity building and training for drivers/staff).

The total investment cost (including 10% contingency) is estimated at about US$40.04 million, including (i) US$16.8 million for bus terminal & on-street interchange (46.2%); (ii) US$10.3 million for pilot bus project (28.3%); (iii) US$1.0 million for public transport fare structure (2.7%); (iv) US$4.6 million for traffic management program (12.6%); (v) US$1.0 million for stringent emission standards for microlet fleet replacement (2.7%); (vi) US$0.7 million for hybrid courier service model (1.9%); US$0.8 million for microlet operation framework (2.2%); and (vii) US$1.2 million for capacity development programs (3.3%).

Table 14-1: Total Investment Cost by Project Component

#	Component	Total Cost (US$)	%	Key Outputs	Type of Improvements / Assumptions
1	**Bus Facilities**	16,800,000	46.2%	Development & improvement of bus terminals / facilities with climate mitigation measures	• 5 bus terminals and 5 on-street interchanges with provision of innovative measures, access road/walk improvements, climate change facilities
2	**Polit Bus Project**	10,300,000	28.3%	Introduction of a pilot bus service on Route 10 in Dili as part of the public transport system	• Proposed 25.3km round trip service with 59 bus stops • 10 buses (9m Euro 5 diesel city bus) • 1 depot to accommodate the fleet with ITS enhancement
3	**Public Transport Fare Model**	1,000,000	2.7%	Modernization of fare structures and payment system as part of the public transport system	• Consulting services for developing specifications of fare collection system
4	**Traffic Management**	4,600,000	12.6%	Comprehensive traffic improvement/management programs to improve public transport operations in Dili	• Traffic circulation modifications & ITS traffic enhancement • Key intersection improvements (including signals & crossings) • On-street parking meter facilities
5	**Stringent Emission Standards**	1,000,000	2.7%	Implementation of migration program for low-emission solutions in public transport vehicles	• 10% of existing microlet fleet in Dili (~90 vehicles) assumed to be replaced by more environmentally friendly vehicles (i.e., Euro 4/5 class)
6	**Hybrid Courier Service Model**	700,000	1.9%	Integration of logistics and passenger transport facilities and services	• Provision of logistics storage facilities including 3 gateway storage hub and 6 regional storage hub
7	**Microlet Operation Framework**	800,000	2.2%	Formulation of public transport associations for public transport services and operations	• Consulting services to develop institutional framework • Corporate branding, marketing, public outreach, social development program
8	**Capacity Development Program**	1,200,000	3.3%	Capacity development programs to enhance implementation, operation, management and monitoring of public transport system	• Capacity Building for Payment System Operator/Manager • Capacity building and training of drivers/staff
Subtotal		36,400,000	100.0%		
Contingency		3,640,000			• Assume 10% contingency based on subtotal cost (Item#1-8)
Total		**40,040,000**			

15. Conclusion

15.1 Summary

This feasibility study report has assessed the feasibility of ten selected facilities shortlisted from the 2024 PTMP, including Dili Convention Center, Becora Terminal, Tibar Terminal, Manleuana Terminal, Hera Terminal, Aldeia Samalakuliba Terminal, Maliana Market On-Street Interchange, Suai Market On-Street Interchange, Lospalos Bemoris On-Street Interchange, and Viqueque City Center On-Street Interchange. The report focused on site assessment, facility schemes/design, cost estimates, financial analysis, economic analysis, and environmental/social safeguards (including gender elements) – with the project overall is considered "feasible" with mitigation measures, safeguard processes, and government support (financially and private sector development).

In addition to this main feasibility study scope, there are six supporting public transport reform programs to develop and expand a quality public transport system for the Timorese including: (i) Dili Pilot Bus Project; (ii) Public Transport Fare and Fare Structure Modelling; (iii) Traffic Management Study to Improve Public Transport Operations; (iv) Stringent Emission Standards for Public Transport Vehicles; (v) Hybrid Courier Service Model; and (vi) Microlet Operation Framework.

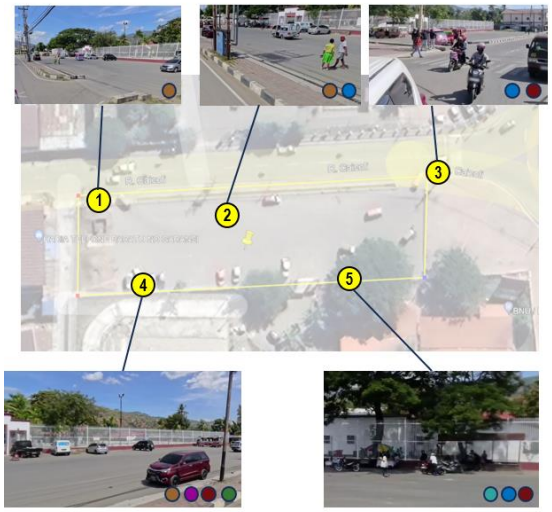
The total investment cost (including 10% contingency) is estimated at about US$40.04 million, including (i) US$16.8 million for bus terminal & on-street interchange (46.2%); (ii) US$10.3 million for pilot bus project (28.3%); (iii) US$1.0 million for public transport fare structure (2.7%); (iv) US$4.6 million for traffic management program (12.6%); (v) US$1.0 million for stringent emission standards for microlet fleet replacement (2.7%); (vi) US$0.7 million for hybrid courier service model (1.9%); US$0.8 million for microlet operation framework (2.2%); and (vii) US$1.2 million for capacity development programs (3.3%).

15.2 Next Steps

The feasibility study will be fine-tuned further based on the guidance and feedback from ADB and MOTC stakeholders. After completion of this study, it is expected that the government will initiate DED preparation based on the results of this feasibility study. Subsequent activities entail due diligence including more details financial analysis and safeguard elements.

Appendix A – Bus Facility Enhancement Toolkit & Observed Issues by Site

A.1 Dili Convention Center



❶ Orderly / Organized	
1-1	Passenger and vehicle areas are mixed
1-2	All types of vehicle mixed together, no dedicated area
1-3	No clear zones for loading/unloading, circulation areas etc.
1-4	One-Way Operation
1-5	Paved surface with pothole
1-6	No offices for operators and administrators
1-7	No preparate road marking and signage
1-8	Inadequate lighting systems
1-9	Key junction are not signalised
1-10	Access require upgrade to be highly accessibility
1-11	Illegal parking of private vehicle

❷ Convenient \ Comfortable	
2-1	No dedicated PUDO for private vehicle
2-2	No zone provision for multi-model interchange
2-3	Small shelter size and require upgrade
2-4	Small number of benches
2-5	Existing retail or kiosk are not well organised
2-6	No ticket information center
2-7	No toilet at terminal
2-8	No wayfinding signage in the terminal
2-9	Walk system require upgrade to be highly accessibility

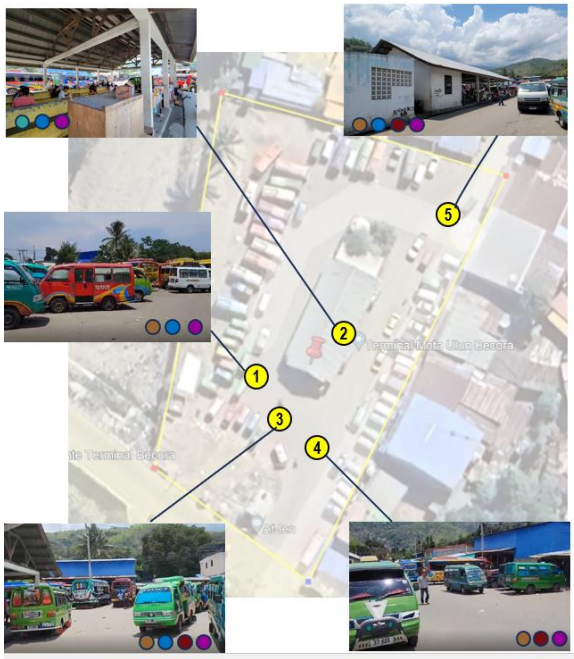
❸ Inclusive	
3-1	No accessibility ramp at crosswalk
3-2	No dedicated sidewalk in terminal
3-3	No tactile pavement provision
3-4	No Crime Prevention Through Environmental Design

❹ Secure	
4-1	No CCTV facilities provision
4-2	No lighting systems
4-3	No guard room/ security person

❺ Safe	
5-1	No dedicated sidewalk in terminal
5-2	No crosswalk at key junction
5-3	No pedestrian signals provision

❻ Climate Resilient	
6-1	No good landscaping
6-2	No rainwater treatment system provision

A.2 Becora Terminal



❶ Orderly / Organized	
1-1	Passenger and vehicle areas are mixed
1-2	All types of vehicle mixed together, no dedicated area
1-3	No clear zones for loading/unloading, circulation areas etc.
1-4	Two-way operation existing in the terminal
1-5	Paved surface but not good maintained
1-6	No offices for operators and administrators
1-7	No preparate road marking and signage
1-8	Inadequate lighting systems
1-9	Key junction are not signalised
1-10	Access require upgrade to be highly accessibility
1-11	Illegal parking of private vehicle

❷ Convenient \ Comfortable	
2-1	No dedicated PUDO for private vehicle
2-2	No zone provision for multi-model interchange
2-3	Existing shelter is old and require upgrade
2-4	Existing Bench require upgrade
2-5	Existing retail or kiosk are not well organised
2-6	No ticked/information centre at terminal
2-7	No toilet at terminal
2-8	No wayfinding signage in the terminal
2-9	Walk system require upgrade to be highly accessibility

❸ Inclusive	
3-1	No accessibility ramp at crosswalk
3-2	No dedicated sidewalk in terminal
3-3	No tactile pavement provision
3-4	No Crime Prevention Through Environmental Design

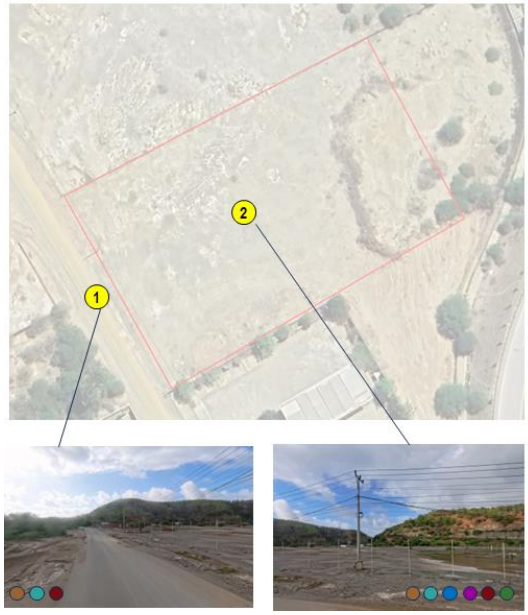
❹ Secure	
4-1	No CCTV facilities provision
4-2	Inadequate lighting systems

Notes: A guard post located at the entrance.

❺ Safe	
5-1	No dedicated sidewalk in terminal
5-2	No crosswalk at key junction
5-3	No pedestrian signals provision

❻ Climate Resilient	
6-1	No good landscaping
6-2	No rainwater treatment system provision, potential flooding risk

A.3 Tibar Terminal



❶ Orderly / Organized	
1-1	No facilities were provided as there was no existing terminal
1-2	
1-3	
1-4	
1-5	
1-6	
1-7	
1-8	
1-9	
1-10	Access road require upgrade to be highly accessibility
1-11	No facilities were provided as there was no existing terminal

❷ Convenient \ Comfortable	
2-1	No facilities were provided as there was no existing terminal
2-2	
2-3	
2-4	
2-5	
2-6	
2-7	
2-8	
2-9	Walk system require upgrade for external road to be highly accessibility

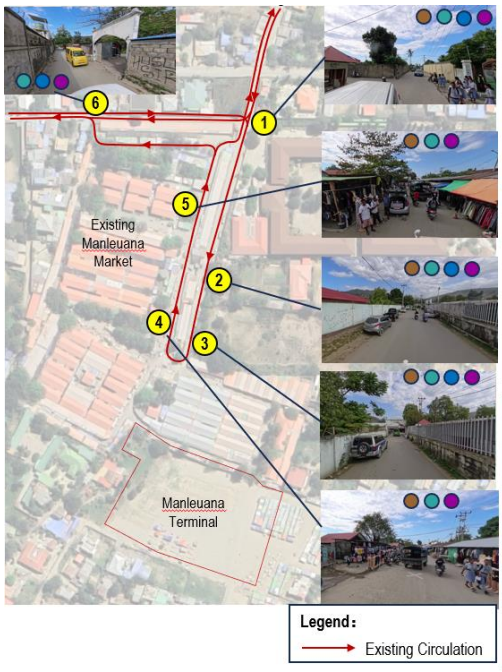
❸ Inclusive	
3-1	No facilities were provided as there was no existing terminal
3-2	
3-3	
3-4	

❹ Secure	
4-1	No facilities were provided as there was no existing terminal
4-2	
4-3	

❺ Safe	
5-1	No facilities were provided as there was no existing terminal
5-2	No crosswalk
5-3	No pedestrian signals provision

❻ Climate Resilient	
6-1	No facilities were provided as there was no existing terminal
6-2	

A.4 Manleuana Market



❶ Orderly / Organized	
1-1	Passenger and vehicle areas are mixed at Manleuana Market
1-2	All types of vehicle mixed, no dedicated area at Manleuana Market
1-3	No clear zones for loading/unloading, circulation areas etc. at Manleuana Market
1-4	
1-5	Paved surface but not good maintained at Manleuana Market
1-6	No offices for operators and administrators currently
1-7	No preparate road marking and signage at Manleuana Market
1-8	Inadequate lighting systems
1-9	Key junction are not signalised
1-10	the circulation need to be optimized, and access road require upgrade to be highly accessibility
1-11	Illegal parking of private vehicle and motorcycle at Manleuana Market and access road

❷ Convenient \ Comfortable	
2-1	No dedicated PUDO for private vehicle
2-2	No zone provision for multi-model interchange
2-3	No covered passenger area at Manleuana Market
2-4	No bench provided
2-5	Existing retail or kiosk are not well organised
2-6	No ticked/information centre at Manleuana Market
2-7	No toilet at Manleuana Market
2-8	No wayfinding signage at Manleuana Market
2-9	Walk system require upgrade to be highly accessibility at Manleuana Market and access road

❸ Inclusive	
3-1	No crosswalk
3-2	No dedicated sidewalk at Manleuana Market and access road
3-3	No tactile pavement provision
3-4	No Crime Prevention Through Environmental Design at Manleuana Market

❹ Secure	
4-1	No CCTV facilities provision
4-2	Inadequate lighting systems at Manleuana Market
4-3	No guard room/ security person at Manleuana Market

❺ Safe	
5-1	No dedicated sidewalk at Manleuana Market and access road
5-2	No crosswalk at key junction
5-3	No pedestrian signals provision

❻ Climate Resilient	
6-1	No good landscaping at Manleuana Market
6-2	No rainwater treatment system provision

A.5 Hera Terminal

❶ Orderly / Organized	
1-1	No facilities were provided as there was no existing terminal
1-2	
1-3	
1-4	
1-5	
1-6	
1-7	
1-8	
1-9	
1-10	Access road require upgrade to be highly accessibility
1-11	No facilities were provided as there was no existing terminal

❷ Convenient \ Comfortable	
2-1	No facilities were provided as there was no existing terminal
2-2	
2-3	
2-4	
2-5	
2-6	
2-7	
2-8	
2-9	Walk system require upgrade for external road to be highly accessibility

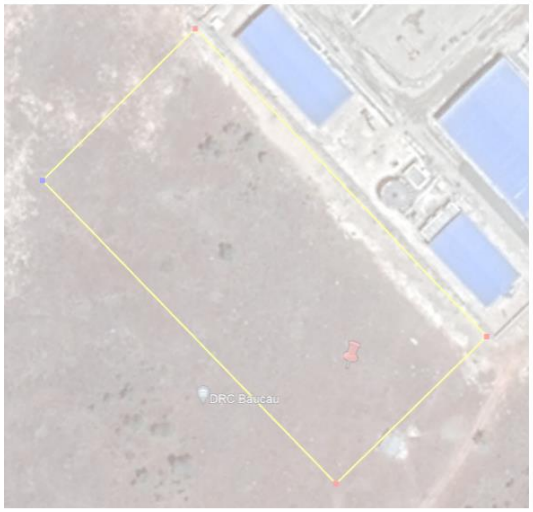
❸ Inclusive	
3-1	No facilities were provided as there was no existing terminal
3-2	
3-3	
3-4	

❹ Secure	
4-1	No facilities were provided as there was no existing terminal
4-2	
4-3	

❺ Safe	
5-1	No facilities were provided as there was no existing terminal
5-2	No crosswalk
5-3	No pedestrian signals provision

❻ Climate Resilient	
6-1	No facilities were provided as there was no existing terminal
6-2	

A.6 Aldeia Samalakuliba Terminal



❶ Orderly / Organized	
1-1	No facilities were provided as there was no existing terminal
1-2	
1-3	
1-4	
1-5	
1-6	
1-7	
1-8	
1-9	The key junction need to be signalized
1-10	Access road require upgrade to be highly accessibility
1-11	No facilities were provided as there was no existing terminal

❷ Convenient \ Comfortable	
2-1	No facilities were provided as there was no existing terminal
2-2	
2-3	
2-4	
2-5	
2-6	
2-7	
2-8	
2-9	Walk system require upgrade for external road to be highly accessibility

❸ Inclusive	
3-1	No facilities were provided as there was no existing terminal
3-2	
3-3	
3-4	

❹ Secure	
4-1	No facilities were provided as there was no existing terminal
4-2	
4-3	

❺ Safe	
5-1	No facilities were provided as there was no existing terminal
5-2	No crosswalk at key junction
5-3	No pedestrian signals provision

❻ Climate Resilient	
6-1	No facilities were provided as there was no existing terminal
6-2	

A.7 Maliana, Suai, Lospalos and Viqueque

Maliana

Suai

Lospalos

Viqueque

❶ Orderly / Organized	
1-1	No facilities were provided as there was no existing terminal
1-2	
1-3	
1-4	
1-5	
1-6	
1-7	
1-8	
1-9	The key junction need to be signalized
1-10	Access road require upgrade to be highly accessibility
1-11	No facilities were provided as there was no existing terminal

❷ Convenient \ Comfortable	
2-1	No facilities were provided as there was no existing terminal
2-2	
2-3	
2-4	
2-5	
2-6	
2-7	
2-8	
2-9	Walk system require upgrade for external road to be highly accessibility

❸ Inclusive	
3-1	No facilities were provided as there was no existing terminal
3-2	
3-3	
3-4	

❹ Secure	
4-1	No facilities were provided as there was no existing terminal
4-2	
4-3	

❺ Safe	
5-1	No facilities were provided as there was no existing terminal
5-2	No crosswalk at key junction
5-3	No pedestrian signals provision

❻ Climate Resilient	
6-1	No facilities were provided as there was no existing terminal
6-2	

Appendix B – Engineering Data

B.1 Utilities (Water Supply and Electricity)

B.1.1 Overview

Utilities data collected as part of site conditions analysis are summarized in this section which entails various elements that affect the design and construction of bus facilities including civil, structural, utilities, geotech, land tenure, etc. Only data collected during the feasibility study phase are included in this report as the team were unable to receive requested data such as utilities at certain locations.

Table B-1: Data Collection Framework

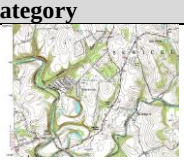
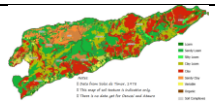
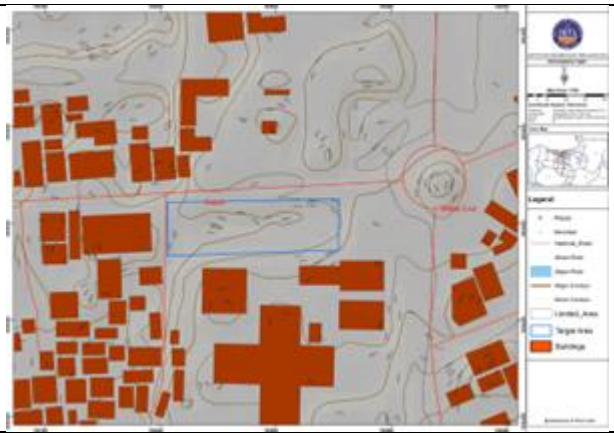
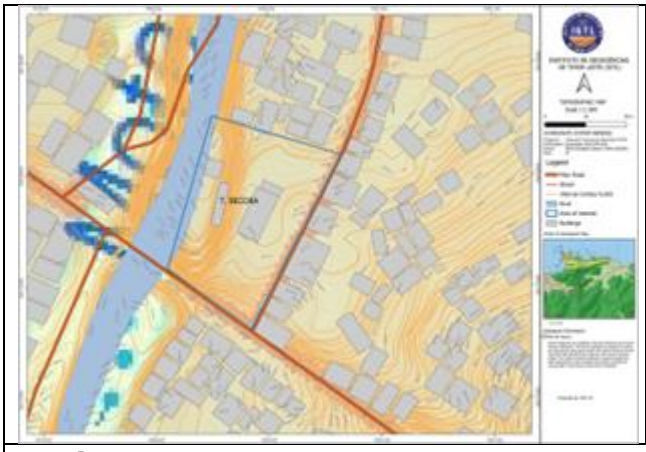
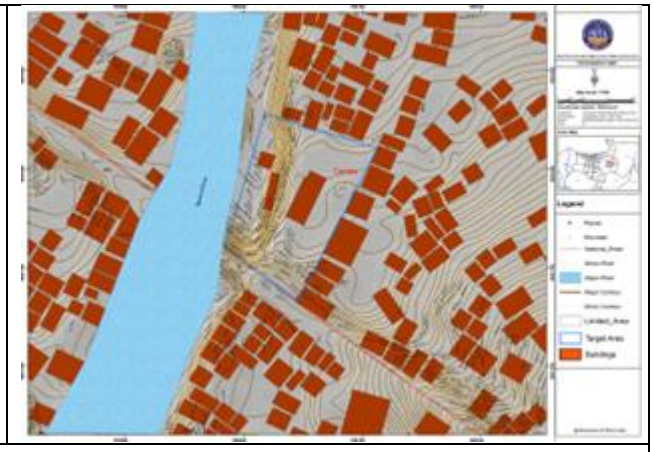
Category	Description	Source of Data
 Topographic	Topographic and site formation includes terrain levels and elevation changes of a site. This will assess any potential impact on the site stemming from topographic and terrain considerations.	https://en-gb.topographic-map.com/map-shcdn/East-Timor/?center=-8.68964%2C126.11206&zoom=9
 Structural (Buildings)	This category looks at the presence of structures and buildings established within the boundary of a site as the development/improvement of a bus facility may require demolish of such structures/buildings – which will have cost and timeline implications.	Field Survey
 Utilities	This category looks at the presence of utilities such as water pipes, power poles build underground and on the ground within the boundary of a site, as the development/improvement of a bus facility may require relocation of such utilities – which will have cost and timeline implications.	Technical Working Group (DNTT)
 Geotech	Identifies soil texture of a site – which has key implications on the detailed site formation during the DED and construction stage (such as expansion and contraction to improve and consolidate the ground).	Timor Leste - Map of Soil Texture (fao.org)

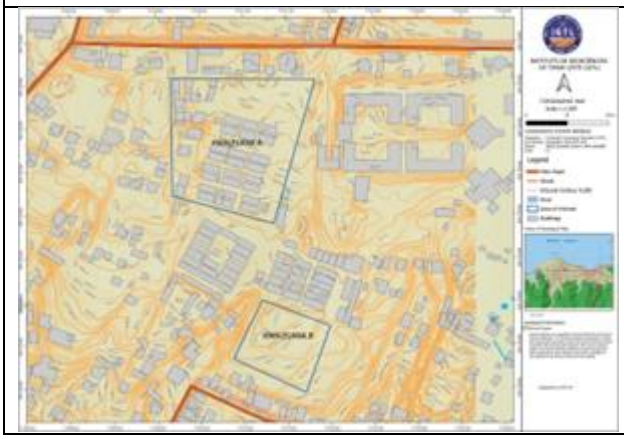
Table B-2: Topographic Maps

Dili Convention Center	
	
Becora	





Manleuana



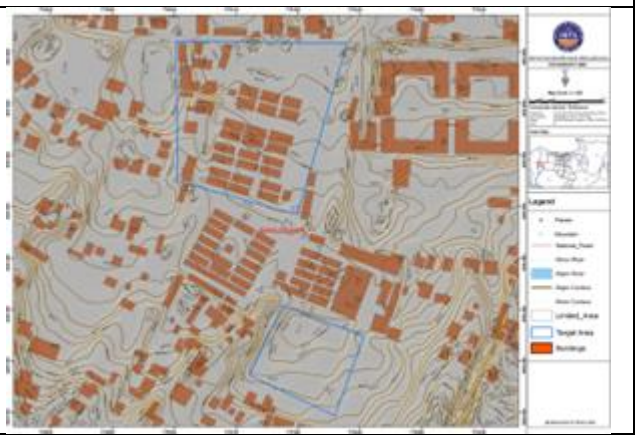
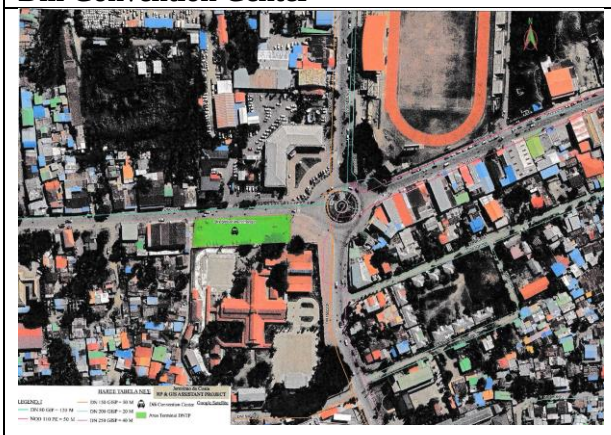
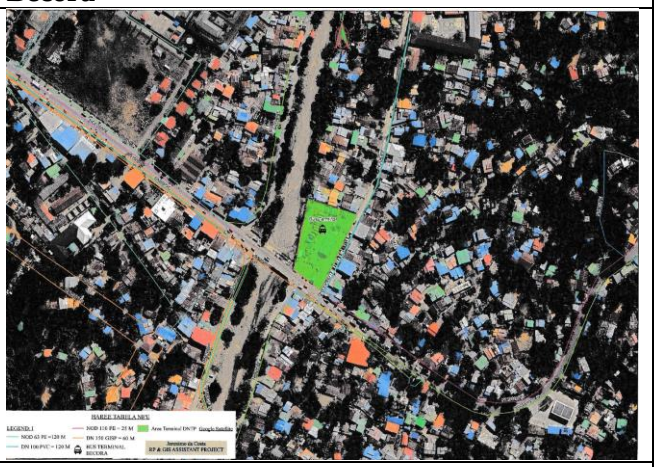
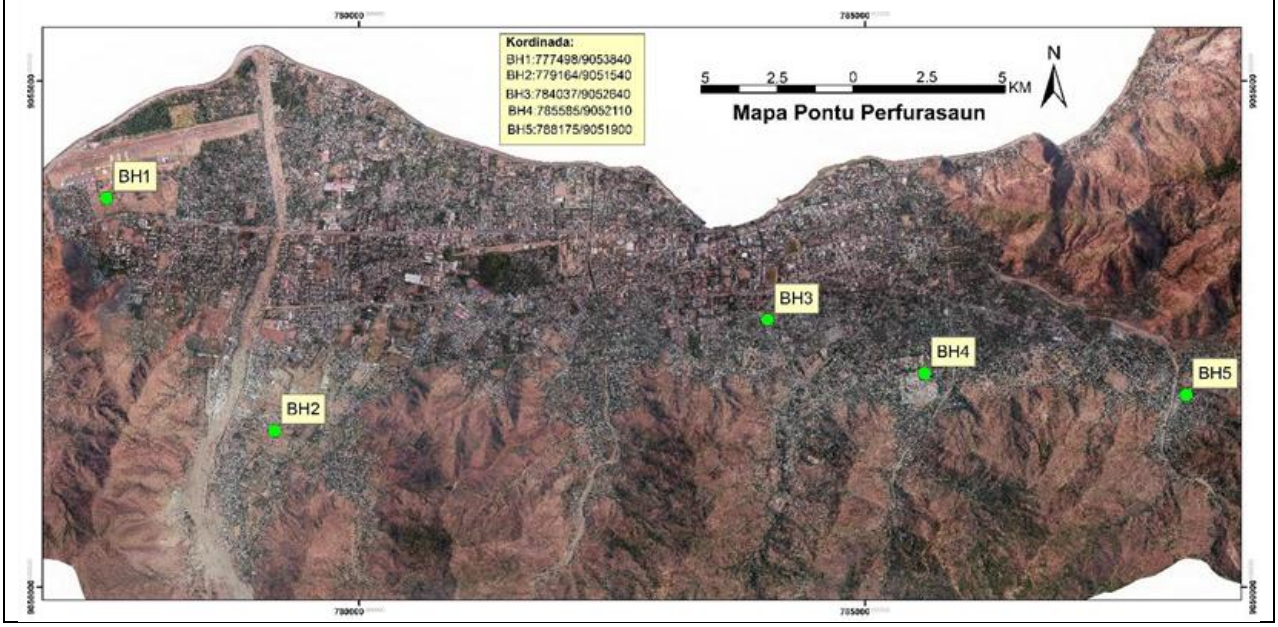


Table B-3: Utilities Maps

Dili Convention Center	Becora
	
Manleuana	**Maliana**
	

Lospalos	Suai
	

Table B-4: Geotech Map

Dili City


Appendix C – Survey Results

C.1 Background of Additional Traffic Survey

Objectives for Additional Survey

The previous surveys conducted in April/May 2023 (i.e., screenline traffic count at city level, terminal surveys (public transport operation by route) identified public transport services, operation, and demand within the terminal. This additional survey focuses on external access leading to/from the terminals in particular traffic and pedestrian volumes and activities with likely significant impact on the surrounding environment. These findings will help the design of road/walk improvements outside the terminal to provide smooth traffic movement to/from the terminal as well as create a safe, comfortable walking environment for pedestrians (both users and passersby).

Type of Survey

1. Traffic Count Survey
2. Pedestrian Count Survey
3. Roadside Activity Survey

This document outlines each of the surveys and the proposed survey locations and survey plans.

Select Bus Terminals

Survey Arrangement

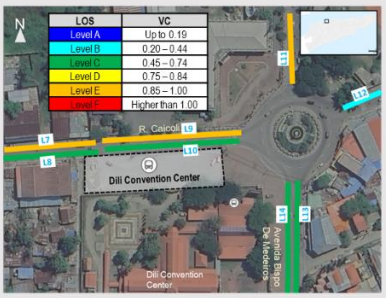
No.	Terminal	Facility Type	Location	Traffic Count Survey			Pedestrian Count Survey			Roadside Activity Survey		
				Weekday	Saturday	Sunday	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
1	Becora Terminal	Bus Terminal	Dili East	√			√			√		
2	Dili Convention Center	On-Street Interchange	Dili Center	√			√			√		
3	Manleuana Terminal	Bus Terminal	Dili South	√		√	√		√			
4	Airport Transit Hub	Bus Terminal	Dili West	√		√	√		√			
5	Terminal de Baucau	Bus Terminal	Baucau	√			√					
6	Hera Terminal	Bus Terminal	Dili East	√			√					

Notes:
1. Data for other regional locations are based on the surveys conducted during the Master Plan stage.
2. After the survey conduced in September 2024, the ADB Mission held in October 2024 concluded that the Dili West Bus Terminal to be developed at Tibar and the airport transit hub was proposed as an on-street interchange. Given both sites are located along the major east-west corridor, survey results for Airport Transit Hub are used as a proxy for analysis at Tibar (including transport, economic, etc.).

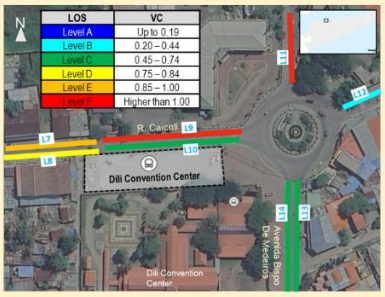
C.2 Dili Convention Center

Dili Convention Center (Vehicle)

Existing Scenario 2024 (Mid-Day Peak)



Reference Scenario 2035 (Mid-Day Peak)



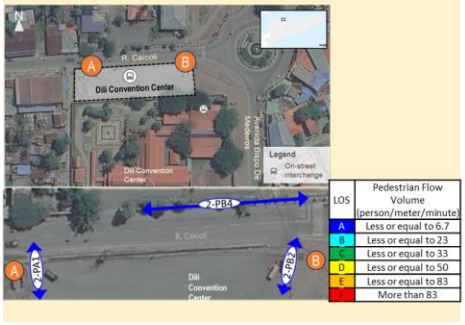
- Traffic of R. Caicoli eastbound (north of site) and Avenida Bispo De Medeiros (north) with high traffic existing and will exceed the road capacity in the 2035
- Geometric improvements are required for R. Caicoli, and road management measure are required for Avenida Bispo De Medeiros (such as prohibition of on-street parking)

Terminal	Day	Link	Road Name	Direction	# of Lanes	Capacity Per Lane	Existing Scenario 2024						Reference Scenario 2035					
							AM Peak		Mid-day Peak		PM Peak		AM Peak		Mid-day Peak		PM Peak	
							Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio
Dili Convention Center	Weekday	L7	R. Caicoli	EB	1	750	601	0.80	709	0.94	613	0.82	630	0.84	750	1.00	650	0.87
		L8	R. Caicoli	WB	1	750	607	0.81	538	0.72	540	0.72	640	0.85	570	0.76	570	0.76
		L9	R. Caicoli	EB	1	750	555	0.74	729	0.97	629	0.84	590	0.79	770	1.03	660	0.88
		L10	R. Caicoli	WB	1	750	658	0.88	496	0.66	461	0.61	700	0.93	520	0.69	490	0.65
		L11	Avenida Bispo De Medeiros	SB	2	2,000	1,443	0.72	1,976	0.99	1,897	0.95	1,520	0.76	2,090	1.05	2,000	1.00
		L12	R. Caicoli	EB	2	1,500	757	0.50	595	0.40	611	0.41	800	0.53	630	0.42	650	0.43
		L13	Avenida Bispo De Medeiros	SB	1	1,000	724	0.72	650	0.65	776	0.78	770	0.77	690	0.69	820	0.82
		L14	Avenida Bispo De Medeiros	NB	1	1,000	750	0.75	596	0.60	638	0.64	790	0.79	630	0.63	670	0.67

Dili Convention Center (Pedestrian)

Existing Scenario 2024

Reference Scenario 2035

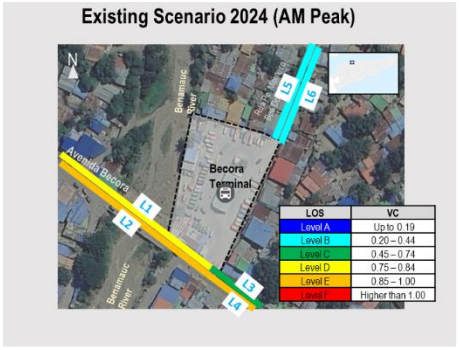


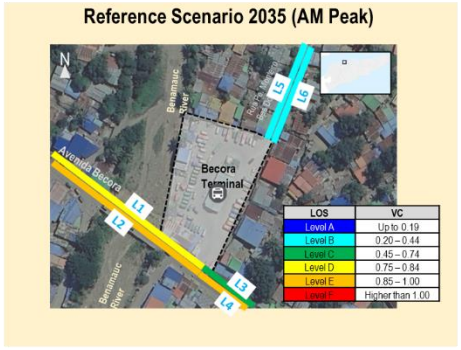
- The sidewalk width is sufficient for both existing and future.
- However, safety pedestrian crossing facilities are required at both access point of future terminal.

Terminal	Day	Link	Type	Direction	Existing Sidewalk Width (m)	Reduction Width for Safety Reason (m)	Adopted Sidewalk Width (m)	Existing Scenario 2024			Reference Scenario 2035		
								Max Peak Hourly Ped Flow	Pedestrian Flow Volume(person/meter/minute)	LOS	Max Peak Hourly Ped Flow	Pedestrian Flow Volume(person/meter/minute)	LOS
Dili Convention Center	Weekday	2-PA1	Sidewalk	2-direction	1	0.3	0.7	99	3	A	100	3	A
		2-PB2	Sidewalk	2-direction	3	0.3	2.7	284	2	A	300	2	A
		2-PB4	Sidewalk	2-direction	1	0.3	0.7	114	3	A	120	3	A

C.3 Becora Terminal

Becora Terminal (Vehicle)

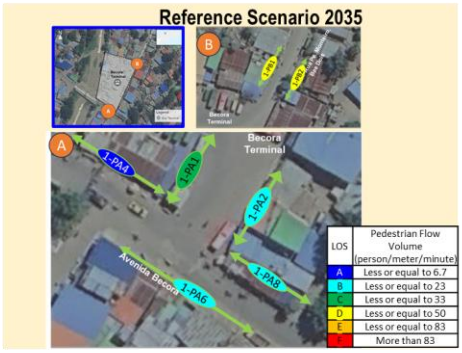




- Traffic of all roads are within the road capacity for both existing and future scenario.

Terminal	Day	Link	Road Name	Direction	#of Lanes	Capacity Per Lane	Existing Scenario 2024						Reference Scenario 2035					
							AM Peak		Mid-day Peak		PM Peak		AM Peak		Mid-day Peak		PM Peak	
							Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio
Becora	Weekday	L1	Avenida Becora	EB	1	1000	753	0.75	859	0.86	872	0.87	800	0.80	920	0.92	930	0.93
		L2	Avenida Becora	WB	1	1000	936	0.94	762	0.76	798	0.80	1,000	1.00	810	0.81	850	0.85
		L3	Avenida Becora	EB	1	750	485	0.65	643	0.86	645	0.86	520	0.69	690	0.92	690	0.92
		L4	Avenida Becora	WB	1	750	668	0.89	567	0.76	550	0.73	710	0.95	610	0.81	590	0.79
		L5	Rua Pe. Monteiro, Bee Dois	NB	1	750	199	0.27	190	0.25	179	0.24	210	0.28	200	0.27	190	0.25
		L6	Rua Pe. Monteiro, Bee Dois	SB	1	750	235	0.31	174	0.23	204	0.27	250	0.33	190	0.25	220	0.29

Becora Terminal (Pedestrian)



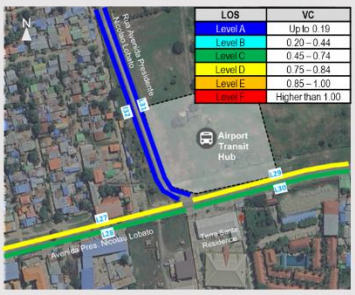
- The sidewalk along Rua Pe. Monteiro, Bee Dois required futher improvement (widening) to serve the Becora terminal better
- Crossing facilities are required for both terminal access for safety reason.

Terminal	Day	Link	Type	Direction	Existing Sidewalk Width (m)	Reduction Width for Safety Reason (m)	Adopted Sidewalk Width (m)	Existing Scenario 2024			Reference Scenario 2035		
								Max Peak Hourly Ped Flow	Pedestrian Flow Volume(person/ meter/minute)	LOS	Max Peak Hourly Ped Flow	Pedestrian Flow Volume(person/ meter/minute)	LOS
Becora	Weekday	1-PA1	Sidewalk	2-direction	0.5	0.3	0.2	282	24	C	300	25	C
		1-PA2	Sidewalk	2-direction	0.5	0.3	0.2	178	15	B	190	16	B
		1-PA4	Sidewalk	2-direction	2	0.3	1.7	143	2	A	150	2	A
		1-PA6	Sidewalk	2-direction	1	0.3	0.7	301	8	B	320	8	B
		1-PA8	Sidewalk	2-direction	1	0.3	0.7	343	9	B	370	9	B
		1-PB1&PB2	Sidewalk	2-direction	0.5	0.3	0.2	399	34	D	430	36	D

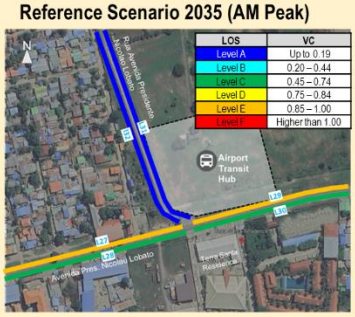
C.4 Airport Transit Hub

Airport Transit Hub (Vehicle)

Existing Scenario 2024 (AM Peak)



Reference Scenario 2035 (AM Peak)



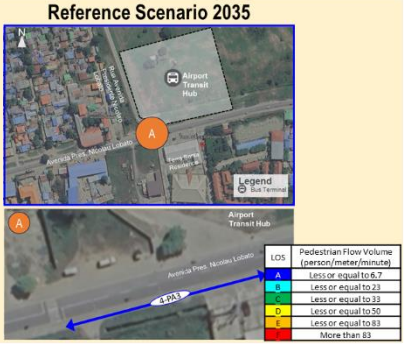
- Traffic of all roads are within the road capacity for both existing and future scenario.
- Traffic signals are recommended at the intersection of Avenida Pres. Nicolau Lobato and Rua Avenida Presidente Nicolao Lobatoto better handle access traffic of terminal and pedestrian crossings

Terminal	Day	Link	Road Name	Direction	# of Lanes	Capacity Per Lane	Existing Scenario 2024						Reference Scenario 2035					
							AM Peak		Mid-day Peak		PM Peak		AM Peak		Mid-day Peak		PM Peak	
							Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio
Airport Transit Hub	Weekday	L27	Avenida Pres. Nicolau Lobato	EB	2	2,000	1,610	0.81	1,086	0.54	1,364	0.68	2,000	1.00	1,350	0.68	1,700	0.85
		L28	Avenida Pres. Nicolau Lobato	WB	2	2,000	1,018	0.51	1,135	0.57	1,333	0.67	1,270	0.64	1,410	0.71	1,660	0.83
		L29	Avenida Pres. Nicolau Lobato	EB	2	2,000	1,589	0.79	1,048	0.52	1,335	0.67	1,980	0.99	1,300	0.65	1,660	0.83
		L30	Avenida Pres. Nicolau Lobato	WB	2	2,000	1,034	0.52	1,139	0.57	1,338	0.67	1,290	0.65	1,420	0.71	1,660	0.83
		L31	Rua Avenida Presidente Nicolao Lobato	SB	1	750	7	0.01	13	0.02	10	0.01	10	0.01	20	0.03	10	0.01
		L32	Rua Avenida Presidente Nicolao Lobato	NB	1	750	45	0.06	56	0.07	44	0.06	60	0.08	70	0.09	50	0.07

Airport Transit Hub (Pedestrian)

Existing Scenario 2024

Reference Scenario 2035

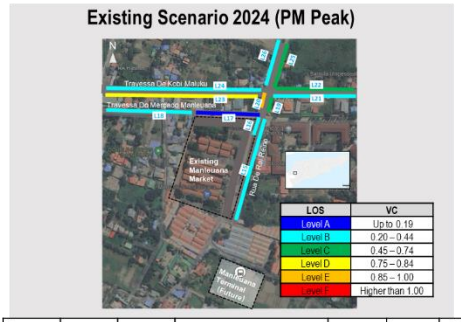


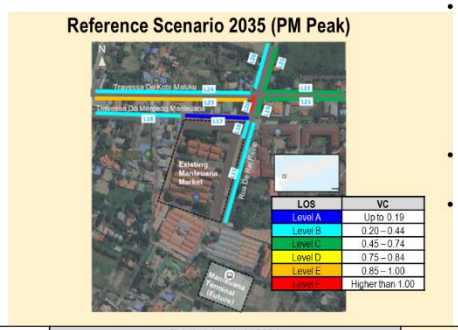
- The sidewalk width is sufficient for both existing and future.
- Additional pedestrian crossing facility are required on the south side of Airport Transition Hub for passenger easier cross Avenida Pres. Nicolau Lobato and access to the terminal.

Terminal	Day	Link	Type	Direction	Existing Sidewalk Width (m)	Reduction Width for Safety Reason (m)	Adopted Sidewalk Width (m)	Existing Scenario 2024			Reference Scenario 2035		
								Max Peak Hourly Ped Flow	Pedestrian Flow Volume(person/meter/minute)	LOS	Max Peak Hourly Ped Flow	Pedestrian Flow Volume(person/meter/minute)	LOS
Airport Transit Hub	Weekday	4-PA3	Sidewalk	2-direction	2	0.3	1.7	141	2	A	180	2	A

C.5 Manleuana Market

Manleuana Market (Vehicle)

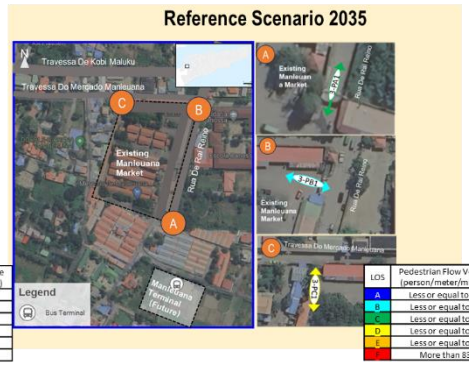




- Traffic of Rua De Rai Reino northbound (road section between Travessa De Kobi Maluku and Travessa Do Mercado Manleuana) with high traffic existing and will exceed the road capacity in the 2035
- Other road links show operate in Satisfied level.
- The road improvement are required for Rua De Rai Reino, road widening, junction improvement, etc. and the traffic circulation need further optimize to increase accessibility of terminal.

Terminal	Day	Link	Road Name	Direction	# of Lanes	Capacity Per Lane	Existing Scenario 2024						Reference Scenario 2035					
							AM Peak		Mid-day Peak		PM Peak		AM Peak		Mid-day Peak		PM Peak	
							Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio
Manleuana Market	Weekday	L15	Rua De Rai Reino	SB	1	750	204	0.27	315	0.42	246	0.33	250	0.33	390	0.52	310	0.41
		L16	Rua De Rai Reino	NB	1	750	177	0.24	304	0.40	212	0.28	220	0.29	380	0.51	260	0.35
		L17	Travessa Do Mercado Manleuana	WB	1	750	15	0.02	8	0.01	15	0.02	20	0.03	10	0.01	20	0.03
		L18	Travessa Do Mercado Manleuana	WB	1	750	193	0.26	266	0.35	236	0.31	240	0.32	330	0.44	290	0.39
		L19	Rua De Rai Reino	SB	1	750	356	0.47	420	0.56	393	0.52	440	0.59	520	0.69	490	0.65
		L20	Rua De Rai Reino	NB	1	750	692	0.92	708	0.94	738	0.98	860	1.15	880	1.17	920	1.23
		L21	Travessa De Kobi Maluku	WB	1	750	305	0.41	404	0.54	312	0.42	380	0.51	500	0.67	390	0.52
		L22	Travessa De Kobi Maluku	EB	1	750	331	0.44	535	0.71	402	0.54	410	0.55	670	0.89	500	0.67
		L23	Travessa De Kobi Maluku	WB	1	750	361	0.48	579	0.77	565	0.75	450	0.60	720	0.96	700	0.93
		L24	Travessa De Kobi Maluku	EB	1	750	75	0.10	288	0.38	165	0.22	90	0.12	360	0.48	210	0.28
		L25	Travessa De Kobi Maluku	SB	1	750	257	0.34	295	0.39	353	0.47	320	0.43	370	0.49	440	0.59
		L26	Travessa De Kobi Maluku	NB	1	750	281	0.37	335	0.45	208	0.28	350	0.47	420	0.56	260	0.35

Manleuana Market (Pedestrian)



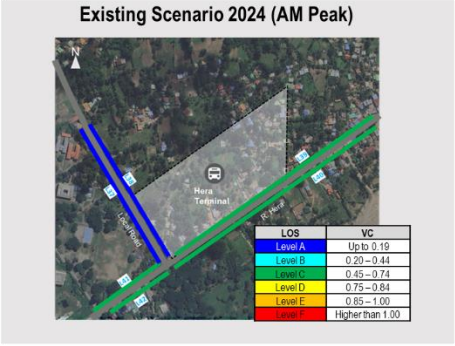
- The existing pedestrian space is adequate for pedestrian circulation, but the currently there are no dedicated sidewalks, which could lead to safety issues.
- Recommended upgrades to the pedestrian system, including safe sidewalks and crossing facilities

Terminal	Day	Link	Type	Direction	Existing Sidewalk Width (m)	Reduction Width for Safety Reason (m)	Adopted Sidewalk Width (m)	Existing Scenario 2024			Reference Scenario 2035		
								Max Peak Hourly Ped Flow	Pedestrian Flow Volume(person/ meter/minute)	LOS	Max Peak Hourly Ped Flow	Pedestrian Flow Volume(person/ meter/minute)	LOS
Manleuana Market	Weekday	3-PA1	Sidewalk	2-direction	0.5	0.3	0.2	222	19	B	280	24	C
		3-PB1	Sidewalk	2-direction	0.5	0.3	0.2	218	19	B	270	23	B
		3-PC1	Sidewalk	2-direction	0.5	0.3	0.2	428	36	D	530	45	D

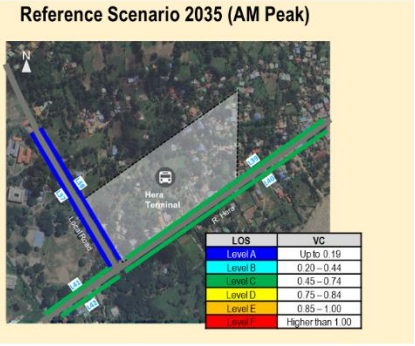
C.6 Hera Terminal

Hera Terminal (Vehicle)

Existing Scenario 2024 (AM Peak)



Reference Scenario 2035 (AM Peak)



- Traffic of all roads are within the road capacity for both existing and future scenario.
- The local road need to be upgraded in conjunction with hub design

Terminal	Day	Link	Road Name	Direction	# of Lanes	Capacity Per Lane	Existing Scenario 2024						Reference Scenario 2035					
							AM Peak		Mid-day Peak		PM Peak		AM Peak		Mid-day Peak		PM Peak	
							Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio
Hera Terminal	Weekday	L37	Local Road	SB	1	750	52	0.07	30	0.04	22	0.03	60	0.08	30	0.04	20	0.03
		L38	Local Road	NB	1	750	23	0.03	48	0.06	39	0.05	20	0.03	50	0.07	40	0.05
		L39	R. Hera	EB	1	750	448	0.60	401	0.53	381	0.51	480	0.64	430	0.57	410	0.55
		L40	R. Hera	WB	1	750	407	0.54	358	0.48	385	0.51	430	0.57	380	0.51	410	0.55
		L41	R. Hera	EB	1	750	439	0.59	413	0.55	398	0.53	470	0.63	440	0.59	420	0.56
		L42	R. Hera	WB	1	750	393	0.52	334	0.44	366	0.49	420	0.56	360	0.48	390	0.52

Hera Terminal (Pedestrian)

Existing Scenario 2024

Reference Scenario 2035

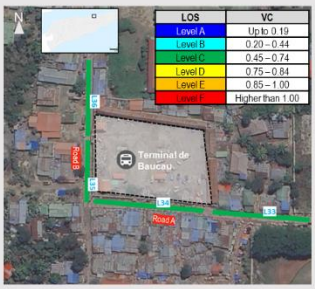
- The sidewalk width is sufficient for both existing and future.
- Additional pedestrian crossing facility are required on the south side of Hera Terminal for passenger easier cross R. Hera and access to the terminal.

Terminal	Day	Link	Type	Direction	Existing Sidewalk Width (m)	Reduction Width for Safety Reason (m)	Adopted Sidewalk Width (m)	Existing Scenario 2024			Reference Scenario 2035		
								Max Peak Hourly Ped Flow	Pedestrian Flow Volume(person/meter/minute)	LOS	Max Peak Hourly Ped Flow	Pedestrian Flow Volume(person/meter/minute)	LOS
Hera Terminal	Weekday	6-PA2	Sidewalk	2-direction	0.5	0.3	0.2	27	3	A	30	3	A
		6-PA3	Sidewalk	2-direction	1	0.3	0.7	69	2	A	70	2	A
		6-PA4	Sidewalk	2-direction	0.5	0.3	0.2	63	6	A	70	6	A

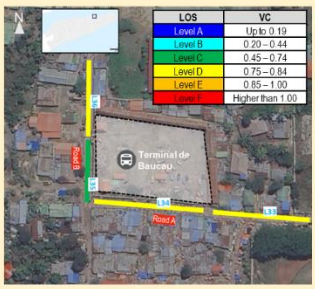
C.7 Terminal de Baucau

Terminal de Baucau (Vehicle)

Existing Scenario 2024 (AM Peak)



Reference Scenario 2035 (AM Peak)



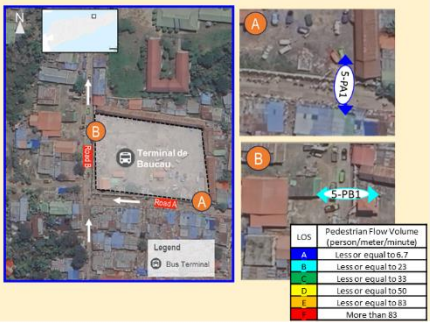
- Traffic of all roads are within the road capacity for both existing and future scenario.
- Since the Baucau terminal will be relocated, the traffic flow for Terminal de Baucau will be the reference for future terminal design

Terminal	Day	Link	Road Name	Direction	# of Lanes	Capacity Per Lane	Existing Scenario 2024						Reference Scenario 2035					
							AM Peak		Mid-day Peak		PM Peak		AM Peak		Mid-day Peak		PM Peak	
							Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio	Traffic Flow (PCU/hr)	V/C Ratio
Terminal de Baucau	Weekday	L33	Road A	WB	1	750	496	0.66	438	0.58	318	0.42	630	0.84	560	0.75	400	0.53
		L34	Road A	WB	1	750	452	0.60	410	0.55	311	0.41	570	0.76	520	0.69	390	0.52
		L35	Road B	NB	1	750	373	0.50	315	0.42	275	0.37	470	0.63	400	0.53	350	0.47
		L36	Road B	NB	1	750	449	0.60	335	0.45	281	0.37	570	0.76	430	0.57	360	0.48

Terminal de Baucau (Pedestrian)

Existing Scenario 2024

Reference Scenario 2035



- The sidewalk width is sufficient for both existing and future.
- Since the Baucau terminal will be relocated, the pedestrian flow for Terminal de Baucau will be the reference for future terminal design

Terminal	Day	Link	Type	Direction	Existing Sidewalk Width (m)	Reduction Width for Safety Reason (m)	Adopted Sidewalk Width (m)	Existing Scenario 2024			Reference Scenario 2035		
								Max Peak Hourly Ped Flow	Pedestrian Flow Volume(person/ meter/minute)	LOS	Max Peak Hourly Ped Flow	Pedestrian Flow Volume(person/ meter/minute)	LOS
Terminal de Baucau	Weekday	5-PA1	Sidewalk	2-direction	2	0.3	1.7	156	2	A	200	2	A
		5-PB1	Sidewalk	2-direction	0.5	0.3	0.2	122	11	B	150	13	B

Appendix D – Cost Estimates

D.1 Bus Terminal Cost Estimates

					#2	#3	#4	#5	#6
#	Cost Item	Unit Cost	Unit	Assumptions/Notes	Becora Terminal	Tibar Terminal	Manleuana Terminal	Hera Terminal	Aldeia Samalakuliba Terminal
1	Terminal Facility Roof	300	m2	Assume same area as waiting & queuing area	250,500	575,700	361,800	317,400	171,900
2	Bus Shelter (Enhanced 6m, Wide 1.8m)	2,600	number	Cost includes covered facilities and seating	13,000	36,400	20,800	0	10,400
3	10m Concrete Bus Bay (1 Bay)	9,600	number	Cost includes excavation, curbs, markings	48,000	134,400	76,800	76,800	38,400
4	Drop-Off Area	200	m2	Include road pavement and sidewalk on each end (5m x 1.8m)	34,000	43,400	37,400	33,000	28,800
5	Parking Area	80	m2	Include road pavement	21,040	81,040	39,040	0	0
6	Waiting & Queuing Area (With Seating)	1,000	m2	Cost includes waiting facilities and seating	410,000	1,029,000	622,000	537,000	260,000
7	Pavement Markings	70	number	Assume road makings over the area of 5m x 3m with the letters of "Bus Stop"	350	980	560	770	280
8	Wayfinding Signage	300	number	Assume 10 signages per terminal site	3,000	3,000	3,000	600	3,000
9	Ticket & Fare Collection Booth	500	m2	Cost includes building costs	8,000	8,000	8,000	8,000	8,000
10	Retail & Kiosk	500	m2	Cost includes building costs	82,000	206,000	124,500	107,500	52,000
11	Security Office	500	m2	Cost includes building costs	2,000	2,000	2,000	2,000	2,000
12	Operation Office	500	m2	Cost includes building costs	12,500	12,500	12,500	12,500	12,500
13	Administration Office	500	m2	Cost includes building costs	12,500	12,500	12,500	12,500	12,500
14	Air Conditioning	1,000	number	Assume 1 A/C for each office	3,000	3,000	3,000	0	3,000
15	Fan	300	number	Assume 1 fan to cover passenger areas of 100m2 (10m x 10m) plus 1 per office building	2,400	4,200	3,000	2,700	1,800
16	Toilets	12,000	number	Assume a toilet building of 8m x 6m including toilet facilities	12,000	12,000	12,000	12,000	12,000
17	Lighting for Vehicles	1,300	number	Assume 1 per every 100m2 of concrete area (pickup, drop-off, and parking)	10,400	26,000	15,600	14,300	7,800
18	Streetlight	300	number	Assume 1 per every 100m2 of the total facility area	9,000	23,700	13,800	12,300	6,300
19	Tactile Paving	60	m2	Based on the unit cost of 0.6 x 1.0 tactile indicator array	7,800	16,380	10,920	7,020	3,120
20	Circulation Areas	80	m2	Circulation space assumed based on design and benchmarking similar bus projects in the region	116,000	324,800	185,600	185,600	92,800
21	Utilities Removal / Relocation	600	number	Assume utility poles removal/relocation every 400m2 (20m x 20m)	4,800	12,000	7,200	6,600	3,600
22	Retention Pond	200	m2	Assume 3% of a site area with a pond depth of 3m	0	47,400	60,000	219,200	69,600

					#2	#3	#4	#5	#6
#	Cost Item	Unit Cost	Unit	Assumptions/Notes	Becora Terminal	Tibar Terminal	Manleuana Terminal	Hera Terminal	Aldeia Samalakuliba Terminal
23	Rainwater Storage	3,100	number	Rainwater harvesting system for a communal system	3,100	3,100	3,100	3,100	3,100
24	Floodwater Drainage	300	m	The cost includes excavation and precast concrete (Box culvert)	75,000	96,000	105,000	279,000	144,000
25	Solar Pannel Roof (Terminal)	1,300	m2	Lumpsum cost per unit for large-scale building/facilities	106,600	267,800	162,500	140,400	67,600
Subtotal					**1,246,990**	**2,981,300**	**1,902,620**	**1,990,290**	**1,014,500**
	Additional Works	10%	%	Additional works include site formation, mechanical & electrical works, other utilities treatment, etc.	124,699	298,130	190,262	199,029	101,450
	Innovative Facilities Improvement	20%	%	Cost includes innovative facilities such as ITS system at the terminal	249,398	596,260	380,524	398,058	202,900
Subtotal (With Additional Improvements)					**1,621,087**	**3,875,690**	**2,473,406**	**2,587,377**	**1,318,850**
	Road & Traffic Improvement	200,000	lumpsum	Cost includes 50m road/traffic upgrades outside of terminal (including traffic light)	200,000	200,000	200,000	200,000	200,000
	Sidewalk & Crossing Improvement	50,000	lumpsum	Cost includes 50m walk upgrades and 2 crosswalk improvements (6m x 3m)	50,000	50,000	50,000	50,000	50,000
External Access Improvements Outside of Terminal					250,000	250,000	250,000	250,000	250,000
Subtotal (With Exter Access Improvements Outside of Terminal)					**1,871,087**	**4,125,690**	**2,723,406**	**2,837,377**	**1,568,850**
	Contingency	20%	%	Assume 20% for contingency	374,217	825,138	544,681	567,475	313,770
Gran Total					**2,245,304**	**4,950,828**	**3,268,087**	**3,404,852**	**1,882,620**
Gran Total (Rounded to Nearest Hundred)					**2,300,000**	**5,000,000**	**3,300,000**	**3,500,000**	**1,900,000**

D.2 On-Street Interchange Cost Estimates

					#1	#7	#8	#9	#10
#	Cost Item	Unit Cost	Unit	Assumptions/Notes	Dili Convention Center [A]	Maliana Market [B]	Suai Market [B]	Lospalos Bemoris [B]	Viqueque City Center [B]
1	Bus Shelter (Enhanced 6m, Wide 1.8m)	2,600	number	Cost includes covered facilities and seating	13,000	7,800	7,800	7,800	7,800
2	Concrete Bus Bay	9,600	number	Cost includes excavation, curbs, markings and concrete pavement resurfacing. Assumed to accommodate 9m bus.	48,000	28,800	28,800	28,800	28,800
3	Sidewalk Improvement	20	m2	Sidewalk Improvement (Shelter - Regular 3m, Wide 1.8m)	900	540	540	540	540
4	Streetlights at Bus Stop	300	number	Improvements only at stops with new shelters	1,500	900	900	900	900
5	Trees at Bus Stop	200	number	Improvements only at stops with new shelters	1,000	600	600	600	600
6	Utility Pole at Bus Stop	600	number	Improvements only at stops with new shelters	3,000	1,800	1,800	1,800	1,800
7	Tactile Paving	60	m2	Based on the unit cost of 0.6 x 1.0 tactile indicator array	180	120	120	120	120
8	Additional Sidewalk Improvement (Normal)	20	m2	Assumed 10m improvement on each side of bus stop x width of sidewalk (including shelter + PWD)	6,000	3,600	3,600	3,600	3,600
9	Administration Office	500	m2	Assume to include a 3m x 3m office with several functions including admin and operation	4,500	4,500	4,500	4,500	4,500

					#1	#7	#8	#9	#10
#	Cost Item	Unit Cost	Unit	Assumptions/Notes	Dili Convention Center [A]	Maliana Market [B]	Suai Market [B]	Lospalos Bemoris [B]	Viqueque City Center [B]
10	Bus Stop Divider Width	60	m2	Reflectorized thermoplastic pavement markings assuming 6mm depth	0	0	0	0	0
11	Bus Stop Vertical Signage	300	number	Assume 1 signage per bay	1,500	900	900	900	900
12	Bus Stop Horizontal Signage	70	number	Assume road makings over the area of 5m x 3m with the letters of "Bus Stop"	350	210	210	210	210
13	Floodwater Drainage	300	m	The cost includes excavation and precast concrete (Box culvert)	56,400	33,900	33,900	33,900	33,900
14	Solar Pannel Roof (On-Street Interchange)	700	m2	Lumpsum cost per unit for small-scale building/facilities	7,700	7,700	7,700	7,700	7,700
Subtotal					**144,030**	**91,370**	**91,370**	**91,370**	**91,370**
	Additional Works	10%	%	Additional works include site formation, mechanical & electrical works, etc.	14,403	9,137	9,137	9,137	9,137
Subtotal (With Additional Improvements)					**158,433**	**100,507**	**100,507**	**100,507**	**100,507**
	Contingency	20%	%	Assume 20% for contingency	31,687	20,101	20,101	20,101	20,101
Gran Total					**190,120**	**120,608**	**120,608**	**120,608**	**120,608**
Gran Total (Rounded to Nearest Hundred)					**200,000**	**130,000**	**130,000**	**130,000**	**130,000**

Note:

[A] Dili convention center includes the cost for five bays to account for additional bays/shelters required to accommodate all eight thru routes proposed to serve this facility.

[B] Given unclear operation nature of local microlet in regional cities, each regional site is assumed to have at least three bays to serve both regional and local transport needs.

D.3 O&M Cost Estimates for Personnel

					#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
#	Cost Item	Unit Cost [A]	Unit	Assumptions /Notes	Dili Convention Center	Becora	Tibar	Manleuana	Hera [B]	Baucau	Maliana Market	Suai Market	Lospalos Bemoris	Viqueque City Center
1	Technical Maintenance Staff	4,320	number	2 per terminal office [B]	-	8,640	8,640	8,640	30,240	8,640	-	-	-	-
2	Operation Staff-Junior	2,640	number	Includes security guards (1 per 4 bus bays) and janitors (2 per terminal with on-site bathrooms); two-shift rotation is assumed	5,280	21,120	31,680	21,120	21,120	15,840	5,280	5,280	5,280	5,280
3	Administra-tive Staff-Junior	2,880	number	4 per terminal office [B]	-	11,520	11,520	11,520	25,920	11,520	-	-	-	-
4	Administra-tive Staff-Senior	3,600	number	1 per terminal office	-	3,600	3,600	3,600	3,600	3,600	-	-	-	-
5	Management-Junior	3,600	number	1 per terminal office	-	3,600	3,600	3,600	3,600	3,600	-	-	-	-
6	Management-Senior	5,760	number	1 per terminal office	-	5,760	5,760	5,760	5,760	5,760	-	-	-	-
Subtotal					**5,280**	**54,240**	**64,800**	**54,240**	**90,240**	**48,960**	**5,280**	**5,280**	**5,280**	**5,280**
Grand Total														**338,880**
Grand Total (Rounded to Nearest Hundred)														**338,900**

Note:

[A] Unit cost is in terms of annual wage and modelled on the average monthly wage of relevant field types as stated in the Timor-Leste Labour Force Survey 2021 Report (https://www.inetl-ip.gov.tl/wp-content/uploads/2023/05/Final-Report-Labour-Force-Survey-TL-2021.pdf). All cost has already included 20% additional renumeration/contingency.

[B] Given the preliminary site designs for the ten terminals/facilities, it is assumed that Hera Terminal (with the largest building footprint and a dedicated corporate office) will serve as the operation control center of the whole public transport network, so additional staff are assumed to be positioned at this location, including 5 additional junior administrative staff and 5 technical maintenance staff, with one staff of each type corresponding to one of the terminal offices in Becora, Tibar, Manleuana, and Baucau, and the last staff responsible for all other facilities that do not include an office.

Appendix E – Financial Revenues Analysis

E.1 Key Assumptions for Revenue Analysis

Type of Revenues	Item	Amount	Unit
Farebox Revenues			
Fare of Microlet	• Student Fare	0.15	USD
	• Adult Fare	0.25	USD
Fare of Bus	• Fare for Route P-1	2	USD
	• Fare for Route P-2	8	USD
	• Fare for Route P-3	4	USD
	• Fare for Route P-4	3	USD
	• Fare for Route P-5	2	USD
	• Fare for Route P-6	8	USD
	• Fare for Route P-7	6	USD
	• Fare for Route P-8	2	USD
	• Fare for Route P-9	9	USD
	• Fare for Route P-10	12	USD
	• Fare for Route P-11	8	USD
	• Fare for Route A-1(airport route)	5	USD
	• Fare for Route A-2(airport route)	5	USD
	• Fare for Route I-1(international route)	35	USD
Allocation percentage of Fare to Bus Terminal Operation	• Existing condition of allocation % of fare revenue to terminal operation	0%	%
	• Future condition of allocation % of fare revenue to terminal operation	5%	%
Commercial Space Rental			
Rental of Kiosk	• Annual Rental per 9m2 kiosk (3m x 3m)	730	USD
Advertisement			
Annual Advertisement Fee per shelter	• Advertisement Fee at Dili & Baucau	3650	USD
	• Advertisement Fee at regional city	1460	USD
Parking Levy			
Parking Fee	• Existing Parking Fee per hour per Space	0.25	USD
	• Daily Occupancy Rate per Space	50%	%
	• Annal Fee per Space	1095	USD
Allocation percentage of Parking Fee to Terminal Operation	• Existing condition of allocation % of parking fee to terminal operation	0%	%
	• Future condition of allocation % of parking fee to terminal operation	20%	%

E.2 Fare Revenues Analysis

Step 1 –Annual Ridership and Terminal Served by Route

The Year 2024 and 2035 service plan for public transport were developed in the 2024 PTMP. The table below shows a summary of ridership by route and the terminals served by each route (with assignment of each route whether terminating or thru route).

Route	Annual Ridership (People trips)		Year 2024 Route Assignment										Year 2035 Route Assignment									
	Year 2024	Year 2035	Becora	Tasitolu	Manleuana Market	Dili Convention Center	Hera	Baucau	Lospalos	Viqueque	Suai	Maliana	Becora	Tasitolu	Manleuana Market	Dili Convention Center	Hera	Baucau	Lospalos	Viqueque	Suai	Maliana
M-1	1,911,720	4,175,040	Terminate			Thru							Terminate			Thru						
M-2	2,988,130	3,196,070	Terminate			Thru							Terminate			Thru						
M-3	3,948,730	9,140,110			Terminate										Terminate							
M-4	1,949,070	4,267,110				Thru										Thru						
M-5	2,840,700	6,980,200				Thru									Terminate	Thru						
M-6	2,202,910	5,192,570				Thru										Thru						
M-7	1,733,090	3,900,200				Thru										Thru						
M-8	1,288,150	2,816,910				Thru										Thru						
M-9	3,736,300	9,074,790				Thru										Thru						
M-10	4,638,520	6,755,860		Terminate										Terminate								
M-11	3,437,330	4,364,890			Terminate									Terminate	Terminate							
M-12	922,290	989,800																				
M-13	967,890	1,267,170			Thru										Terminate							
A-1		105,850																				
A-2		21,900																				
P-1	19,098	23,738			Thru										Thru							
P-2	11,548	14,483			Thru										Thru							
P-3	495,199	666,382	Terminate					Terminate									Terminate	Terminate				
P-4	163,721	215,536		Terminate										Terminate								
P-5	651,010	888,105		Terminate										Terminate								
P-6	84,048	100,206	Terminate						Terminate								Terminate	Thru	Terminate			
P-7	136,987	177,013		Terminate								Terminate		Terminate								Terminate
P-8	50,073	64,086	Terminate														Terminate					
P-9	43,880	57,402			Thru										Thru							
P-10	89,373	106,882									Terminate				Thru						Terminate	
P-11	110,849	140,739	Terminate							Terminate							Terminate	Thru		Terminate		
S-1		971,412											Terminate				Terminate					
I-2		306,600												Terminate								

Step 2 –Annual Ridership by Terminal

The ridership served by each terminal is estimated by the ridership on the route and the terminal's contribution to the route (terminating or thru), When a route terminates at two terminals, the total route ridership will be divided equally (50%) between the terminate terminals, and when a route transits or thru a terminal, the ridership for the thru terminal is assumed to be 10% of the total route ridership, and the remaining route ridership will be divided equally between the terminating terminals. Based on the data indicated in Step 1, ridership served by each terminal are summarized in below:

Route	Year 2024 Ridership										Year 2035 Ridership									
	Becora	Tasitolu	Manleuana Market	Dili Convention Center	Hera	Baucau	Lospalos	Viqueque	Suai	Maliana	Becora	Tasitolu	Manleuana Market	Dili Convention Center	Hera	Baucau	Lospalos	Viqueque	Suai	Maliana
M-1	1,720,548			191,172							3,757,536			417,504						
M-2	2,689,317			298,813							2,876,463			319,607						
M-3			3,948,730										9,140,110							

Route	Year 2024 Ridership										Year 2035 Ridership									
	Becora	Tasitolu	Manleuana Market	Dili Convention Center	Hera	Baucau	Lospalos	Viqueque	Suai	Maliana	Becora	Tasitolu	Manleuana Market	Dili Convention Center	Hera	Baucau	Lospalos	Viqueque	Suai	Maliana
M-4				194,907										426,711						
M-5				284,070									6,282,180	698,020						
M-6				220,291										519,257						
M-7				173,309										390,020						
M-8				128,815										281,691						
M-9				373,630										907,479						
M-10		4,638,520										6,080,274								
M-11			3,437,330									2,182,445	2,182,445							
M-12																				
M-13			96,789										1,267,170							
A-1																				
A-2																				
P-1			1,910										2,374							
P-2			1,155										1,448							
P-3	247,600					247,600									333,191	333,191				
P-4		163,721										215,536								
P-5		651,010										888,105								
P-6	42,024						42,024								45,093	10,021	45,093			
P-7		68,494								68,494		88,506								88,506
P-8	50,073														64,086					
P-9			4,388										5,740							
P-10									89,373				10,688						96,194	
P-11	55,425							55,425							63,332	14,074		63,332		
S-1		-	-	-	-	-	-	-	-		485,706	-	-	-	485,706	-	-	-	-	-
I-2												306,600								
Total	**4,804,986**	**5,521,745**	**7,490,302**	**1,865,007**	**-**	**247,600**	**42,024**	**55,425**	**89,373**	**68,494**	**7,119,705**	**9,761,466**	**18,892,155**	**3,960,289**	**991,408**	**357,285**	**45,093**	**63,332**	**96,194**	**88,506**

Note: Shuttle bus service (S-1) connecting Becora and Hear is assumed to be free at this stage. Further assessment of a business model or assignment of other microlet routes or route to/from Metinaro to this S-1 route is required to estimate detailed revenues for this route.

Step 3 –Summary of Ridership and Fare Revenue

Estimated fare revenue for terminals based on ridership on different routes serve at each terminal (with different fares on different routes as shown in the assumption table), summed to calculate total fare revenue for routes served by each terminal. Given not all revenues can be used for terminal O&M, we assumed 5% of the total fare revenue to be allocated for bus terminal use for future condition and existing condition is 0%. The ridership and revenue have been shows in the table below:

Site	Annual Ridership			Annual Fare Revenue (Total)			Annual Fare Revenue (Allocated for Bus Terminal Use)		
	Year 2024	Year 2030 [A]	Year 2035	Year 2024	Year 2030 [A]	Year 2035	Year 2024	Year 2030	Year 2035
Becora Terminal	4,804,986	5,729,295	6,633,999	2,862,352	2,006,723	1,492,650	0	100,336	74,632
Tibar	5,521,745	7,534,300	9,761,466	3,247,811	7,629,289	15,543,967	0	381,464	777,198
Manleuana Terminal	7,490,302	12,406,613	18,892,155	1,736,191	2,898,383	4,442,433	0	144,919	222,122
Dili Convention Center	1,865,007	2,812,350	3,960,289	419,627	632,779	891,065	0	31,639	44,553
Hera Terminal	-	505,702	505,702		2,328,336	2,328,336	0	116,417	116,417
Baucau	247,600	302,428	357,285	990,398	1,253,549	1,525,519	0	62,677	76,276
Lospalos	42,024	43,671	45,093	336,192	349,368	360,741	0	17,468	18,037
Viqueque	55,425	59,607	63,332	443,396	476,856	506,660	0	23,843	25,333
Suai	89,373	93,031	96,194	1,072,476	1,116,375	1,154,327	0	55,819	57,716
Maliana	68,494	78,772	88,506	410,961	472,632	531,038	0	23,632	26,552
Total	**20,184,954**	**29,565,769**	**40,404,021**	**11,519,404**	**19,164,290**	**28,776,736**	**0**	**958,215**	**1,438,837**

Note: [A] the annal ridership and annual fare revenue of year 2030 are back calculated based on 2024 and 2035 data.

E.3 Kiosks Rental Income

During the terminal design, commercial area was reserved for each terminal, and the number of kiosks for each terminal was calculated based on an assumed area of 3m x 3m for each kiosk. Based on the annual rent of each kiosk as stated in the Assumption, the Kiosks Rental Income is calculated as follows:

Terminal	Area for Retail / Kiosk (m2)	Number of Kiosks (number)	Annual Rental of Kiosks (USD)
Becora Terminal	164	18	13,140
Tibar	412	45	32,850
Manleuana Terminal	249	27	19,170
Dili Convention Center	0	0	0
Hera Terminal	215	23	16,790
Baucau	104	11	8,030
Lospalos	0	0	0
Viqueque	0	0	0
Suai	0	0	0
Maliana	0	0	0
Total	**1144**	**124**	**90,520**

E.4 Shelter Advertisement Income

The shelter advertisement income will be based on the number of panels provided at buildings or bus shelters (depending on location and proposed facility type – terminals and on-street interchange). The advertisement fee differs by location, with that for Dili and Baucau assumed to be higher at US$ 3,650 annually (or US$10 / day), and that for other region assumed at US$ 1,460 annually (or US$4 / day).

Terminal	Number of Shelter (number)	Advertisement Fee per Shelter by Region (USD)	Annual Advertisement Fee (USD)
Becora Terminal	5	3,650	18,250
Tibar	14	3,650	51,100
Manleuana Terminal	8	3,650	29,200
Dili Convention Center	3	3,650	10,950
Hera Terminal	8	3,650	29,200
Baucau	4	3,650	14,600
Lospalos	2	1,460	2,920
Viqueque	2	1,460	2,920
Suai	2	1,460	2,920
Maliana	2	1,460	2,920
Total	**50**		**164,980**

E.5 On-Street Parking Charge

The potential locations and number of parking space were illustrated in section 10.3.3. The assumed annual parking fee per space is 1,095 USD as shown in E.1 Key Assumption Table, 20% of the total parking charge will be allocated to bus terminal operation.

Potential Parking Space (number)	Annual Parking Fee per Space (USD)	Annual On-street Parking Charge (USD)	Annual On-street Parking Charge Allocated to Bus Terminal (USD)
520	1,095	569,400	113,800

Appendix F- Economic Benefits Estimation

F.1 Key Assumptions

Item		Amount	Unit	Note/Assumptions
General Assumptions				
Job Opportunity per Kiosk		2	Person/Kiosk	Kiosk Size (3m x 3m)
Existing Waiting Time at Terminal		30	min	Assumed waiting time based on survey results and field observations
Reduction Factor for Perceived Waiting Time after the Improvement		20%	Percentage	Average reduction in perceived waiting time of 20% for non-priority customers
Assumed Peak Hour Factor		10%	Percentage	
Annual Days		365	Days	
Assumed Mode Shift from Private can and Motorcycle to Public Transport		5%	Percentage	Assumed modal shift expected due to facility improvements
Assumed PCU Factor by Mode				
Microlet		1.5	PCU/vehicle	
Bus		3	PCU/vehicle	
Car		1	PCU/vehicle	
Motorcycle		0.5	PCU/vehicle	
Goods Vehicle		2	PCU/vehicle	
Microlet		1.5	PCU/vehicle	
Assumed Passenger Capacity by Mode				
Microlet		14	People/vehicle	Based on survey results
Bus		30	People/vehicle	
Car		2.5	People/vehicle	
Motorcycle		1.5	People/vehicle	
Goods Vehicle		2	People/vehicle	
Average Travel Distance by Mode				
Microlet		20	km	Based on survey results
Bus		77	km	
Car		89	km	
Motorcycle		104	km	
Goods Vehicle		35	km	
GHG Emission Factor by Mode				
Microlet		0.000269	ton CO2 / km	Based on regional experience (Indonesia)
Bus		0.001350	ton CO2 / km	
Car		0.000269	ton CO2 / km	
Motorcycle		0.000082	ton CO2 / km	
Goods Vehicle		0.001350	ton CO2 / km	
Annual Traffic Growth Rate by Terminal Site				
Dili Convention Center		0.50%	Percentage	Referenced Region - Nain Feto
Becora		0.60%	Percentage	Referenced Region - Cristo Rei
Manleuana Market		2.00%	Percentage	Referenced Region - Dom Aleixo
Tibar		2.00%	Percentage	Referenced Region - Dom Aleixo
Hera		0.60%	Percentage	Referenced Region - Cristo Rei
Baucau and Others		2.20%	Percentage	Referenced Region - Baucau
Operation Efficiency Improvement by Terminal Site				
Time Reduction Factor of Each Movements (Entry-Unloading-Layover-Loading-Exit)	Dili Convention Center	30%	Percentage	Assume to be same as Becora as no existing facility
	Becora	30%	Percentage	
	Manleuana Market	30%	Percentage	
	Tibar	0%	Percentage	No circulation as similar to bus stop
	Hera	30%	Percentage	Assume to be same as Becora as no existing facility
	Baucau	30%	Percentage	
	Others	0%	Percentage	No circulation as similar to bus stop
Time Reduction Factor of Each Activity (Unloading, Layover and Loading)	Dili Convention Center	20%	Percentage	Assume to be same as Becora as no existing facility
	Becora	20%	Percentage	
	Manleuana Market	20%	Percentage	
	Tibar	0%	Percentage	No circulation as similar to bus stop
	Hera	20%	Percentage	Assume to be same as Becora as no existing facility
	Baucau	20%	Percentage	
	Others	0%	Percentage	No circulation as similar to bus stop
Number of Kiosks Proposed by Terminal Site Based on Design				
Dili Convention Center		0	Number	Based on terminal preliminary design
Becora		18	Number	
Manleuana Market		27	Number	
Tibar		45	Number	
Hera		23	Number	
Baucau		11	Number	

Item	Amount	Unit	Note/Assumptions
Others	0	Number	
Accident Rate per 100,000,000km for Non-Public Transport			
Light Injury	62.695	Number	Based on historical traffic accident data in Dili and total vehicle-km travelled in Dili
Heavy Injury	10.101	Number	
Death	1.733	Number	
Accident Rate per 100,000,000km for Public Transport			
Improvement Factor for Public Transport	35%	Percentage	Reduction ratio in fatalities based on drivers/passenger of bus in Indonesia
Light Injury	62.695	Number	
Heavy Injury	10.101	Number	
Death	1.733	Number	

F.2 Summary of Annualized Economic Benefits

Type of Economic Benefits	Unit	After Improvement																														
		Year																														
		2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Travel Time Savings for Vehicle (Within 1 km)	Annualized Hours	563,265	567,526	571,830	576,180	580,576	585,017	589,506	594,043	598,627	603,261	607,945	612,680	617,466	622,304	627,195	632,139	637,139	642,193	647,304	652,472	657,699	662,984	668,328	673,734	679,201	684,731	690,325	695,983	701,707	707,497
Travel Time Savings for Passengers (Within 1 km)	Annualized Hours	1,835,318	1,850,035	1,864,918	1,879,969	1,895,189	1,910,583	1,926,152	1,941,900	1,957,829	1,973,941	1,990,241	2,006,731	2,023,413	2,040,292	2,057,369	2,074,649	2,092,134	2,109,828	2,127,734	2,145,855	2,164,196	2,182,759	2,201,548	2,220,567	2,239,820	2,259,310	2,279,042	2,299,019	2,319,246	2,339,726
Travel Time Savings for People Using Sidewalk (Within 1	Annualized Hours	370,559	374,279	378,051	381,876	385,756	389,690	393,681	397,728	401,834	405,998	410,223	414,508	418,856	423,267	427,743	432,284	436,892	441,568	446,313	451,129	456,016	460,976	466,010	471,120	476,307	481,573	486,918	492,344	497,853	503,446
Direct Waiting Time Savings for People at Terminal	Annualized Hours	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perceived Waiting Time Savings for People at Terminal	Annualized Hours	810	823	835	848	862	875	889	903	917	932	947	962	977	993	1,009	1,025	1,042	1,059	1,076	1,093	1,111	1,129	1,148	1,167	1,186	1,205	1,225	1,246	1,266	1,287
Operation Time Savings for Vehicle at Terminal	Annualized Hours	36,685	37,895	39,168	40,509	41,922	43,411	43,907	44,412	44,924	45,445	45,975	46,513	47,060	47,616	48,181	48,755	49,339	49,932	50,535	51,149	51,772	52,406	53,050	53,705	54,372	55,049	55,738	56,438	57,151	57,875
Number of Job Creation	number	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248
GHG Reduction	tonne CO2 (Annualized)	7,442	7,530	7,620	7,711	7,802	7,895	7,989	8,085	8,181	8,278	8,377	8,477	8,578	8,680	8,783	8,888	8,993	9,101	9,209	9,319	9,430	9,542	9,656	9,771	9,887	10,005	10,124	10,244	10,366	10,490
Reduction of Light Injury	Annualized Accident #s	52.6	53.2	53.8	54.5	55.1	55.8	56.5	57.1	57.8	58.5	59.2	59.9	60.6	61.3	62.1	62.8	63.6	64.3	65.1	65.9	66.6	67.4	68.2	69.0	69.9	70.7	71.5	72.4	73.3	74.1
Reduction of Heavy Injury	Annualized Accident #s	8.5	8.6	8.7	8.8	8.9	9.0	9.1	9.2	9.3	9.4	9.5	9.7	9.8	9.9	10.0	10.1	10.2	10.4	10.5	10.6	10.7	10.9	11.0	11.1	11.3	11.4	11.5	11.7	11.8	11.9
Reduction of Fatalities	Annualized Accident #s	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0

F.3 Peak Hour Time Consumption for Vehicle within 1 km (1,000 hour)

Unit	Annualized Hours	After Improvement																														
		Year																														
Scenario	Site	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Without Improvement	Becora Terminal	527.14	530.30	533.48	536.68	539.90	543.14	546.40	549.68	552.98	556.30	559.63	562.99	566.37	569.77	573.19	576.62	580.08	583.56	587.07	590.59	594.13	597.70	601.28	604.89	608.52	612.17	615.84	619.54	623.26	627.00
Without Improvement	Tibar	329.92	336.52	343.25	350.11	357.12	364.26	371.54	378.97	386.55	394.29	402.17	410.21	418.42	426.79	435.32	444.03	452.91	461.97	471.21	480.63	490.24	500.05	510.05	520.25	530.66	541.27	552.09	563.14	574.40	585.89
Without Improvement	Manleuana Terminal	44.33	45.21	46.12	47.04	47.98	48.94	49.92	50.92	51.94	52.98	54.04	55.12	56.22	57.34	58.49	59.66	60.85	62.07	63.31	64.58	65.87	67.19	68.53	69.90	71.30	72.73	74.18	75.66	77.18	78.72
Without Improvement	Dili Convention Center	190.19	191.14	192.10	193.06	194.03	195.00	195.97	196.95	197.94	198.92	199.92	200.92	201.92	202.93	203.95	204.97	205.99	207.02	208.06	209.10	210.14	211.19	212.25	213.31	214.38	215.45	216.53	217.61	218.70	219.79
Without Improvement	Hera Terminal	77.09	77.55	78.02	78.49	78.96	79.43	79.91	80.39	80.87	81.35	81.84	82.33	82.83	83.32	83.82	84.33	84.83	85.34	85.85	86.37	86.89	87.41	87.93	88.46	88.99	89.53	90.06	90.60	91.15	91.69
Without Improvement	Baucau	90.21	92.20	94.23	96.30	98.42	100.58	102.80	105.06	107.37	109.73	112.14	114.61	117.13	119.71	122.34	125.04	127.79	130.60	133.47	136.41	139.41	142.47	145.61	148.81	152.09	155.43	158.85	162.35	165.92	169.57
Without Improvement	Lospalos	90.21	90.66	91.12	91.57	92.03	92.49	92.95	93.42	93.89	94.35	94.83	95.30	95.78	96.26	96.74	97.22	97.71	98.20	98.69	99.18	99.68	100.17	100.68	101.18	101.68	102.19	102.70	103.22	103.73	104.25
Without Improvement	Viqueque	90.21	91.48	92.76	94.06	95.37	96.71	98.06	99.43	100.83	102.24	103.67	105.12	106.59	108.08	109.60	111.13	112.69	114.27	115.87	117.49	119.13	120.80	122.49	124.21	125.94	127.71	129.50	131.31	133.15	135.01
Without Improvement	Suai	90.21	90.66	91.12	91.57	92.03	92.49	92.95	93.42	93.89	94.35	94.83	95.30	95.78	96.26	96.74	97.22	97.71	98.20	98.69	99.18	99.68	100.17	100.68	101.18	101.68	102.19	102.70	103.22	103.73	104.25
Without Improvement	Maliana	90.21	90.93	91.66	92.40	93.13	93.88	94.63	95.39	96.15	96.92	97.70	98.48	99.26	100.06	100.86	101.67	102.48	103.30	104.13	104.96	105.80	106.65	107.50	108.36	109.23	110.10	110.98	111.87	112.76	113.66
With Improvement	Becora Terminal	206.05	207.29	208.53	209.78	211.04	212.31	213.58	214.86	216.15	217.45	218.75	220.07	221.39	222.71	224.05	225.40	226.75	228.11	229.48	230.85	232.24	233.63	235.03	236.44	237.86	239.29	240.73	242.17	243.62	245.09
With Improvement	Tibar	306.29	312.42	318.67	325.04	331.54	338.17	344.94	351.84	358.87	366.05	373.37	380.84	388.46	396.22	404.15	412.23	420.48	428.89	437.46	446.21	455.14	464.24	473.53	483.00	492.66	502.51	512.56	522.81	533.27	543.93
With Improvement	Manleuana Terminal	33.93	34.61	35.30	36.01	36.73	37.46	38.21	38.98	39.76	40.55	41.36	42.19	43.03	43.89	44.77	45.67	46.58	47.51	48.46	49.43	50.42	51.43	52.46	53.51	54.58	55.67	56.78	57.92	59.08	60.26
With Improvement	Dili Convention Center	98.72	99.21	99.71	100.21	100.71	101.21	101.72	102.23	102.74	103.25	103.77	104.29	104.81	105.33	105.86	106.39	106.92	107.46	107.99	108.53	109.08	109.62	110.17	110.72	111.27	111.83	112.39	112.95	113.52	114.08
With Improvement	Hera Terminal	63.74	64.12	64.50	64.89	65.28	65.67	66.06	66.46	66.86	67.26	67.66	68.07	68.48	68.89	69.30	69.72	70.14	70.56	70.98	71.41	71.84	72.27	72.70	73.14	73.58	74.02	74.46	74.91	75.36	75.81
With Improvement	Baucau	69.55	71.08	72.64	74.24	75.87	77.54	79.25	80.99	82.77	84.59	86.45	88.36	90.30	92.29	94.32	96.39	98.51	100.68	102.90	105.16	107.47	109.84	112.25	114.72	117.25	119.83	122.46	125.16	127.91	130.72
With Improvement	Lospalos	69.55	69.89	70.24	70.60	70.95	71.30	71.66	72.02	72.38	72.74	73.10	73.47	73.84	74.21	74.58	74.95	75.32	75.70	76.08	76.46	76.84	77.23	77.61	78.00	78.39	78.78	79.18	79.57	79.97	80.37
With Improvement	Viqueque	69.55	70.52	71.51	72.51	73.52	74.55	75.60	76.66	77.73	78.82	79.92	81.04	82.17	83.32	84.49	85.67	86.87	88.09	89.32	90.57	91.84	93.13	94.43	95.75	97.09	98.45	99.83	101.23	102.65	104.08
With Improvement	Suai	69.55	69.89	70.24	70.60	70.95	71.30	71.66	72.02	72.38	72.74	73.10	73.47	73.84	74.21	74.58	74.95	75.32	75.70	76.08	76.46	76.84	77.23	77.61	78.00	78.39	78.78	79.18	79.57	79.97	80.37
With Improvement	Maliana	69.55	70.10	70.66	71.23	71.80	72.37	72.95	73.54	74.12	74.72	75.32	75.92	76.53	77.14	77.75	78.38	79.00	79.64	80.27	80.92	81.56	82.21	82.87	83.54	84.20	84.88	85.56	86.24	86.93	87.63

Note: For Manleuana Terminal, using the traffic data at Manleuana Market where provide PT service currently

F.4 Peak Hour Time Consumption for Passenger within 1 km (1,000 hour)

Unit	Annualized Hours	After Improvement																												
		Year																												
Scenario	Site	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Without Improvement	Becora Terminal	1,475.96	1,484.82	1,493.73	1,502.69	1,511.71	1,520.78	1,529.90	1,539.08	1,548.32	1,557.61	1,566.95	1,576.35	1,585.81	1,595.33	1,604.90	1,614.53	1,624.22	1,633.96	1,643.76	1,653.63	1,663.55	1,673.53	1,683.57	1,693.67	1,703.84	1,714.06	1,724.34	1,734.69	1,745.10	1,755.57
Without Improvement	Tibar	923.77	942.24	961.09	980.31	999.91	1,019.91	1,040.31	1,061.12	1,082.34	1,103.99	1,126.07	1,148.59	1,171.56	1,194.99	1,218.89	1,243.27	1,268.13	1,293.50	1,319.37	1,345.75	1,372.67	1,400.12	1,428.12	1,456.69	1,485.82	1,515.54	1,545.85	1,576.76	1,608.30	1,640.46
Without Improvement	Manleuana Terminal	124.12	126.60	129.13	131.71	134.35	137.04	139.78	142.57	145.42	148.33	151.30	154.32	157.41	160.56	163.77	167.05	170.39	173.79	177.27	180.82	184.43	188.12	191.88	195.72	199.64	203.63	207.70	211.85	216.09	220.41
Without Improvement	Dili Convention Center	532.53	535.20	537.87	540.56	543.26	545.98	548.71	551.45	554.21	556.98	559.77	562.57	565.38	568.21	571.05	573.90	576.77	579.66	582.55	585.47	588.39	591.34	594.29	597.26	600.25	603.25	606.27	609.30	612.35	615.41
Without Improvement	Hera Terminal	215.85	217.15	218.45	219.76	221.08	222.40	223.74	225.08	226.43	227.79	229.16	230.53	231.92	233.31	234.71	236.11	237.53	238.96	240.39	241.83	243.28	244.74	246.21	247.69	249.18	250.67	252.17	253.69	255.21	256.74
Without Improvement	Baucau	478.01	488.53	499.28	510.26	521.49	532.96	544.68	556.67	568.91	581.43	594.22	607.29	620.65	634.31	648.26	662.53	677.10	692.00	707.22	722.78	738.68	754.93	771.54	788.52	805.86	823.59	841.71	860.23	879.15	898.49
Without Improvement	Lospalos	478.01	480.40	482.80	485.22	487.64	490.08	492.53	495.00	497.47	499.96	502.46	504.97	507.50	510.03	512.58	515.15	517.72	520.31	522.91	525.53	528.15	530.79	533.45	536.12	538.80	541.49	544.20	546.92	549.65	552.40
Without Improvement	Viqueque	478.01	484.70	491.49	498.37	505.35	512.42	519.60	526.87	534.25	541.73	549.31	557.00	564.80	572.71	580.73	588.86	597.10	605.46	613.94	622.53	631.25	640.08	649.04	658.13	667.35	676.69	686.16	695.77	705.51	715.39
Without Improvement	Suai	478.01	480.40	482.80	485.22	487.64	490.08	492.53	495.00	497.47	499.96	502.46	504.97	507.50	510.03	512.58	515.15	517.72	520.31	522.91	525.53	528.15	530.79	533.45	536.12	538.80	541.49	544.20	546.92	549.65	552.40
Without Improvement	Maliana	478.01	481.84	485.69	489.58	493.49	497.44	501.42	505.43	509.48	513.55	517.66	521.80	525.98	530.18	534.43	538.70	543.01	547.35	551.73	556.15	560.60	565.08	569.60	574.16	578.75	583.38	588.05	592.75	597.50	602.28
With Improvement	Becora Terminal	576.94	580.40	583.88	587.38	590.91	594.45	598.02	601.61	605.22	608.85	612.50	616.18	619.87	623.59	627.34	631.10	634.89	638.70	642.53	646.38	650.26	654.16	658.09	662.04	666.01	670.00	674.02	678.07	682.14	686.23
With Improvement	Tibar	857.61	874.77	892.26	910.11	928.31	946.88	965.81	985.13	1,004.83	1,024.93	1,045.43	1,066.34	1,087.66	1,109.42	1,131.60	1,154.24	1,177.32	1,200.87	1,224.88	1,249.38	1,274.37	1,299.86	1,325.85	1,352.37	1,379.42	1,407.01	1,435.15	1,463.85	1,493.13	1,522.99
With Improvement	Manleuana Terminal	95.01	96.91	98.85	100.82	102.84	104.90	106.99	109.13	111.32	113.54	115.81	118.13	120.49	122.90	125.36	127.87	130.43	133.03	135.69	138.41	141.18	144.00	146.88	149.82	152.81	155.87	158.99	162.17	165.41	168.72
With Improvement	Dili Convention Center	276.41	277.80	279.19	280.58	281.98	283.39	284.81	286.23	287.67	289.10	290.55	292.00	293.46	294.93	296.40	297.89	299.38	300.87	302.38	303.89	305.41	306.94	308.47	310.01	311.56	313.12	314.69	316.26	317.84	319.43
With Improvement	Hera Terminal	178.46	179.53	180.60	181.69	182.78	183.87	184.98	186.09	187.20	188.33	189.46	190.59	191.74	192.89	194.05	195.21	196.38	197.56	198.74	199.94	201.14	202.34	203.56	204.78	206.01	207.24	208.49	209.74	211.00	212.26
With Improvement	Baucau	368.51	376.62	384.90	393.37	402.02	410.87	419.91	429.15	438.59	448.24	458.10	468.18	478.48	489.00	499.76	510.75	521.99	533.48	545.21	557.21	569.47	581.99	594.80	607.88	621.26	634.92	648.89	663.17	677.76	692.67
With Improvement	Lospalos	368.51	370.35	372.20	374.07	375.94	377.82	379.70	381.60	383.51	385.43	387.36	389.29	391.24	393.19	395.16	397.14	399.12	401.12	403.12	405.14	407.16	409.20	411.25	413.30	415.37	417.45	419.53	421.63	423.74	425.86
With Improvement	Viqueque	368.51	373.67	378.90	384.20	389.58	395.04	400.57	406.18	411.86	417.63	423.48	429.40	435.42	441.51	447.69	453.96	460.32	466.76	473.30	479.92	486.64	493.45	500.36	507.37	514.47	521.67	528.98	536.38	543.89	551.51
With Improvement	Suai	368.51	370.35	372.20	374.07	375.94	377.82	379.70	381.60	383.51	385.43	387.36	389.29	391.24	393.19	395.16	397.14	399.12	401.12	403.12	405.14	407.16	409.20	411.25	413.30	415.37	417.45	419.53	421.63	423.74	425.86
With Improvement	Maliana	368.51	371.46	374.43	377.43	380.44	383.49	386.56	389.65	392.77	395.91	399.07	402.27	405.49	408.73	412.00	415.30	418.62	421.97	425.34	428.75	432.18	435.63	439.12	442.63	446.17	449.74	453.34	456.97	460.62	464.31

Note: For Manleuana Terminal, using the traffic data at Manleuana Market where provide PT service currently

F.5 Peak Hour Time Consumption for People Using Sidewalk within 1 km (1,000 hour)

Unit	Annualized Hours	After Improvement																												
		Year																												
Scenario	Site	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Without Improvement	Becora Terminal	509.30	512.36	515.43	518.52	521.64	524.77	527.91	531.08	534.27	537.47	540.70	543.94	547.21	550.49	553.79	557.12	560.46	563.82	567.20	570.61	574.03	577.48	580.94	584.43	587.93	591.46	595.01	598.58	602.17	605.78
Without Improvement	Tibar	162.22	165.47	168.78	172.15	175.59	179.11	182.69	186.34	190.07	193.87	197.75	201.70	205.74	209.85	214.05	218.33	222.70	227.15	231.69	236.33	241.05	245.87	250.79	255.81	260.92	266.14	271.47	276.89	282.43	288.08
Without Improvement	Manleuana Terminal	286.95	292.69	298.54	304.51	310.60	316.82	323.15	329.61	336.21	342.93	349.79	356.79	363.92	371.20	378.62	386.20	393.92	401.80	409.83	418.03	426.39	434.92	443.62	452.49	461.54	470.77	480.19	489.79	499.59	509.58
Without Improvement	Dili Convention Center	121.67	122.28	122.89	123.50	124.12	124.74	125.36	125.99	126.62	127.25	127.89	128.53	129.17	129.82	130.47	131.12	131.77	132.43	133.09	133.76	134.43	135.10	135.78	136.46	137.14	137.82	138.51	139.21	139.90	140.60
Without Improvement	Hera Terminal	70.97	71.40	71.83	72.26	72.69	73.13	73.57	74.01	74.45	74.90	75.35	75.80	76.25	76.71	77.17	77.64	78.10	78.57	79.04	79.52	79.99	80.47	80.96	81.44	81.93	82.42	82.92	83.41	83.91	84.42
Without Improvement	Baucau	146.84	150.07	153.37	156.75	160.19	163.72	167.32	171.00	174.76	178.61	182.54	186.55	190.66	194.85	199.14	203.52	208.00	212.57	217.25	222.03	226.91	231.91	237.01	242.22	247.55	253.00	258.56	264.25	270.06	276.01
Without Improvement	Lospalos	146.84	147.57	148.31	149.05	149.80	150.55	151.30	152.06	152.82	153.58	154.35	155.12	155.90	156.68	157.46	158.25	159.04	159.83	160.63	161.43	162.24	163.05	163.87	164.69	165.51	166.34	167.17	168.01	168.85	169.69
Without Improvement	Viqueque	146.84	148.89	150.98	153.09	155.24	157.41	159.61	161.85	164.11	166.41	168.74	171.10	173.50	175.93	178.39	180.89	183.42	185.99	188.59	191.23	193.91	196.62	199.38	202.17	205.00	207.87	210.78	213.73	216.72	219.76
Without Improvement	Suai	146.84	147.57	148.31	149.05	149.80	150.55	151.30	152.06	152.82	153.58	154.35	155.12	155.90	156.68	157.46	158.25	159.04	159.83	160.63	161.43	162.24	163.05	163.87	164.69	165.51	166.34	167.17	168.01	168.85	169.69
Without Improvement	Maliana	146.84	148.01	149.20	150.39	151.59	152.81	154.03	155.26	156.50	157.76	159.02	160.29	161.57	162.87	164.17	165.48	166.81	168.14	169.48	170.84	172.21	173.59	174.97	176.37	177.78	179.21	180.64	182.09	183.54	185.01
With Improvement	Becora Terminal	328.50	330.47	332.45	334.45	336.46	338.47	340.50	342.55	344.60	346.67	348.75	350.84	352.95	355.07	357.20	359.34	361.50	363.66	365.85	368.04	370.25	372.47	374.71	376.95	379.22	381.49	383.78	386.08	388.40	390.73
With Improvement	Tibar	146.00	148.92	151.90	154.94	158.04	161.20	164.42	167.71	171.06	174.48	177.97	181.53	185.16	188.87	192.64	196.50	200.43	204.44	208.52	212.69	216.95	221.29	225.71	230.23	234.83	239.53	244.32	249.21	254.19	259.27
With Improvement	Manleuana Terminal	228.13	232.69	237.34	242.09	246.93	251.87	256.91	262.04	267.28	272.63	278.08	283.64	289.32	295.10	301.01	307.03	313.17	319.43	325.82	332.34	338.98	345.76	352.68	359.73	366.92	374.26	381.75	389.38	397.17	405.11
With Improvement	Dili Convention Center	109.50	110.05	110.60	111.15	111.71	112.27	112.83	113.39	113.96	114.53	115.10	115.68	116.25	116.83	117.42	118.01	118.60	119.19	119.79	120.38	120.99	121.59	122.20	122.81	123.42	124.04	124.66	125.28	125.91	126.54
With Improvement	Hera Terminal	63.88	64.26	64.64	65.03	65.42	65.81	66.21	66.61	67.01	67.41	67.81	68.22	68.63	69.04	69.45	69.87	70.29	70.71	71.14	71.56	71.99	72.43	72.86	73.30	73.74	74.18	74.62	75.07	75.52	75.98
With Improvement	Baucau	127.75	130.56	133.43	136.37	139.37	142.43	145.57	148.77	152.04	155.39	158.81	162.30	165.87	169.52	173.25	177.06	180.96	184.94	189.01	193.16	197.41	201.76	206.20	210.73	215.37	220.11	224.95	229.90	234.96	240.12
With Improvement	Lospalos	127.75	128.39	129.03	129.68	130.32	130.98	131.63	132.29	132.95	133.62	134.28	134.95	135.63	136.31	136.99	137.67	138.36	139.05	139.75	140.45	141.15	141.86	142.57	143.28	143.99	144.71	145.44	146.17	146.90	147.63
With Improvement	Viqueque	127.75	129.54	131.35	133.19	135.06	136.95	138.86	140.81	142.78	144.78	146.80	148.86	150.94	153.06	155.20	157.37	159.58	161.81	164.08	166.37	168.70	171.06	173.46	175.89	178.35	180.85	183.38	185.95	188.55	191.19
With Improvement	Suai	127.75	128.39	129.03	129.68	130.32	130.98	131.63	132.29	132.95	133.62	134.28	134.95	135.63	136.31	136.99	137.67	138.36	139.05	139.75	140.45	141.15	141.86	142.57	143.28	143.99	144.71	145.44	146.17	146.90	147.63
With Improvement	Maliana	127.75	128.77	129.80	130.84	131.89	132.94	134.01	135.08	136.16	137.25	138.35	139.45	140.57	141.69	142.83	143.97	145.12	146.28	147.45	148.63	149.82	151.02	152.23	153.45	154.67	155.91	157.16	158.41	159.68	160.96

Note: For Manleuana Terminal, using the traffic data at Manleuana Market where provide PT service currently

F.6 Annual Direct Waiting Time for People at Terminal (1,000 hour)

Unit	Annualized Hours	After Improvement																													
		Year																													
Scenario	Site	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Without Improvement	Becora Terminal	0.78	0.79	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.83	0.84	0.84	0.85	0.85	0.86	0.86	0.87	0.87	0.88	0.88	0.89	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93
Without Improvement	Tibar	1.03	1.05	1.07	1.10	1.12	1.14	1.16	1.19	1.21	1.23	1.26	1.28	1.31	1.34	1.36	1.39	1.42	1.45	1.47	1.50	1.53	1.56	1.60	1.63	1.66	1.69	1.73	1.76	1.80	1.83
Without Improvement	Manleuana Terminal	1.70	1.73	1.77	1.80	1.84	1.88	1.91	1.95	1.99	2.03	2.07	2.11	2.16	2.20	2.24	2.29	2.33	2.38	2.43	2.48	2.53	2.58	2.63	2.68	2.73	2.79	2.84	2.90	2.96	3.02
Without Improvement	Dili Convention Center	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.43	0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.44	0.45
Without Improvement	Hera Terminal	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Without Improvement	Baucau	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08
Without Improvement	Lospalos	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Without Improvement	Viqueque	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Without Improvement	Suai	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Without Improvement	Maliana	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
With Improvement	Becora Terminal	0.78	0.79	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.83	0.84	0.84	0.85	0.85	0.86	0.86	0.87	0.87	0.88	0.88	0.89	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93
With Improvement	Tibar	1.03	1.05	1.07	1.10	1.12	1.14	1.16	1.19	1.21	1.23	1.26	1.28	1.31	1.34	1.36	1.39	1.42	1.45	1.47	1.50	1.53	1.56	1.60	1.63	1.66	1.69	1.73	1.76	1.80	1.83
With Improvement	Manleuana Terminal	1.70	1.73	1.77	1.80	1.84	1.88	1.91	1.95	1.99	2.03	2.07	2.11	2.16	2.20	2.24	2.29	2.33	2.38	2.43	2.48	2.53	2.58	2.63	2.68	2.73	2.79	2.84	2.90	2.96	3.02
With Improvement	Dili Convention Center	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.43	0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.44	0.45
With Improvement	Hera Terminal	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
With Improvement	Baucau	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08
With Improvement	Lospalos	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
With Improvement	Viqueque	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
With Improvement	Suai	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
With Improvement	Maliana	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

F.7 Annual Perceived Waiting Time for People at Terminal (1,000 hour)

Unit	Annualized Hours	After Improvement																													
		Year																													
Scenario	Site	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Without Improvement	Becora Terminal	0.78	0.79	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.83	0.84	0.84	0.85	0.85	0.86	0.86	0.87	0.87	0.88	0.88	0.89	0.90	0.90	0.91	0.91	0.92	0.92	0.93	0.93
Without Improvement	Tibar	1.03	1.05	1.07	1.10	1.12	1.14	1.16	1.19	1.21	1.23	1.26	1.28	1.31	1.34	1.36	1.39	1.42	1.45	1.47	1.50	1.53	1.56	1.60	1.63	1.66	1.69	1.73	1.76	1.80	1.83
Without Improvement	Manleuana Terminal	1.70	1.73	1.77	1.80	1.84	1.88	1.91	1.95	1.99	2.03	2.07	2.11	2.16	2.20	2.24	2.29	2.33	2.38	2.43	2.48	2.53	2.58	2.63	2.68	2.73	2.79	2.84	2.90	2.96	3.02
Without Improvement	Dili Convention Center	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.40	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.43	0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.44	0.45
Without Improvement	Hera Terminal	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Without Improvement	Baucau	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08
Without Improvement	Lospalos	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Without Improvement	Viqueque	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Without Improvement	Suai	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Without Improvement	Maliana	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
With Improvement	Becora Terminal	0.63	0.63	0.64	0.64	0.64	0.65	0.65	0.65	0.66	0.66	0.67	0.67	0.67	0.68	0.68	0.69	0.69	0.70	0.70	0.70	0.71	0.71	0.72	0.72	0.72	0.73	0.73	0.74	0.74	0.75
With Improvement	Tibar	0.83	0.84	0.86	0.88	0.89	0.91	0.93	0.95	0.97	0.99	1.01	1.03	1.05	1.07	1.09	1.11	1.13	1.16	1.18	1.20	1.23	1.25	1.28	1.30	1.33	1.35	1.38	1.41	1.44	1.47
With Improvement	Manleuana Terminal	1.36	1.39	1.41	1.44	1.47	1.50	1.53	1.56	1.59	1.62	1.66	1.69	1.72	1.76	1.79	1.83	1.87	1.90	1.94	1.98	2.02	2.06	2.10	2.14	2.19	2.23	2.28	2.32	2.37	2.41
With Improvement	Dili Convention Center	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.35	0.36
With Improvement	Hera Terminal	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07
With Improvement	Baucau	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06
With Improvement	Lospalos	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
With Improvement	Viqueque	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
With Improvement	Suai	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
With Improvement	Maliana	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

F.8 Annual Operation Time for Vehicle at Terminal (1,000 hour)

Unit	Annualized Hours	After Improvement																													
		Year																													
Scenario	Ste	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Without Improvement	Becora Terminal	21.29	21.35	21.41	21.48	21.54	21.60	21.73	21.86	21.99	22.13	22.26	22.39	22.53	22.66	22.80	22.93	23.07	23.21	23.35	23.49	23.63	23.77	23.92	24.06	24.20	24.35	24.49	24.64	24.79	24.94
Without Improvement	Tibar	31.99	34.87	38.00	41.43	45.15	49.22	50.20	51.21	52.23	53.28	54.34	55.43	56.54	57.67	58.82	60.00	61.20	62.42	63.67	64.94	66.24	67.57	68.92	70.30	71.70	73.14	74.60	76.09	77.61	79.17
Without Improvement	Manleuana Terminal	38.42	40.31	42.29	44.36	46.54	48.83	49.81	50.80	51.82	52.86	53.91	54.99	56.09	57.21	58.36	59.52	60.72	61.93	63.17	64.43	65.72	67.03	68.38	69.74	71.14	72.56	74.01	75.49	77.00	78.54
Without Improvement	Dili Convention Center	72.68	74.28	75.91	77.59	79.30	81.04	81.45	81.85	82.26	82.68	83.09	83.50	83.92	84.34	84.76	85.19	85.61	86.04	86.47	86.90	87.34	87.77	88.21	88.65	89.10	89.54	89.99	90.44	90.89	91.35
Without Improvement	Hera Terminal	4.91	4.91	4.91	4.91	4.91	4.91	4.93	4.96	4.99	5.02	5.05	5.08	5.11	5.15	5.18	5.21	5.24	5.27	5.30	5.33	5.37	5.40	5.43	5.46	5.50	5.53	5.56	5.60	5.63	5.66
Without Improvement	Baucau	2.16	2.27	2.38	2.50	2.63	2.76	2.82	2.89	2.95	3.01	3.08	3.15	3.22	3.29	3.36	3.44	3.51	3.59	3.67	3.75	3.83	3.91	4.00	4.09	4.18	4.27	4.36	4.46	4.56	4.66
Without Improvement	Lospalos	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14
Without Improvement	Viqueque	0.19	0.20	0.20	0.20	0.21	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.23	0.24	0.24	0.24	0.25	0.25	0.25	0.26	0.26	0.26	0.27	0.27	0.27	0.28	0.28	0.29	0.29	0.29
Without Improvement	Suai	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18
Without Improvement	Maliana	0.18	0.18	0.19	0.19	0.19	0.20	0.20	0.20	0.20	0.20	0.21	0.21	0.21	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.23	0.24	0.24
With Improvement	Becora Terminal	16.32	16.37	16.42	16.46	16.51	16.56	16.66	16.76	16.86	16.96	17.06	17.17	17.27	17.37	17.48	17.58	17.69	17.79	17.90	18.01	18.12	18.23	18.33	18.44	18.56	18.67	18.78	18.89	19.00	19.12
With Improvement	Tibar	28.05	30.57	33.33	36.33	39.60	43.16	44.02	44.91	45.80	46.72	47.65	48.61	49.58	50.57	51.58	52.61	53.67	54.74	55.83	56.95	58.09	59.25	60.44	61.65	62.88	64.14	65.42	66.73	68.06	69.42
With Improvement	Manleuana Terminal	29.45	30.90	32.42	34.01	35.68	37.44	38.19	38.95	39.73	40.52	41.33	42.16	43.00	43.86	44.74	45.64	46.55	47.48	48.43	49.40	50.39	51.39	52.42	53.47	54.54	55.63	56.74	57.88	59.03	60.22
With Improvement	Dili Convention Center	55.72	56.95	58.20	59.48	60.79	62.13	62.44	62.76	63.07	63.38	63.70	64.02	64.34	64.66	64.98	65.31	65.64	65.96	66.29	66.63	66.96	67.29	67.63	67.97	68.31	68.65	68.99	69.34	69.68	70.03
With Improvement	Hera Terminal	3.68	3.68	3.68	3.68	3.68	3.68	3.70	3.72	3.75	3.77	3.79	3.81	3.84	3.86	3.88	3.91	3.93	3.95	3.98	4.00	4.02	4.05	4.07	4.10	4.12	4.15	4.17	4.20	4.22	4.25
With Improvement	Baucau	1.66	1.74	1.83	1.92	2.02	2.12	2.17	2.21	2.26	2.31	2.36	2.41	2.47	2.52	2.58	2.63	2.69	2.75	2.81	2.87	2.94	3.00	3.07	3.13	3.20	3.27	3.35	3.42	3.50	3.57
With Improvement	Lospalos	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
With Improvement	Viqueque	0.15	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19	0.20	0.20	0.20	0.21	0.21	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.23	0.24
With Improvement	Suai	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
With Improvement	Maliana	0.14	0.14	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19

F.9 Job Creation (number)

Unit	Number (Not Time Related)	After Improvement																													
		Year																													
Scenario	Ste	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Without Improvement	Becora Terminal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Without Improvement	Tibar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Without Improvement	Manleuana Terminal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Without Improvement	Dili Convention Center	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Without Improvement	Hera Terminal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Without Improvement	Baucau	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Without Improvement	Lospalos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Without Improvement	Viqueque	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Without Improvement	Suai	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Without Improvement	Maliana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
With Improvement	Becora Terminal	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
With Improvement	Tibar	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
With Improvement	Manleuana Terminal	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54
With Improvement	Dili Convention Center	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
With Improvement	Hera Terminal	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
With Improvement	Baucau	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
With Improvement	Lospalos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
With Improvement	Viqueque	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
With Improvement	Suai	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
With Improvement	Maliana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

F.10 GHG Emission - System Level (1,000 tonnes CO2)

Unit	Annualized CO2 Emissions	After Improvement																													
		Year																													
Scenario	Mode	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Without Improvement	Microlet	4.37	4.42	4.48	4.53	4.58	4.64	4.69	4.75	4.81	4.86	4.92	4.98	5.04	5.10	5.16	5.22	5.28	5.35	5.41	5.48	5.54	5.61	5.67	5.74	5.81	5.88	5.95	6.02	6.09	6.16
Without Improvement	Bus	33.80	34.20	34.61	35.02	35.43	35.86	36.28	36.72	37.15	37.60	38.04	38.50	38.95	39.42	39.89	40.36	40.84	41.33	41.82	42.32	42.82	43.33	43.85	44.37	44.90	45.44	45.98	46.52	47.08	47.64
Without Improvement	Motorcycle	119.21	120.63	122.07	123.52	124.99	126.48	127.99	129.51	131.05	132.61	134.19	135.79	137.41	139.05	140.70	142.38	144.07	145.79	147.52	149.28	151.06	152.86	154.68	156.52	158.39	160.27	162.18	164.11	166.07	168.04
Without Improvement	Car	67.41	68.21	69.02	69.84	70.68	71.52	72.37	73.23	74.10	74.99	75.88	76.78	77.70	78.62	79.56	80.51	81.46	82.43	83.42	84.41	85.42	86.43	87.46	88.50	89.56	90.62	91.70	92.80	93.90	95.02
Without Improvement	Goods Vehicle	73.51	74.39	75.27	76.17	77.08	77.99	78.92	79.86	80.81	81.78	82.75	83.73	84.73	85.74	86.76	87.80	88.84	89.90	90.97	92.05	93.15	94.26	95.38	96.52	97.67	98.83	100.01	101.20	102.40	103.62
With Improvement	Microlet	4.78	4.84	4.90	4.96	5.01	5.07	5.13	5.20	5.26	5.32	5.38	5.45	5.51	5.58	5.64	5.71	5.78	5.85	5.92	5.99	6.06	6.13	6.21	6.28	6.35	6.43	6.51	6.58	6.66	6.74
With Improvement	Bus	35.27	35.69	36.12	36.55	36.99	37.43	37.87	38.32	38.78	39.24	39.71	40.18	40.66	41.14	41.63	42.13	42.63	43.14	43.65	44.17	44.70	45.23	45.77	46.31	46.87	47.42	47.99	48.56	49.14	49.72
With Improvement	Motorcycle	113.25	114.60	115.96	117.35	118.74	120.16	121.59	123.04	124.50	125.98	127.48	129.00	130.54	132.09	133.67	135.26	136.87	138.50	140.15	141.82	143.51	145.22	146.94	148.69	150.47	152.26	154.07	155.91	157.76	159.64
With Improvement	Car	64.04	64.80	65.57	66.35	67.14	67.94	68.75	69.57	70.40	71.24	72.08	72.94	73.81	74.69	75.58	76.48	77.39	78.31	79.25	80.19	81.14	82.11	83.09	84.08	85.08	86.09	87.12	88.16	89.21	90.27
With Improvement	Goods Vehicle	73.51	74.39	75.27	76.17	77.08	77.99	78.92	79.86	80.81	81.78	82.75	83.73	84.73	85.74	86.76	87.80	88.84	89.90	90.97	92.05	93.15	94.26	95.38	96.52	97.67	98.83	100.01	101.20	102.40	103.62

F.11 Light Injury by Mode at System Level (number)

Accident Factor	Non-PT	Accident Rate	62.69	Light Injury
Accident Factor	PT	Accident Rate	21.94	Light Injury

Unit	Annualized Accident #s	After Improvement																														
		Year																														
Scenario	Mode	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Without Improvement	Microlet	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5
Without Improvement	Bus	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8
Without Improvement	Motorcycle	906	917	928	939	950	962	973	985	996	1,008	1,020	1,032	1,045	1,057	1,070	1,082	1,095	1,108	1,122	1,135	1,148	1,162	1,176	1,190	1,204	1,218	1,233	1,248	1,263	1,278
Without Improvement	Car	157	159	161	163	165	167	168	171	173	175	177	179	181	183	185	187	190	192	194	197	199	201	204	206	209	211	214	216	219	221
Without Improvement	Goods Vehicle	34	35	35	35	36	36	37	37	38	38	38	39	39	40	40	41	41	42	42	43	43	44	44	45	45	46	46	47	48	48
With Improvement	Microlet	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
With Improvement	Bus	6	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8	8	8	8	8
With Improvement	Motorcycle	861	871	882	892	903	914	924	935	947	958	969	981	992	1,004	1,016	1,028	1,041	1,053	1,066	1,078	1,091	1,104	1,117	1,130	1,144	1,158	1,171	1,185	1,199	1,214
With Improvement	Car	149	151	153	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	185	187	189	191	193	196	198	200	203	205	208	210
With Improvement	Goods Vehicle	34	35	35	35	36	36	37	37	38	38	38	39	39	40	40	41	41	42	42	43	43	44	44	45	45	46	46	47	48	48

F.12 Heavy Injury by Mode at System Level (number)

Accident Factor	Non-PT	Accident Rate	10.10	Heavy Injury
Accident Factor	PT	Accident Rate	3.54	Heavy Injury

Unit	Annualized Accident #s	After Improvement																														
		Year																														
Scenario	Mode	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Without Improvement	Microlet	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Without Improvement	Bus	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Without Improvement	Motorcycle	146	148	150	151	153	155	157	159	161	162	164	166	168	170	172	174	176	179	181	183	185	187	189	192	194	196	199	201	203	206
Without Improvement	Car	25	26	26	26	27	27	27	27	28	28	28	29	29	29	30	30	31	31	31	32	32	32	33	33	34	34	34	35	35	36
Without Improvement	Goods Vehicle	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8
With Improvement	Microlet	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
With Improvement	Bus	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
With Improvement	Motorcycle	139	140	142	144	145	147	149	151	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	189	191	193	196
With Improvement	Car	24	24	25	25	25	25	26	26	26	27	27	27	28	28	28	29	29	29	30	30	30	31	31	32	32	32	33	33	33	34
With Improvement	Goods Vehicle	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8

F.13 Fatalities by Mode at System Level (number)

Accident Factor	Non-PT	Accident Rate	1.73	Death
Accident Factor	PT	Accident Rate	0.61	Death

Unit	Annualized Accident #s	After Improvement																														
		Year																														
Scenario	Mode	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059
Without Improvement	Microlet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Without Improvement	Bus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Without Improvement	Motorcycle	25	25	26	26	26	27	27	27	28	28	28	29	29	29	30	30	30	31	31	31	32	32	33	33	33	34	34	34	35	35
Without Improvement	Car	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6
Without Improvement	Goods Vehicle	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
With Improvement	Microlet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
With Improvement	Bus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
With Improvement	Motorcycle	24	24	24	25	25	25	26	26	26	26	27	27	27	28	28	28	29	29	29	30	30	31	31	31	32	32	32	33	33	34
With Improvement	Car	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6
With Improvement	Goods Vehicle	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1