Ministry of Planning and Strategic Investment
Democratic Republic of Timor-Leste

The Project for Study on Dili Urban Master Plan in the Democratic Republic of Timor-Leste

Final Report
Part I: Current Conditions

October 2016

Japan International Cooperation Agency (JICA)

Nippon Koei Co., Ltd.

Pacet Corp.

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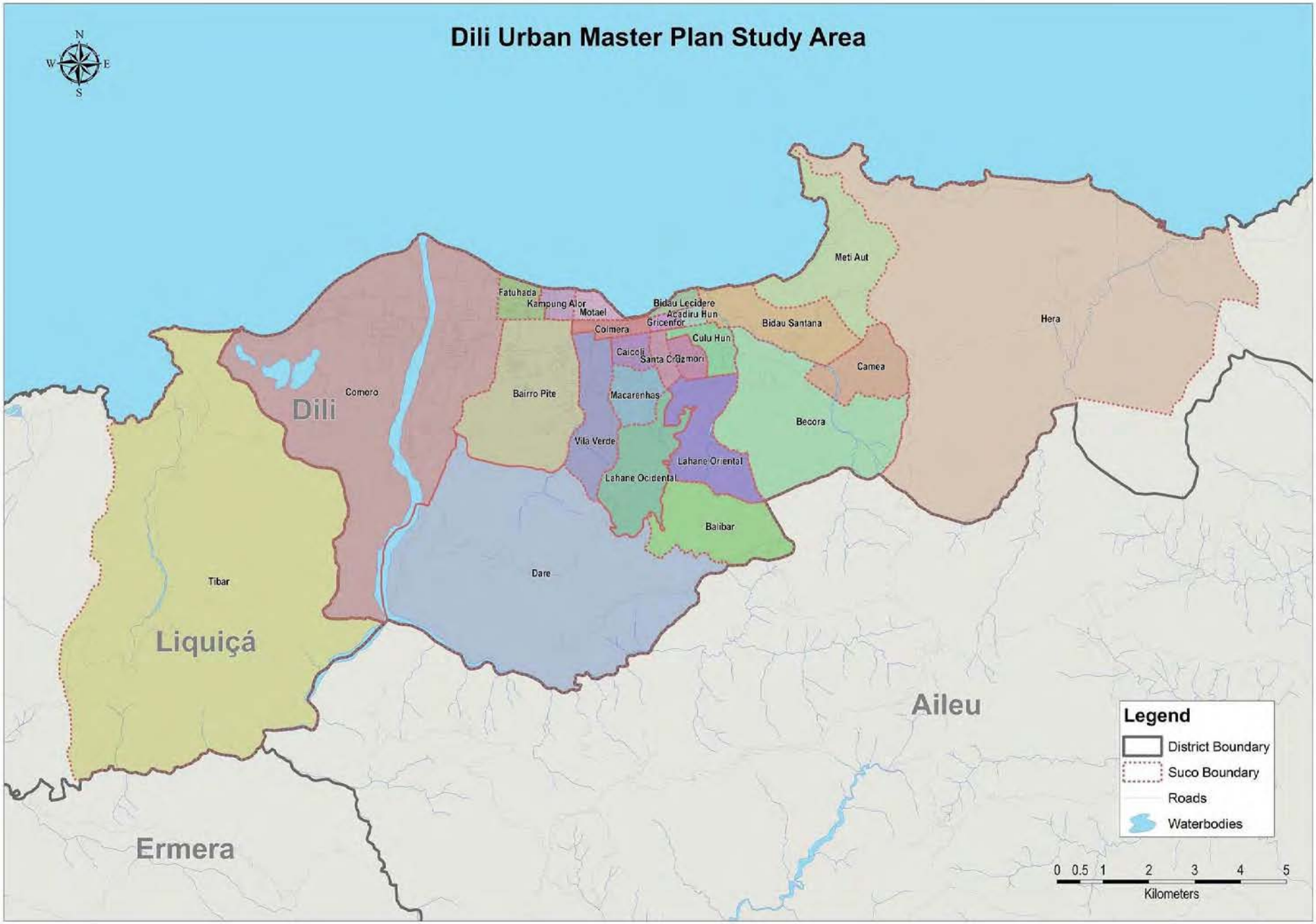
Source: JICA Website



Location Map

PART I: ANALYSIS OF CURRENT CONDITIONS

EXECUTIVE SUMMARY

1. INTRODUCTION

1.1 Dili is the capital city of Timor-Leste and comprises six administrative posts, 31 sucos and 241 aldeias. The Dili Municipality accommodates a population of 234,026 (2010 Census) with annual population growth rate at 4.1% which is far above the national average growth rate (2.45%). The urban population is expected to share 30% of the national population in 2020.

1.2 There has been no overarching countermeasure undertaken against such rapid growth of urban population. Various urban issues are arising such as uncontrolled urbanization, traffic congestion due to rapid increase in number of vehicles, higher risks of natural disaster, degraded sanitary condition due to underdeveloped sewerage and solid waste management facilities. These issues have further obstructed the economic activities.

1.3 In this background, the Government of Timor-Leste (GoTL) requested the Government of Japan to prepare the development vision that will enhance sustainable economic growth, and to formulate the integrated Dili urban master plan. In response to the request, the Ministry of Public Works and the Japan International Cooperation Agency (JICA) signed the Record of Discussion for the implementation of “the Project for Study on Dili Urban Master Plan in the Democratic Republic of Timor-Leste (hereinafter referred to as "the Project") in October 2013. (Ministry of Public Works has been reorganized as Ministry of Public Works, Transport and Communications (MoPWTC) after government reform in February 2015.) After the government reform in February 2015, the executing agency for this project was changed from MoPWTC to the Ministry of Planning and Strategic Investment (MPSI). The minutes of meetings for the Amendment of the Record of Discussions was signed in July 2015.

1.4 The Project aims to formulate the integrated urban master plan that will facilitate sustainable development in Dili Metropolitan Area (DMA). Transferring participatory planning method through collaborative work with the counterpart and involvement of stakeholders in the planning process are also some of the objectives of the Project. Moreover, to ensure its feasibility by obtaining approval of the formulated master plan by the GoTL is also one of the crucial components of the Project. Both the counterparts of the GoTL and the JICA Project Team (JPT) have worked and conducted the study together.

1.5 The Steering Committee (SC) functions as the decision making body on project operation and output. The Working Group (WG) is working with the project members to examine the technical aspects of the projects as well as donor coordination.

1.6 This final report consists of three volumes as follows. Dividing the report into three volumes is helpful for the readers to easily refer to the overall outputs of the Project.

- Volume I: Current Conditions
- Volume II: The Master Plan
- Volume III: Appendix

2. CURRENT SETTING OF THE PROJECT AREA

Population and Demography

2.1 Timor-Leste accommodates some of one million population over the country, where nearly

identical proportions of male/female are structured at 51% to 49%. In the 2004 Census, 26% of the national population was accounted for urban population, which has grown rapidly reaching 30% in six years in 2010. Dili Municipality accommodates a population of 234,026 (2010 Census) with annual population growth rate at 4.77% which is far above the national average growth rate (2.4%) during 2004-2010.

2.2 The table below presents population, land area, population density, and average household size by administrative post (suco for Liquica Municipality) for the project area. Dom Aleixo accommodates the largest population, followed by Cristo Rei Administrative Post. Average household size in the project area is estimated at 6.7 persons per household.

Outline of the Current Population by Administrative Posts in the Project Area

Municipality	Sub-dist./Suco	Pop. 2010	Land Area (ha)	Pop. Density (Person/ha)	No. of Household	Avg. Household Size
Dili	Vera Cruz	34,015	3,280	10.4	5,318	6.4
Dili	Nain Feto	26,592	520	51.1	4,015	6.6
Dili	Dom Aleixo	105,154	3,310	31.8	15,896	6.6
Dili	Cristo Rei	54,936	6,530	8.4	7,505	7.3
Liquica	Tibar (Suco)	3,096	4,220	0.7	429	7.2
Project Area (Est.)		**223,793**	17,862	12.5	33,163	6.7

Source: Highlights of the 2010 Census Main Results in Timor-Leste and Timor-Leste 2010 Population and Housing Census Vol. 4 - Suco Report

2.3 Male population in the project area is 53%, while female is 47%. The age group of 15-64 that is potential working group accounts for 63% of total population in the project area. The young population under age 29 is prominent in the project area.

Socio-economy and Industry

2.4 The level of national education has a low record at 34% of students aged above 6 years old who never attended school, as of 2010. Due to the historically conflicting era, the rate of no schooling was higher for the older population in general. However, recent attendance rate of primary school for the children has significantly improved from 37% in 2004 to 73% in 2010. For Dili Municipality, 86% of the population aged above five years old has attended at least primary school in the project area, while 14% population still presents without any school attendance.

2.5 Dili Municipality accommodates most of the university students accounting for 76% of the national total number of university students. This implies that Timorese most likely need to move to Dili in seek of higher or post-secondary education. In fact, Migration Monograph of Census 2010 has revealed that education purpose is one of the most popular reasons for migration to Dili.

2.6 The literacy rate by the regions and four languages indicates that Dili Municipality has the highest literacy rate at 86%, while it is much lower at 46% for the rural areas, which dominates 70% of the national population. Thus, the national average is substantially lowered to 58%. The literacy rates of Tetun, mother tongue, Portuguese and English have been substantially improved during the inter-censual period. The literacy rates will continue to increase as the government invests more on education and the youth generation grows.

2.7 Potential working population (age 15-64) has substantially grown almost 1.5 times since 2004. Overall unemployment rate in Dili Municipality has declined from 26.9% to 17.4% in 2010, while the labor force participation rate has also declined. This result implies that the economically inactive population such as housewives and students has grown more rapidly than the economically active population. Unemployment rate for the age under 30 in Dili Municipality has recorded remarkably higher than that of the national level. It is implied that a substantial number of the youth has entered into the labor market in Dili. Due to the great potential number of youth population, it is apparent that the working population will

substantially increase for at least the next 15 years. Therefore, further job creation in Dili is the urgent issue to be concerned in order to absorb such increasing working population. Primary industries including agriculture, forestry and fishery are still large sector of employment even in the urban area. However, it is slightly smaller than government employment. The largest labor force absorbing industry is tertiary industry at 44%, including various service industries such as wholesale, retailer, hotel, restaurant, and transportation. Service industry and government employment dominate more than 65% of labor distribution, while secondary industry represented by manufacturing and construction remains to have minimal shares of labor distribution.

2.8 GDP in Timor-Leste recorded approximately 1 billion USD in 2011 (2010 constant price), performing at an average growth rate of 12.1% in the last five years. Although agriculture, forestry, and fishery are the predominant industries employing the largest share (67%) of national labor force, its GDP share has remained very small. Manufacturing, construction, and other mining industries have been growing rapidly in the last five years. Major growth contribution comes from construction sub-sector supported by the increasing government infrastructure investment. Manufacturing sub-sector has remained at only 3.6% of share to the GDP in 2011. According to "The Data Collection Survey on Industrial Development for the Republic of Timor-Leste" conducted by JICA in 2014, however, there are growing small-scale manufacturing industries such as cannery and mineral water bottlers. The business model of mineral water bottling is quite similar to the export processing in which raw materials (pet bottle) are imported, bottled domestically, and its partial amount of products are exported to Singapore. Thus, there is a little but certain sign of a growing manufacturing industry. In contrast to the primary industry, the service industry is considered as the largest employer in the urban area or in Dili Municipality. In terms of GDP share, the service industry has been the greatest contributor. Service industry includes hotel, restaurant, wholesaler, retailer, storage/trader, transportation, finance / insurance, real estate, information, communication and technology (ICT) and other various service activities.

2.9 Timor-Leste is exclusively dependent on import for goods and services. DMA as a gateway plays a key role in external and internal trading. The largest export goods of Timor-Leste is coffee, followed by wood / wood products. Major destinations of coffee exports are the U.S., Germany, Japan, South Korea, and Indonesia. Imported goods include daily consumables, packaged food stuff, grains, bottled drinks, alcohol, footwear, and garment sold at retail shops or supermarket, as well as machinery, electrical equipment, vehicle, spare parts, construction materials, metal/ glass/ plastic products. DMA is positioned as a gateway city in international trade whereas it also has key function in regional trade with Timorese enclave territory, Oecusse Municipality and Atauro Island.

2.10 The following table summarizes the identified major plans related to industrial development. Target areas of the plans are located in not only DMA but also the other areas of the country.

Major Industrial Development Plan In and Around DMA (1/2)

No.	Type	Location	Description
1	Industrial Park	Liquica Municipality (Tibar)	It is under planning for locating about 60 ha land in Tibar area. About 50 ha of industrial estate was initially planned to be established in Hera. However, the plan was cancelled by the Prime Minister's decision that a similar scale of industrial estate should be developed in the proximity of the new Tibar Port in Liquica Municipality. Alternatively, a vocational training center is under planning to be established in some 7 ha of government land in Tibar.
2	Hotel / Building	Downtown Dili	Indonesian investor will construct AGP (Artha Graha Peduli) Square which comprises a 26-story building. The construction was commenced in 2013 and now under construction appointed by Indonesian state-owned enterprise, PT. Pembangunan Perumahan (Housing Construction).

Major Industrial Development Plan In and Around DMA(2/2)

No.	Type	Location	Description
3	Tourism / Resort Development	Dili Municipality (Comoro)	It is a 580 ha of five-star hotel resort development in Tibar-Taci Tolu area by a Malaysian developer. It will create 1,500 employment opportunities and more with multiplier effects on subsidiary service industries.
4	Tourism / Resort Development	Dili Municipality (Cristo Rei)	Tourist resort development east of Cristo Rei, which includes a five-star hotel beach resort by the owner of Timor Plaza. Approximately 10,000 employment opportunities are expected.
5	Industrial Park	Baucau Municipality	Industrial estate of 59 ha in Cavabela is planned. It seems that a contractor is already procured for land reclamation for the proposed site. However, the type of industries to be established is not yet determined.
6	Industrial Park	Lautem Municipality	Industrial estate of 50 ha in Lacal is planned. It seems that a contractor is already procured for land reclamation for the proposed site. However, the type of industries to be established is not yet determined.
7	Industrial Park	Covalima Municipality	It is still in the conceptual stage for locating a 50 ha land in Suai. There has been no concrete plan yet.
8	Industrial Park	Oecusse Municipality	ZEESM (Special Zones of Social Market Economy) in Oecusse is led by the former prime minister, Dr. Alkatiri in Oecusse Municipality. It is a pilot project for comprehensive development for the enclave including the development of airport, port, power station, water and sanitation facilities, road network, hospitals, schools, culture center, industrial estate, hotels, commercial, and housing area. It is planned to serve a population of 30,000.

Source: JICA Project Team based on hearing at MCIE, MOT and Former Prime Minister Office

Current Social and Environmental Status

2.11 Geography: The DMA is located at the northwest coast which faces the Ombai Strait and is approached by the mountains at the south side. The DMA has limited flatland as it is about four kilometers even in the longest distance from the coast to the foot of mountains. Furthermore, the DMA is divided into three areas, Tibar, Dili, and Hera from the west.

2.12 Biodiversity: A total of 30 protected areas were listed in Timor-Leste; and three of them, Cristo Rei Protected Area, Tasitolu and Behau, are located in the DMA. The NDFNC is going to review the list of protected areas. Behau will be abolished and two mangrove areas will be listed in Dili Municipality although the location details are unclear. Besides, an international NGO, Bird Life International, undertook a survey and designated Important Biodiversity Areas (IBA) to conserve important habitats of bird populations in 2007. Two IBA, Tasitulo and Areia Branca Beach and Hinterland, are located in the DMA. Mangrove trees are not lushly vegetated on the coast of Suco Tibar located at the west end of DMA.

2.13 Administrative Boundary: Timor-Leste has an administration system which consists of municipality, administrative post, and suco (village level). There are 25 suco(s) under 5 administrative posts and 2 municipalities in the DMA which is about 180 km^2.

2.14 Land Use: In DMA, three-fourth of the land area is dominated by a natural area which mostly stretches to the hilly and mountainous areas. Most parts of this area have steep slopes and are not suitable for habitation.

2.15 Living Conditions: The living conditions in DMA are urbanized as most in the country. However, firewood is still mainly used as source of cooking fuel in the households, and most residents do not use septic tanks for the means of waste disposal in the DMA. These can be concerns as to their influences on water pollution and deforestation.

2.16 Cultural Heritages: There were no specific designated cultural heritages like a historical urban districts identified in the DMA although churches and cultural monuments were scattered in the area. However, according to the State Secretariat of Arts and Culture (SSAC) under the Ministry of Tourism, there are architectural heritages of Portuguese colonization period. Meanwhile, local people state that they have sacred/holy places of old trees, rocks, and/or traditional houses in communities.

2.17 Pollution: As Timor-Leste has not established environmental standards, emission standards, and effluent standards and have not conducted monitoring activities; it is difficult to study the present situation of air/water pollution in the DMA without concrete data. However, it is assumed that serious air pollution and water pollution with chemical substances have not been serious because the secondary industry has not been developed as mentioned in the above section on "Economic Activities", and not many factories are located in the DMA based on the existing land use conditions.

National Plans and Programs

2.18 SDP 2011-2030 envisions the utilization of oil revenues to foster economic and social development and the diversification of the economy. Timor-Leste's aim is to transition from lower to upper middle-income status by 2030. The SDP targets the development of three core sectors, namely petroleum, agriculture, and tourism. It is aimed at achieving by means of targeted investment in infrastructure, education, and human social capitals. In the national strategy, "Dili-Tibar-Hera" is identified as one of the six national strategic zones with focus on service trading and developments such as Tibar commercial port, industrial estate, higher education, marine tourism, business (CBD), and upgrade of the international airport.

2.19 One of the major fiscal programs is the Infrastructure Fund (IF) of which primary objective is to finance the implementation of infrastructure development that requires significant investments in multi-year projects of over US$1 million. Source of the IF is financed from annual oil and non-oil revenue and partial withdrawal from the Petroleum Fund of which balance has been accumulated to some of US$ 14.1 billion. The investment volume from the IF is expected to peak in 2016 and gradually diminish towards 2018. Such actions in infrastructure development are expected not only to reduce capacity constraints and assist in facilitating more productive economy, but also create a framework to lower transaction costs, create jobs, and generate income, stimulating domestic market integration and increasing demand in rural areas. One of the most challenging issues is whether to execute the projects and programs as these are budgeted. It may require substantial improvement in institutional capacity and efficiency with respect to government expenditure.

2.20 Other major program is the Human Capital Development Fund (HCDF). The main programs funded by the HCDF are as follows:

(1) Scholarship was designed for the general public, public servants, and children of veterans.

(2) Vocational training is designed for public servants in the following areas: criminal lawyers, auditors, judges, notaries, private lawyers, translators and inspectors. It also supports the training of manpower to work abroad, particularly in construction; provides training for trainers in Tibar Center and other centers; and supports basic training in languages and math skills.

(3) Technical training is comprised of training activities for public administration and delivered through higher education and polytechnics.

(4) Other types of training cover programs for young teachers in higher education and polytechnic education for health, police, and defense force officers.

2.21 Regional developments are carried out under the Development Program of Decentralization (PDD). Under this program, the Integrated District Development Plan (PDID) and the National Suco Development Plan (PNDS) are implemented all over the country. PDD is aimed at boosting the local private sector, promoting a decentralized decision-making framework. In 2013, the GoTL launched the Registry and Verification of Enterprises Service (SERVE) in order to facilitate the administrative aspects for enhancing the national business environment. According to the State Budget 2014, the SERVE reported that it has accelerated private sector development and about 1,500 companies were newly created in 2013.

3. URBAN CONDITIONS

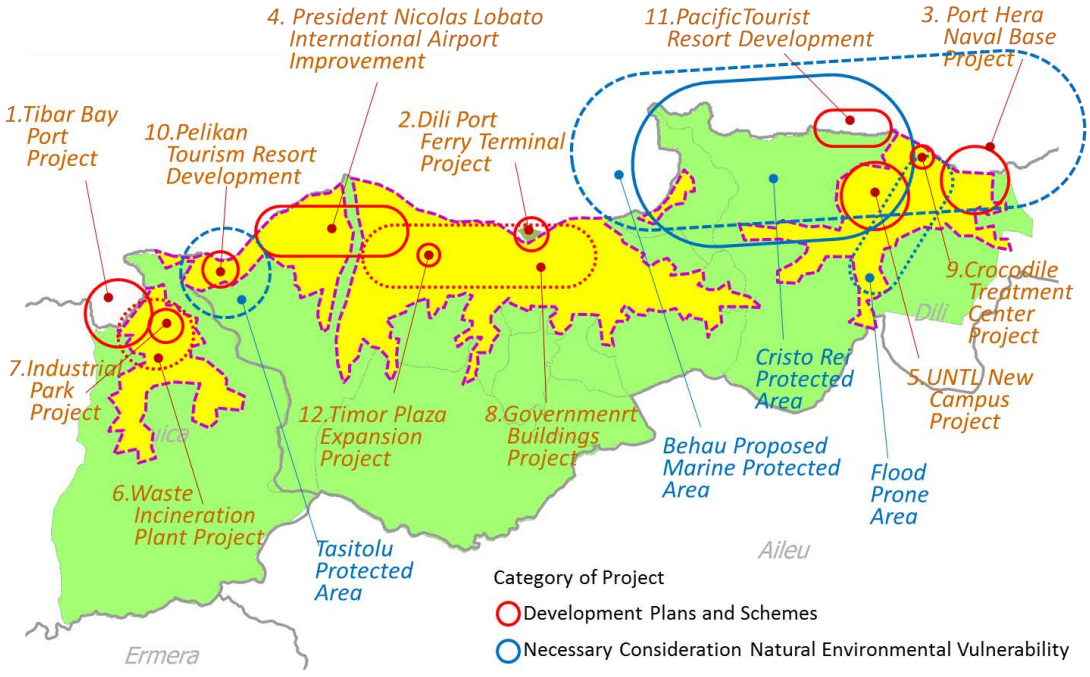
Development Trend in DMA

3.1 The urbanization of Dili started when the Portuguese colonial government moved its center from Lifau at Oecusse to Dili in 1769. The central area of Dili including facilities of government administration, commercial and business, churches, and others on the road network at that time has been maintained and succeeded as representation of historical legacy of Timor-Leste, where visitors can enjoy and think of the old times as an attractive historical area.

3.2 According to the examination of the settlement density of DMA, the gross density in habitable areas in DMA is estimated as 6,698 ha (37 % out of total DMA), and its gross population density becomes 33.4 persons per hectare in habitable land.

3.3 After recovering deterioration of urban facilities from Indonesian occupation, small-scale private sector investment (e.g. retail, restaurant, and wholesale) seems to have become brisk in recent years. However, large scale estate developments including housing estates and industrial estates do not seem to be active in Dili except for commercial and tourism sectors.

3.4 Public sector investments are very active in recent years. The following figure shows current urban developments and major infrastructure developments in DMA.



Source: JICA Project Team

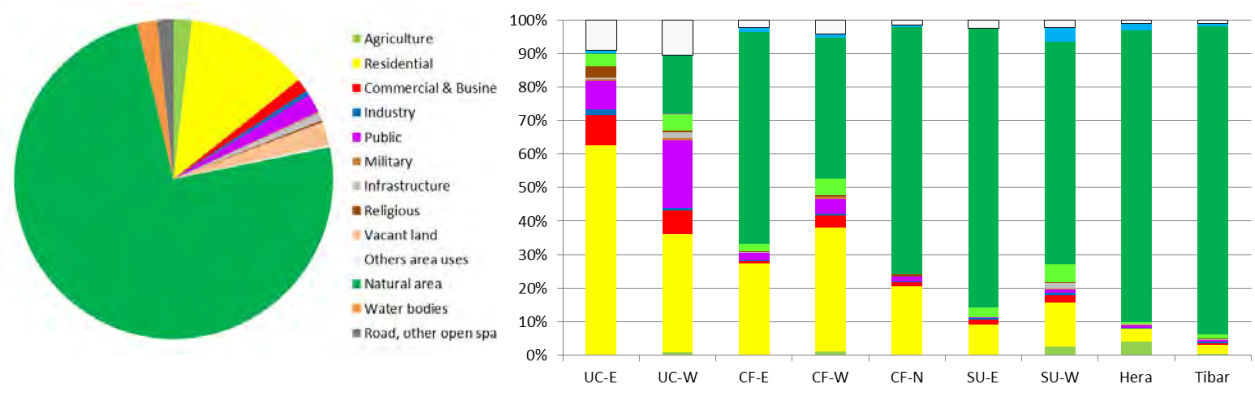
Constraints and Opportunities of Habitable Areas in DMA

Land Use Conditions

3.5 According to the Land Use Survey for DMA by the JICA Project Team (hereinafter JPT) in August 2014, its result reveals that natural area including forest and natural bush covers around 74.5% of the total DMA and other predominant land use is residential and mixed residential use with other uses sharing 12.5% of total DMA land.

3.6 Based on the spatial character of DMA by the urban block, the land use of Urban Center block is occupied mainly by residential areas and government land followed by commercial & business use. The majority of land use is mountain or other natural area in the urban blocks of Center Fringe, Suburban, Hera, and Tibar as large sucos with large natural lands shared by 50%

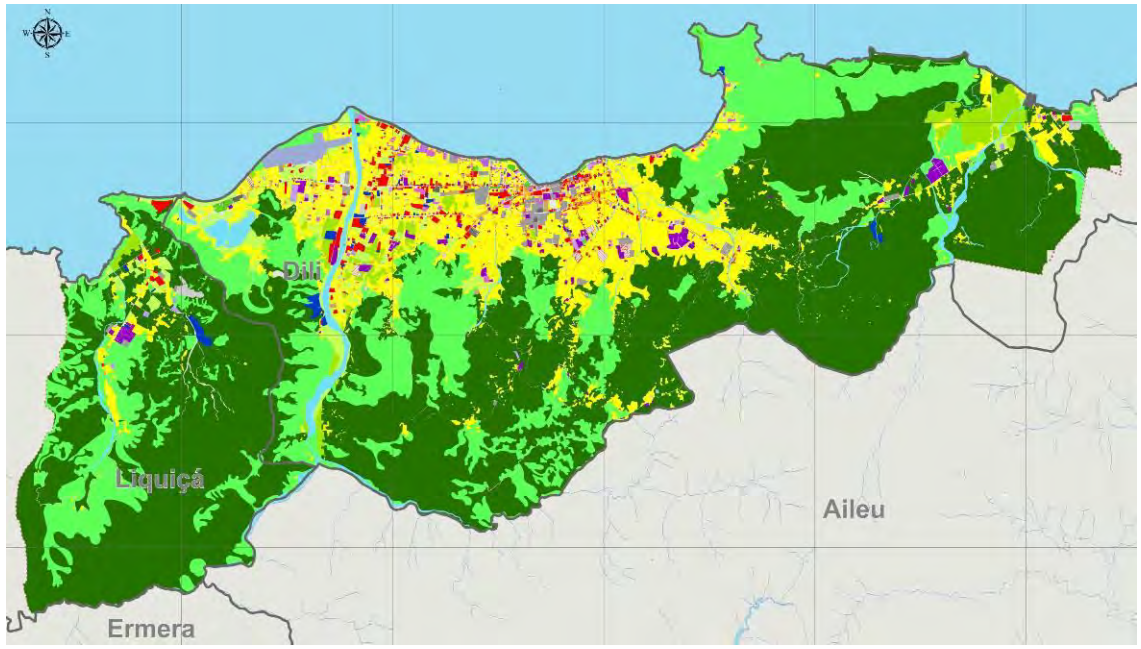
to over 90% of total urban block area.



DMA Total Aggregated SUCO Land Use by Urban Block

Note: UC-E=Urban Center East, UC-W=UC West, CF-E=Center Fringe East, CF-W=CF West, CF-N = CF North, SU-E = Suburban East, SU-W=SU West,
Source: JICA Project Team (Land Use Survey: August 2014)

Existing Land Use Composition in DMA



Existing Land Use Class
- Residential
- Mixed Use w/R
- Commercial & Business
- Hotel & Restaurant
- Market
- Mixed Use (Commercial & Industry)
- Military
- Reclamation land
- Hospital
- Religious (Cathedral, Church, temple)
- Institution (Association, Embassy, etc)
- Education
- Industry
- Vacant Land
- Transportation facilities
- Water bodies
- Agriculture /aquaculture land
- Natural grass/bush land
- Park and recreation area
- Forest
- Public infrastructure
- Governmental administrative facilities
- Market

Source: JICA Project Team

Existing Land Use 2014 in DMA

Key Public Facilities and Services

3.7 Key public facilities represented mainly by schools and health facilities in DMA have been developed and improved by each responsible national authority. However, population concentration and increase in DMA has also brought gaps between their capacity and demand due to insufficient facilities and lands.

3.8 It should be noted as a large project in DMA that the UNTL has developed the master plan of "University City" approved by the GoTL in Hera where the campus including the two faculties of Technical Engineering and Agronomy is located in Administrative Post of Crist Rei close to Hera Town.

Historical and Cultural Heritages and its Conservation

3.9 Currently there is no Law on Cultural Heritage and the Government Resolution 25/2011 as effective guidance till establishment of the Cultural Heritage National Law, stipulated policies and guidance relating to the protection of cultural heritage. Therefore there is no official registration of historical and cultural heritages under the regulation or law.

3.10 The townscape of Dili, especially in the city center area has attracted visitors not only foreign tourists but also people of Timor-Leste as one of the national identity. Visitors are enjoying historical environment in the city center where many Portuguese colonial buildings are distributed mainly in the sucos of Motael, Gricenfor, and Bidau Lecidere.

4. CONDITIONS OF ROAD AND TRANSPORT

Road and Urban Transportation

4.1 In the road network of DMA, National Road A01 and "Banana-Road" have four lanes, but the other roads have almost less than four lanes. The inter-city road network connects radially between Dili and other major cities in Timor-Leste. Four national roads exist in DMA. Currently, toll roads do not exist in DMA.

4.2 Each road construction project is conducted based on road design standards in Timor-Leste, but the road design standard is not formally approved yet.

4.3 The National Directorate for Road, Bridge, and Flood Control (DRBFC) of MoPWTC, is the institution in charge of road development including survey, planning, and construction of national roads and other roads in DMA.

4.4 The National Directorate of Land Transport (DNTT), which is in MoPWTC, is the institution in charge of public transportation. DNTT is the authority providing licenses of Microlets, and also in charge of public transportation facility improvement planning including for bus shelters, and traffic safety facilities such as parking lots, road signs, and road surface markings.

4.5 Two types of surveys, Household Interview Survey and Traffic Count Survey, were conducted. Household Interview Survey is divided into Person Trip Survey and State Preference Survey. Traffic Count Survey is divided into Cordon Line Survey, Screen Line Survey, Traffic Count Survey, and Travel Speed Survey.

4.6 Future problems and issues of transportation sector in DMA are identified based on the result of demand and gap analysis. In DMA, not only traffic congestion but traffic accidents are the transportation problems corresponding to the increase in the traffic demand.

Seaport

4.7 The berth of Dili Port has a total length of 289.2 m and its depth ranges from 5.5 m to 7.5 m. A 180 m section of the berth (between BL 1 and BL 4) was rehabilitated in 2009 by JICA's grant aid. The remaining section of 109.2 m which was constructed in 1997 has suffered serious

deterioration and needs to be repaired.

4.8 Dili Port has two ferry routes: one connects with Oecusse (isolated enclave of Timor-Leste) in West Timor (Indonesia) and the other with Atauro located at Atauro Island on the opposite bank of Dili Port. There is no jetty for ferry boats but a slipway is used as a landing place for passengers and vehicles. APORTIL has a "Dry Port" at Tasitolu about 8 km west from Dili Port.

4.9 Before and after independence, Japan has been assisting with the development of infrastructure in various fields of cooperation with international donor agencies such as the Asian Development Bank (ADB) and the World Bank. A long-term expert for port security and maintenance has been dispatched to Dili Port from November 2012 by JICA. Germany donated the ferry Berlin "NAKROMA" currently sailing between Dili and Oecusse as well as Dili and Atauro. Germany has been planning to donate another ferry through Kreditanstalt für Wiederaufbau (KfW). The United States Coast Guard (USCG) carried out a review of security measures for Dili Port relating to the International Ship and Port Facility Security Code (ISPS Code) in 2008. The US government is interested in accelerating the implementation of the ISPS Code in Timor-Leste.

4.10 In Dili Port, there are two organizations (DNTM and APORTIL) under the Ministry of Transport and Communication. The National Director of Maritime Transport (DNTM) has the authority to give permission and grant licenses. APORTIL is responsible for the management of Dili Port which is the only international trading port and any other matters concerning the port sector. The staff of APORTIL is comprised of 42 employees.

4.11 Government policies on port development include the Timor-Leste Strategic Development Plan 2011-2030 (SDP), Program of the Fifth Constitutional Government 2012-2017 Legislature, and Five-year Strategic Plan of APORTIL 2013-2017. New ports are positioned as a national priority to support the growing economy and meet future industry and freight demands as discussed in Chapter 3 of the SDP (Infrastructure Development). The construction of Tibar New Port is scheduled to commence by 2015 and operation will start by 2020.

4.12 The Government of Timor-Leste is planning to create a new port at Tibar, 11 km to the west of Dili. This project was analyzed in the report "Public Private Partnership (PPP), Approaches to Port Development in Timor-Leste" published by IFC in 2011.

4.13 In line with the construction progress of Tibar New Port, all cargoes except passengers which are treated in Dili Port will be transferred to the New Port gradually from 2018 and completely by 2020. As a consequence, Dili Port will become a dedicated ferry port using new ferry facilities which will be constructed on the west side of BL 6. Provision of ferries and construction of a ferry terminal are issues and constraints.

4.14 Although some questions remain concerning the cargo forecast, Tibar New Port will be constructed as scheduled as a national project through the initiative of ADN and IFC. The utilization of the newly developed Tasitolu "Dry Port" by APORTIL remains unclear. It could be used as an inland bonded CFS for LCL container cargoes. Issues and constraints for Tibar New Port are role-sharing between public and private sectors and the role of APORTIL.

4.15 Hera naval port is planned to be developed under the "Hera Port Master Plan" of the administration's Strategy. Issues and constraints are consistency with urban master plan and safety measures.

Airport

4.16 PNLIA is the only international airport in Timor-Leste and services regular flight operation to/ from Denpasar Airport in Indonesia, Changi Airport in Singapore, and Darwin Airport in Australia. Operating airlines are currently five airlines such as SilkAir/ Air Timor which are code sharing flight operated by Silk Air, Airnorth, Sriwijaya, and Garuda Indonesia.

4.17 PNLIA handles around 198,080 passengers and 172 tons cargo in 2014 for international air traffic in Timor-Leste. PNLIA is located in west side of Dili City and situated 8.0 m Mean Sea Level MSL) with one 1,850 meter runway, four exit taxiways, and three separated passenger terminal building for departure, arrival and VIP.

4.18 The aviation feature PNLIA from 2008 to 2013 constantly increased. However, cargo tonnage was decreased because Merpati Air stopped its operation in 2012.

4.19 The International Finance Corporation (IFC) revised the PNLIA PPP project 2015. IFC studied the traffic forecast, runway development comparison, and land side including terminal building area. The detailed IFC runway development comparison plans have two options. MoPWTC is now evaluating the runway options under the relevant government organizations based on technical as well as environmental and social aspect. On the other hand, MoPWTC received some proposals for PNLIA airport development from China, Korea and Australia.

4.20 The air transportation administration has two organizations under MoPWTC: the Civil Aviation Authority Timor Leste (AACTL) and Air Navigation Administration Timor Leste (ANATL) established by Decree-Law 8/2005. AACTL is in charge of supervising, regulating, monitoring, and inspecting the civil aviation sector and the role of ANATL as state company in charge of operating and managing national airports and air navigation infrastructure. However, the previous Civil Aviation Department under MoPWTC still executes actual operation.

4.21 Current fact of airport sector is classified into two such as “Congestion at Passenger Terminal” and “Restriction of flight services.” Passenger terminal building was constructed during Indonesian colonial period as local domestic airport, so there was no prepared custom, immigration and quarantine (C.I.Q) facilities and also increasing passenger volume after independent up to now. Therefore, passenger terminal area is now quite narrow for proper passenger services. Another fact such as “Restriction of flight services” has occurred due to the short runway length and no installed lighting system. Therefore, it is necessary to improve the airport facility giving priority to passenger terminal and runway facilities.

5. CONDITIONS OF INFRASTRUCTURE

Disaster Management

5.1 The urban area lacks preparedness for possible disasters. A major earthquake or tsunami can cause substantial damages to the lives and buildings as well as fatal damages to residents in Timor-Leste who may not be prepared for the disasters.

5.2 The GoTL issued the National Disaster Risk Management Plan (October 2005), which adopted all hazard approaches and dealt with the management of all types of natural disasters. The GoTL with the assistance of UNDO issued the National Disaster Risk Management plan and the National Disaster Risk Management Policy (March 2008) which provides a platform for developing programs. Due to the decentralization of power, local governments become responsible for disaster prevention/mitigation, preparedness, response and recovery, and require having heavy responsibilities and high implementation capacities, and it is remarkable that the local governments lack competent staff for DRM.

5.3 Timor-Leste totally depends on neighboring countries for weather information, earthquakes, and tsunamis: weather forecast data from RIMES Thailand, severe weather warnings like cyclones from the Australian Bureau of Meteorology Forecasting Center, information of earthquakes from Indonesia and REMISE Thailand, and tsunami from the three countries: India, Indonesia and Australia. However, Timor-Leste lacks competent technical staff to utilize these information/data and has not prepared for DRM yet.

5.4 For organization improvement for Disaster Risk Reduction, it is necessary to solve the following issues:

- To improve the weak coordination among the line ministries/agencies for mainstreaming of DRM;
- To improve organizations and enhance technical capacity of local governments to advance preparedness for DRM;
- To improve hazard monitoring facilities and enhance technological capacities for natural hazard monitoring and assessment;
- To improve the capacity to collect hazards and disaster data/information which are indispensable for planning preparedness;
- To enhance communities' participation for DRR and improve their disaster resilient capacities; and
- To prepare necessary laws and regulations of Timor-Leste for improvement of the current situation of DRM.

Solid Waste Management

5.5 The bulk of the municipal solid waste (MSW) of Dili comes from residential areas, commercial establishments, and institutions. Using the study conducted by ADB in 2014, waste generation in Dili is projected to increase from 103 tons per day (tpd) in 2014 to 137 tpd in 2020 and 235 tpd by 2035. Waste is made of up 50 to 60% biodegradables and 40 to 50% aggregate for the recyclables, residuals, and other waste components. Sweeping of litter along main roads and beaches is done by both the government and private sector. Prior to collection, waste is temporarily stored in 337 open concrete bins, 42 aging skips m^3, and by the various containers used by commercial establishments and private residences.

5.6 Current waste collection covers four of the six sub-districts of Dili. The sub-districts covered by the waste collection system are Cristo Rei, Dom Aleixo, Vera Cruz, and Nain Feto. The bulk of waste collection is contracted to 40 privately-owned trucks and complemented by 12 government owned vehicles. In 2014, the average number of truck trips per day is 106 which translated to an estimated daily collection of 73 tons or 71% of the waste generated. In 2015, the number of daily trips increased to 134 which translated to a collection of 93 tons or 86% of the waste generated.

5.7 Waste recycling is done by the private sector. The focus of recycling is the recovery of aluminum and other metals for eventual sale to buyers in Singapore and Malaysia. The metal fractions of the waste are recovered by waste pickers from bins, from the dumpsite, and at the household level. Polyethylene terephthalate (PET) bottles, carton, paper, and glass bottles are currently not collected and recycled in Dili. A small capacity composting plant is operated by a private company within the Tibar Dumpsite area.

5.8 The collected waste is disposed into the Tibar Dumpsite which is located approximately 13 road kilometers southwest of the center of Dili. Manual recovery of the metal fraction by over 70 waste pickers and burning of waste is practiced at the dumpsite. The primary gap in disposal is the absence of a sanitary landfill which will facilitate engineered placement and encapsulation of the waste and minimal negative impact to the environment.

5.9 The government provides funds for the operation and maintenance of the Dili waste management system from a budget allocated by the Ministry of Finance. A "user pays" system has yet to be implemented which should initially target the commercial establishments and government offices.

5.10 Two incineration units are currently used to treat medical waste from Hospital Nacional Guido Valadares and from an undetermined number of community health centers and clinics in Dili. These units are located within the hospital compound and the Tibar Dumpsite.

5.11 In general, segregation of waste at source is not practiced in Dili. Partial recovery of recyclables is focused on the metals. Food waste is fed to the house pets and pigs. Burning of waste is practiced and done in some cases inside the concrete bins. Littering and dumping in vacant lots and waterways are carried out likely due to limited information on proper waste management. Mixed waste is placed on bins and/ or vicinity of designated collection points.

5.12 A comprehensive law that will cover all the aspects of solid waste management has yet to be legislated. Currently, solid waste management in Dili is broadly guided by the Constitution of Timor-Leste, Decree Law 33//2008 and Decree Law 5/2011.

5.13 Solid waste management in Dili District is implemented under the Ministry of State Administration, specifically through the Sanitation Department. The department is composed of 280 personnel who perform the interrelated functions of gardening and landscape maintenance, sweeping and road cleaning, waste collection, and disposal. Other government institutions that will be indirectly linked to solid waste management include the Ministry of Industry, Commerce and Environment for environmental permits for waste management facilities, Ministry of Health for waste-related health issues and treatment of medical waste, Ministry of Public Works for the establishment of waste management facilities, and Ministry of Education for increasing awareness on environmental protection.

5.14 The current solid waste management of Dili corresponds to a collect and dump system. Improvement of the system requires the resolution of the following development issues;

- Absence of comprehensive law on solid waste management;
- Need to rehabilitate the Tibar dumpsite and develop an environmentally acceptable disposal facility;
- Limited awareness on solid waste management and environmental protection;
- Limited institutional capacity;
- Impact of sanitary landfill development on the waste pickers at Tibar Dumpsite;
- Financing of solid waste management facilities and operations;
- Private sector participation and government monitoring; and
- Use of proven technology on waste processing, treatment, and disposal over the long term.

Power Supply

5.15 In 2010, the Government of Timor-Leste took a major decision to undergo a great power infrastructure development. Hera and Betano power plants are the first biggest infrastructure projects in Timor-Leste which now electrify the whole nation. The total generating capacity of the two power plants (Hera 120 MW and Betano 136 MW) is 256MW. The total peak power demand of Timor-Leste is about 64.1 MW, equivalent to 54% capacity of Hera Power Plant. All of power source derived from Hera Power Plant and Betano Power Plant for spare. Meanwhile, the peak power demand of Dili is 42.11 MW.

5.16 To provide power to Dili City, Dili Substation was installed with a capacity of 63 MVA and a voltage of 150/20 KV. This substation has two transformers with 31.5 MVA each and a spare space for a future 31.5 MVA transformer. In addition, the network of 20 kV distribution substations in Dili has 217 transformers, equivalent to 50,555 kVA installed capacity and transmission lines are approximately 204.92 km.

5.17 Besides the development of power sector in Timor-Leste, the power sector has many kinds of

donor projects such as infrastructure management, rehabilitation, and development plan projects by some organization such as ADB, World Bank, and JICA.

5.18 Currently, the power sector is under the Ministry of Public Works (MoPW), which are covering various infrastructure sectors from road, bridge, urban planning, to water and power. MoPW has three secretaries of state: a) State Secretariat of Public Works; b) State Secretariat of Water, Sanitation and Urbanization; and c) State Secretariat of Electricity. And power sector administration is under Director General of Electricity (Director General of EDTL).

5.19 With the administration of EDTL, the tariff system has changed over the four periods (from 2002 to 2014) which is reduced from 249 cents per kWh to 5 cents per kWh.

5.20 The objective of the power sector is to ensure the synchronization between power supply development and power grid to provide the best quality, reliability, and efficiency of power. And it has to meet the needs of socio-economic development. Based on the study of the current conditions, the development issues and constraints should be implemented as follows:

(a) Improvement of distribution network and primary substation; and

(b) Using renewable energy.

Telecommunication

5.21 Voice telecommunications in Timor-Leste is largely mobile. As of the end of 2013, there are 650,000 mobile-cellular subscriptions. This number of mobile-cellular subscription corresponds to nearly 55% of the current population. In contrast, the number of fixed phones is not significant, and has only risen marginally since Timorese independence. At the end of 2013 there were 3,000 fixed telephone subscriptions, accounting to less than 1% of the population. They are used mainly in governmental, corporate, and NGO offices in Dili, as well as in some private homes.

5.22 Beside the development of mobile subscriptions, there was a rapid growth of fixed broadband subscriptions, with a bandwidth of over 256 kbps, up by 660% compared between 2008 and 2013. But in general, the percentage of individuals using the internet is as low as 1.1%.

5.23 Currently, international connectivity is provided only through satellite links and no submarine fiber links which is connected to Timor-Leste. Therefore, internet speed is slow with higher costs. Timor-Leste is far from any submarine fiber links serving the Pacific or Southeast Asian regions. In the future, terrestrial local cable links can be terminated relatively closer, in Kupang, Indonesia (about 300 km) and Darwin Australia (about 750 km).

5.24 In addition, radio and television are the most widespread form of mass media in Timor-Leste. There are 1 AM radio station, 37 FM radio stations by other, 1 televison station by Television of Timor-Leste (TVTL). Beside the state-owned RTTL, Timor-Leste also has a privately-owned television channel STL TV by STL Corporation.

5.25 With the rapid development of telecommunications, the GoTL has announced that it has awarded the country's two new telecommunication licenses to Vietnam's Viettel Global Investment (with the operator name Telemor) and PT Telekomunikasi Indonesia International (with the operator name Telkomcel), with the aim of introducing competition to the Timor-Leste markets by 2010.

5.26 Currently, the telecommunications sector is managed by the National Communications Authority (ANC). The ANC have responsibilities including: overseeing registration of service providers; granting radio spectrum licenses; monitoring compliance with legislation, regulations, and licenses; regulating interconnection, competition, and consumer protection; resolving disputes among and between operators and service providers; and allocating, assigning, and supervising the use of radio spectrum and numbering, among other responsibilities.

5.27 Based on the study of the current conditions, the development issues and constraints should be implemented as follows:

(a) Upgrading the fiber trunk network in Dili

(b) Common infrastructure and bunch of existing overhead line cables

(c) Upgrade government network

(d) Upgrade government data center with cyber security

6. URBAN MANAGEMENT CONDITIONS

6.1 Spatial management is administered by laws and regulations concerning spatial management and land management, and most of which are still under preparation, including the Spatial Planning Law and National Spatial Plan.

6.2 The Spatial Planning Law, Housing and Settlements Law, and National Spatial Plan, which are considered as the foundation of urban management in Timor-Leste, are under preparation by a Portuguese consultant, under the supervision of the National Directorate of Housing and Urban Planning, Ministry of Public Works. Some of land management-related laws have been established by the Ministry of Justice.

6.3 Even though the Dili Urban Master Plan should be prepared to satisfy requirements in the Spatial Planning Law, since Spatial Planning Law is still under preparation, it is necessary to ensure consistency of the Dili Urban Master Plan and Spatial Planning Law. In addition, legal justification of the Dili Urban Master Plan has to be secured by the law for approval and implementation of the plan.

6.4 The National Spatial Plan (NSP) will show the basic structure, land use, hierarchy of urban areas, and hierarchy of infrastructure; thus, the structure plan, land use plan, and infrastructure development strategy to be proposed in the Dili Urban Master Plan have to be consistent with the structure and hierarchy at a national level.

6.5 Land management-related laws will have impact during implementation of the Dili Urban Master Plan. Issues for land management for implementation of the MP are summarized below.

- **Land Use Control:** Implementation of zoning plan/zoning code will limit the use of private land such as limit activity of land and volume of building. Laws on land management should mention limiting use of private property for efficient spatial management.
- **Urban Development Project**: Implementation of urban development project requires land acquisition. To follow the Constitution which mentions the use of private property for public purpose can take place with fair compensation, detailed rules on land acquisition have to be mentioned in the laws on land management.

6.6 Since there is no regulation for construction permit, land control is implemented based on Indonesian system with a taste of Timor-Leste. The necessary documents for the application include certificate of land ownership issued by the National Directorate of Land, Property and Cadastre (DNTP) of the Ministry of Justice (MoJ), a location map of the building, architectural drawings set (scale 1: 100-50), structural calculation documents, water supply, electricity, building materials, and a letter of authorization of the suco chief. In addition, there is also a case to submit a recommendation document of the Ministry of Commerce, Industry, and Environment (MCIE) and report on environmental and social impacts. It should be noted that, at present, the fee of application at the offices is free.

6.7 Because there are no land use zoning and building regulations, evaluation is done on a case-by-case basis by the applicant project. For example, if there is a building proposal, such as a large-scale shop in a residential area, the owners can be advised to provide enough parking space for the proposed building, but it is not legally enforceable. For building regulation, the Directorate of Building (DNE) has continued to request to prepare the building code for Timor Leste since 2012, but approval is not done yet and construction is carried out in compliance with the building code of Indonesia so far.

6.8 To realize the land use plan and other action plans to be proposed in this master plan, it is necessary to enact laws and regulations on land use control especially on zoning code.

6.9 Since spatial management means the "management of state territory" covering from urban area to rural area, from build-up area to agriculture and forest area, many organizations are involved, among which National Directorate of Housing and Urban Planning of the Ministry of Planning and Strategic Investment is responsible for spatial management in terms of plan formulation and land use control. Other organizations include MoPWTC, Ministry of State Administration, Ministry of Justice, Ministry of Agriculture and Fisheries, and Ministry of Tourism.

6.11 There is a need to continue to clarify the role of work between DNE and municipality, and other organizations in order to perform the appropriate job of development and building permit in accordance with the proposed and approved land use plan in this project.

6.12 By promoting WG meeting, consultation, and coordination on the roles among concerned government organizations, the capacity of individuals and organizations will be enhanced.

Human Resources Management

6.13 According to the result of a questionnaire survey to all the staff members of the DNHPU, the superior group, compared with the junior and senior group, there are more times to participate in human resources training programs, seminars and workshops; and times to attend the official meeting is larger. For this reason, personal connection is wide, and they have more reliable information. Since their work experience is long, they know various planning tools necessary for the urban planning and they have a high job performance and efficiency.

6.14 All staff should be assigned to one of the division of the department and it is necessary to clarify their respective job. In addition, toward the end of this project, all of the staff needs to be able to outline and explain issues and policy options in place of the meetings of WG, steering committee, and public consultation.

6.15 Technology transfer through OJT by each expert of JPT to each C/P personnel is the basic program to learn about professional knowledge and know-how. Technical training is conducted on the preparation and operation of the WG meeting, the steering committee, and the public consultation, including production of presentation materials and minutes of meetings.

6.16 Targeting 12 junior staff of DNHPU, according to the results of the questionnaire surveys conducted at the beginning and at the end of the this project, all the staff could increase their level of understanding for the knowledge and know-how relating to urban planning.

6.17 For setting the program of the capacity building, it is assumed to follow two steps, and the different approaches during this project period and after the project are as follows.

- During this project: Technology transfer with main focus on formulation of urban plan through OJT and WG
- After the project: Human resource development approach with main focus on land use management and urban development projects

Database Management and Geographic Information System

6.18 Currently there is no legal framework which solely focuses on the development of GIS infrastructure in Timor-Leste. Within DNHPU under MPSI, there are existing geographic databases covering parts of the study area that are from previous projects conducted within the agency.

6.19 In terms of capacity for GIS utilization, DNHPU has a little experienced personnel on GIS operation with old version of GIS software, but there is no separate GIS division or office dedicated for the maintenance and update of GIS databases. Local counterparts working under the Land Use Working Group for this project for the Dili Urban Master Plan have assessed themselves to be at beginner level in terms of GIS knowledge and capacity. They were trained for basic skill and knowledge of GIS operation via coaching and mentoring during the project.

7. DEVELOPMENT AND PLANNING ISSUES

7.1 Main issues and the direction mentioned by each theme of working group: land use, institution, socio-economy, road and public transportation, infrastructure, and environment, are summarized in the table below.

Overview of Main Issues and Directions for Each Planning Theme

Theme	Main issues	Directions to be solved
1. Land Use	Response to large burden on lands of DMA by continuous population increase	Well-organized urban management by controlling inappropriate urban sprawl into fragile land in hilly areas and implementing efficient land use in built-up areas
2. Institution	Proper spatial management and building control and infrastructure development	Preparation of spatial management tool such as Spatial Planning Law, National Spatial Plan
3. Socio-economy	Response to expected high population density and high unemployment rate in Dili	Achievement of regionally-balanced development in Timor-Leste
4. Road and public transportation	Response to increase of transportation demand	Increasing of traffic capacity by road construction and utilization of ITS; Traffic Demand Management (TDM) by introducing mass transit
5. Infrastructure		
(1) Seaport	Smooth implementation of the Tibar New Port Project under PPP scheme	Removal of uncertain factors by clarifying role-sharing between public and private sectors
(2) Airport	Improve safety and capacity of airport facilities such as runway, lighting system, terminal building	Promotion of PPP project or improvement of President Nicolau Lobato International Airport
(3) Disaster prevention	Provision of proper prevention measures, preparedness and timely information to the people in risk	Improvement of institutional and technical capacity at both national level and district level for implementing disaster risk management
(4) Water supply	Grasping maximum potential of the water resources in DMA for planning water supply facilities	Conducting detailed studies about the yield of surface water and groundwater
(5) Sewerage/Drainage	• Improving channel inlet and flow condition through removal of dust and garbage in channels • Revising the DSMP based on the latest urban development plan	• Conducting public awareness seminars on the roles of drainage system and proper actions • Clarification of points to be revised in DSMP
(6) Solid waste management	Reducing health and safety risks to waste pickers, workers, and inhabitants near the dumpsite in Tibar	Rehabilitation of the Tibar dumpsite and development of an environmentally acceptable disposal facility
(7) Power Supply	Improvement of distribution network	Increase of transformers and low-voltage lines
(8) Telecommunication	Speed up of internet connection	Upgrade of the fiber trunk network mainly international connections by submarine fiber cable
6.Environment	Response to disordered developments especially for tourism developments in protected areas	Establishment of entire project approval system with legislations

Source: JICA Project Team

The Project for Dili Urban Master Plan in the Democratic Republic of Timor-Leste

Final Report
Part I: Current Conditions

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EXECUTIVE SUMMARY
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ABBREVIATIONS

AACTL	Autoridade de Aviação Civil de Timor-Leste/Civil Aviation Authority of Timor-Leste
ACC	Adaptation to Climate Change
ADB	Asian Development Bank
ADIGO	Australian Defense Imagery & Geospatial Organization
ADN	Agencia de Desevolvimentto Nacional (National Development Agency)
ADSL	Asymmetric Digital Subscriber Line
AIP	Aeronautical Information Publication
ALGIS	Agriculture Land GIS Unit; Ministry of Agriculture and Fishery
ANATL	Administração de Navigação Aérea de Timor-Leste (Air Navigation Administration Timor-Leste)
ANC	National Communications Authority
APORTIL	Administração dos Portos de Timor-Leste
ARCOM	Communications Regulatory Authority
ASEAN	Association of Southeast Asian Nations
AusAID	Australian Aid
BAS	Business Activity Survey
BOM	Australian Bureau of Meteorology
BOO	Build-Own-Operate
BOT	Build-Operate-Transfer
BRT	Bus Rapid Transit
BTO	Build-Transfer-Operate
BTS	base transceiver stations
C/P	Counterparts
CIGD	Inter-Ministerial Commission for Disaster Risk Management
CPS	Country Partner Strategy
CSTS	Community Sewerage Treatment System
DDMCs	District Disaster Management Commissions
DGES	General Directorate of Higher Education, Ministry of Education
DGS	General Directorate of Statistics, Ministry of Finance
DMA	Dili Metropolitan Area
DMC	Disaster Management Center
DMP	Dili Metropolitan Area Urban Master Plan
DNCQA	National Directorate for Water Quality Control, Ministry of Public Works (reconstructed to MOPWTC)
DNE	National Directorate of Environment, Ministry of Commerce, Industry and Environment
DNE	DN das Edificações (National Directorate of Building), Ministry of Public Works (reconstructed to MOPWTC)

DNEP CC	DN de Estradas, Pontes e Controlo de Cheias (National Directorate of Road, Bridges and Flood Control), Ministry of Public Works (reconstructed to MOPWTC)
DNHPU	DN da Habitação e Planeamento Urbano (National Directorate of Housing and Urban Planning), Ministry of Planning and Strategic Investment
DNRH	DN de Recursos Humanos (National Directorate of Human Resources)
DNSA	National Directorate Water Supply Services, Ministry of Public Works (reconstructed to MOPWTC)
DNSB	National Directorate Sanitation Services, Ministry of Public Works (reconstructed to MOPWTC)
DNTM	National Directorate of Maritime Transport, Ministry of Transportation and Communication (reconstructed to MOPWTC)
DNTP	National Directorate of Land, Property and Cadastre, Ministry of Justice
DNTPSC	National Directorate of Land and Property and Cadastral Services, Ministry of Justice
DOC	Disaster Operation Center
DRBFC	National Directorate for Road, Bridge and Flood Control, Ministry of Public Works (reconstructed to MOPWTC)
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DSDMP	Dili Sanitation and Drainage Master Plan
EDTL	Electricity of Timor-Leste
EMIS	Education Management Information System Unit, Ministry of Education
ETTA	East Timor Transitional Administration
GDP	Gross Domestic Product
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoTL	Government of Timor-Leste
GRDP	Gross Regional Domestic Product
HDPE	High Density Polyethylene
HOV	High Occupancy Vehicle
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IFC	International Finance Corporation
IGE	Institute of Equipment Management
INCOIS	Indian National Center for Ocean Information Services
IPG	Institution of Petroleum and Geology, Ministry of Petroleum and Mineral Resources
ITS	Intelligent Transportation System
ITU	International Telecommunication Union
JICA	Japan International Cooperation Agency
JICA STRADA	JICA System for Traffic Demand Analysis
JPT	JICA Project Team
KFW	Kreditanstalt für Wiederaufbau

LFP	Labor Force Participation
LiDAR	Light Detection and Ranging
LRT	Light Rail Transit
MBKG	Badan Meteorologi, Klimatologi, dan Geofisika
MCIE	Ministry of Commerce, Industry and Environment
MLIT	Ministry of Land, Infrastructure, Transport and Tourism in Japan
MOE	Ministry of Education
MOF	Ministry of Finance
MOH	Ministry of Health
MOI	Ministry of Infrastructure (reconstructed to MOPW)
MOJ	Ministry of Justice
MoPW	Ministry of Public Works (reconstructed to MOPWTC)
MOSA	Ministry of State Administration
MOT	Ministry of Tourism
MOTC	Ministry of Transportation and Communication (reconstructed to MOPWTC)
MPMR	Ministry of Petroleum and Mineral Resources
MPS	Major Projects Secretariat
MPSI	Ministry of Planning and Strategic Investment
MSL	Mean Sea Level
MSS	Ministry of Social Solidarity
MSW	municipal solid waste
NDMD	National Disaster Management Directorate
NESP	National Education Strategic Plan 2011-2030
NHSSP	National Health Sector Strategic Plan 2011-2030
NMT	Non-Motorized Transport
O&M	Operation & Maintenance
OD	Origin and Destination
OJT	On-the-Job Training
PDD	Development Program of Decentralization
PDID	Integrated District Development Plan
PET	Polyethylene terephthalate
PMU	Project Management Unit
PNDS	National Suco Development Plan
PNLIA	President Nicolau Lobato International Airport
PPP	Public Private Partnership
R/D	Record of Discussion
R4D	Roads for Developments
RO	Rehabilitate-Operate

RTTL	Radio and Television of Timor-Leste
SC	Steering Committee
SDP	Timor-Leste Strategic Development Plan 2011-2030
SEAPRI	Secretariat of State for Support and Promotion of Private Sector
SEPFOPE	Secretariat of State for Vocational Training and Employment
SERVE	Registry and Verification of Enterprises Service
SISCa	Integrated Community Health Services
SKM	Sinclair Knight Merz
SNE	National Electricity System
SPTL	Spatial Planning of Timor-Leste
SWM	Solid Waste Management
TDM	Traffic Demand Management
TFTL	Telecom Fund of Timor-Leste
THR	Threshold
TVTL	Television of Timor-Leste
UASB	Upflow Anaerobic Sludge Blanket (Waste Water Treatment Method)
UNDP	United Nations Development Programme
UNTAET	United Nations Transitional Administration in East Timor
UNTL	National University of Timor Lorosa'e
USCG	United States Coast Guard
UTM	Universal Transverse Mercator
WACS	waste characterization study
WB	World Bank
WCP	Water Consumption per Capita
WG	Working Group
WHO	World Health Organization
WTP	Water Treatment Plant (Water Supply)
WWTP	Waste Water Treatment Plant (Sewerage)

CHAPTER 1 : INTRODUCTION

1.1 Background

Dili is the capital city of Timor-Leste and comprises six administrative posts, 31 *sucos* and 241 *aldeias*. Dili Municipality accommodates a population of 234,026 (2010 Census) with an annual population growth rate at 4.1%, which is far above the national average growth rate of 2.45%. The urban population is expected to share 30% of the national population in 2020.

There has been no overarching countermeasure undertaken against such rapid growth of urban population. Various urban issues such as uncontrolled urbanization, traffic congestion due to rapid increase in number of vehicles, higher risks of natural disaster, degraded sanitary conditions due to underdeveloped sewerage and solid waste management facilities are arising. These issues have further obstructed economic activities.

Against this background, the Government of Timor-Leste (GoTL) requested the Government of Japan (GOJ) to prepare the development vision that will enhance sustainable economic growth, and to formulate the Integrated Dili Urban Master Plan. In response to the request, the Ministry of Public Works and Japan International Cooperation Agency (JICA) have signed the Record of Discussion for the implementation of “the Project for Study on Dili Urban Master Plan in the Democratic Republic of Timor-Leste (hereinafter referred to as "the Project") in October 2013. (The Ministry of Public Works has been reorganized as the Ministry of Public Works, Transport and Communications (MoPWTC) after government reform was instituted in February 2015.) After February 2015, the executing agency of the Project was changed from MoPWTC to the Ministry of Planning and Strategic Investment (MPSI). Minutes of the Meetings for the Amendment of the Record of Discussions was signed in July 2015.

1.2 Outline of the Project

(1) Objectives of the Project

The objectives of the Project are the formulation of integrated urban master plan that will facilitate sustainable development in the Dili Metropolitan Area and the approval of the formulated master plan by the GoTL.

(2) Expected Outputs

(i) Formulation of Dili Urban Master Plan toward 2030

(ii) Formulation of Action Plan toward 2020

(iii) Proposals and recommendations with regard to the approval process of the Dili Urban Master Plan and laws/regulations in urban planning

(iv) Capacity development on urban planning through the Project

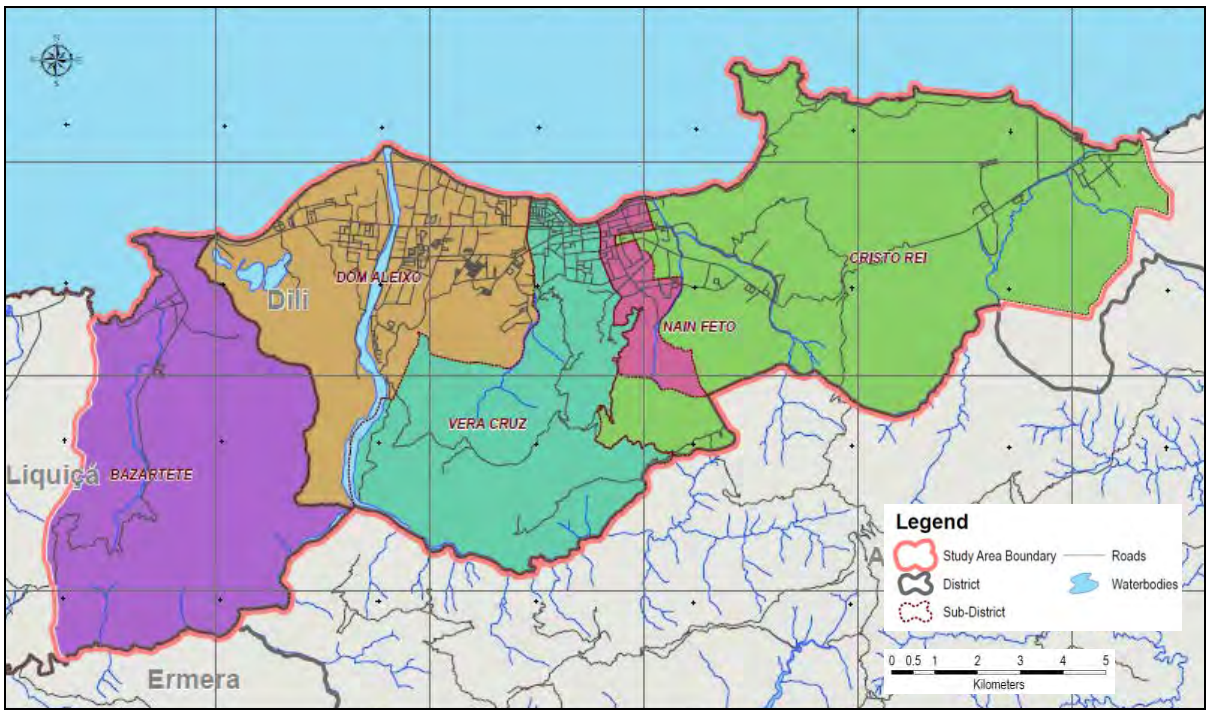
(3) Main Counterpart Agency

The main counterpart agency is the National Directorate of Housing and Urban Planning (DNHPU), Ministry of Planning and Strategic Investment (MPSI).

1.3 Project Area

(1) Project Area

The project area is the Dili Metropolitan Area (DMA) covering four administrative posts (Dom Alexio, Nain Feto, Vera Cruz, and Cristo Rei in Dili Municipality) and Tibar area of Bazartete Administrative Post in Liquica Municipality. The population of the DMA was 223,793 (2010 Census) and land area is 178.62 km^2. Figure 1.3.1 shows the location map of each administrative post in the project area.



Source: JICA Project Team based on the Directorate of National Statistics

Figure 1.3.1 Location Map

Table 1.3.1 shows the population, land area, and population density by administrative post. Nain Feto and Dom Alexio administrative posts have high population density, while Cristo Rei and Bazartete administrative posts have fairly low population density.

Table 1.3.1 Population, Land Area, and Population Density by Administrative Post

Municipality	Administrative Post (Suco)	Population (persons)	Land Area (km^2)	Population Density (persons/km^2)
Dili	Dom Alexio	105,154	33.12	3,175
	Vera Cruz	34,015	32.77	1,038
	Nain Feto	26,592	5.15	5,163
	Cristo Rei	54,936	65.33	841
Liquica	Bazartete (Tibar)	3,096	42.25	73
Grand Total		223,793	178.62	Average 1,233

Source: Timor-Leste 2010 Population and Housing Census, Volume 2: Population Distribution by Administrative Areas

(2) Background and Rationale of Setting the Project Area

The project area was set based on the official request to the Japanese government for technical assistance on the Dili Urban Master Plan on 25 August 2011. The Record of Discussion on the Project for the Study on Dili Urban Master Plan in the Democratic Republic of Timor-Leste was agreed upon between the Ministry of Public Works and JICA on 26 February 2013, while the Minutes of Meeting between JICA and the Ministry of Planning and Strategic Investment for the Amendment of the Record of Discussions on the Project was signed on 14 July 2015.

The rationales for the project area are as follows:

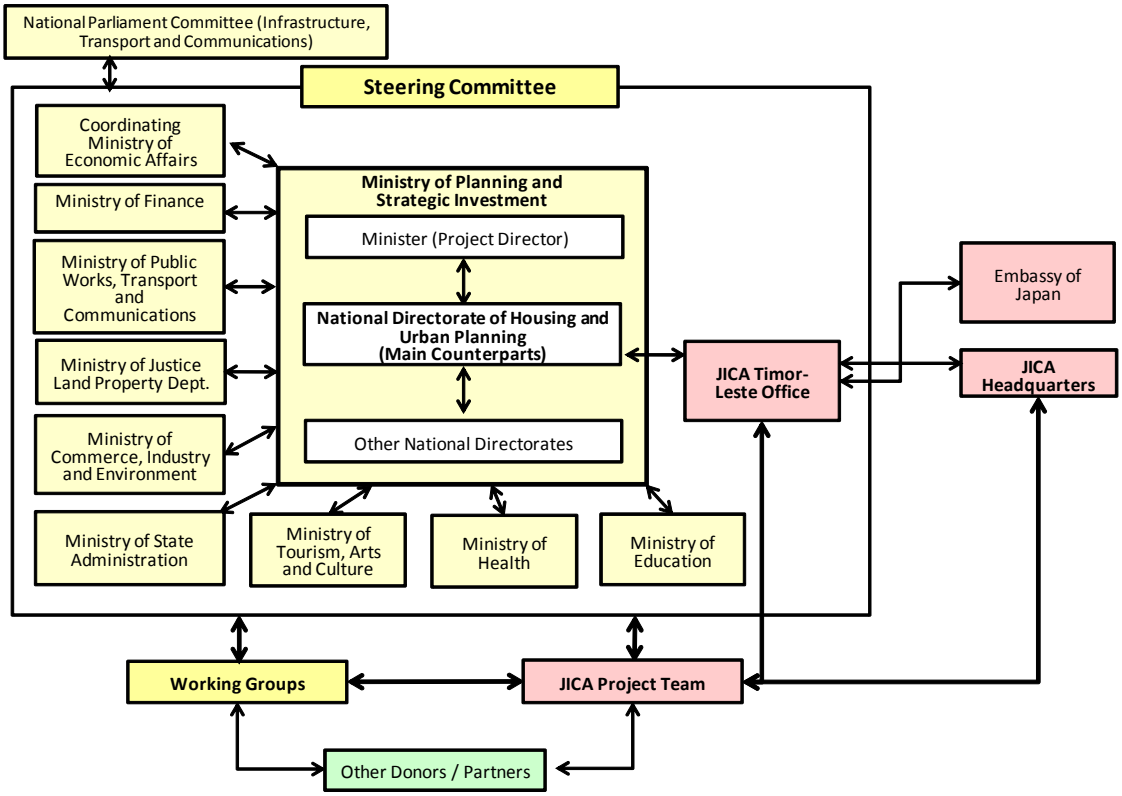
1) This master plan is expected to play a significant role in a sub-plan to support the initiatives mentioned in the Timor-Leste Strategic Development Plan 2011-2030 (SDP). In the SDP, Dili-Tibar-Hera is defined as one of the national strategic zones. It is stated in the SDP that "this zone (Dili-Tibar-Hera) has a variety of potentially significant sectors related to services, trading, and proposed developments such the Tibar Commercial Port, the industrial estate in Hera, large-scale housing, new higher education areas, marine tourism, a new central business district, and the upgrade of the international airport."

2) DMA is a suitable area for efficient economic linkage in terms of efficient deployment of human resources and supporting goods for the second and tertiary economic sector development.

3) DMA is an advantageous area that maximizes efficient operation of business in proximity to the Tibar New Seaport and Presidente Nicolau Lobato International Airport (PNLIA) as national gateways.

1.4 Organizational Arrangement

The Project involves various organizations as illustrated in Figure 1.4.1 below.



Source: JICA Project Team based on the Minutes of Meeting for Amendment of Record of Discussion (R/D)

Figure 1.4.1 Proposed Working Framework for the Project

The Steering Committee (SC) is responsible for decision making on the project operation and output, while the Working Group (WG) takes part in the Project at the working level as project members to examine the technical aspects of the project as well as carry out donor coordination. The main counterpart, the National Directorate of Housing and Urban Planning, functions as the secretariat to the SC and WG.

In order to further strengthen the cooperation and coordination mechanism for smooth and effective implementation of the Project, the WG is proposed in order to form a sector-wise approach as presented in Table 1.4.1. The WG is designated to enhance communication among stakeholders, efficient discussion on planning issues, and information collection and technology transfer to the counterpart personnel and other stakeholders.

Table 1.4.1 Outline of the Working Group

Objectives / Activities	• Creation of ownership for the counterpart personnel • Arranging, analyzing, and sharing the current conditions/issues (urban area, transportation, logistics, infrastructure, socio-economy, and others) • Planning discussions (development vision, frames, spatial structure plan, land use and others) • Coordination with relevant organizations • Technology transfer (through on-the-job training (OJT) and lecture-style)
Membership	Chairperson: Director of National Directorate of Housing and Urban Planning, MPSI Secretariat: Manager of National Directorate of Housing and Urban Planning, MPSI Members: Each director of national directorate in MOPWTC, Ministry of Justice (MOJ), Secretary State for Land and Property, Ministry of Commerce, Industry and Environment (MCIE), Ministry of Tourism, Arts, and Culture (MOT), Ministry of Health (MOH), Ministry of Education (MOE), Ministry of Finance (MOF), other donors and others.
Method	• Continuous activities from the beginning (current condition analysis stage) to the end (planning stage) of the project. • WG meetings are classified into theme: i) land use, ii) institution, iii) socio-economy, iv) road and public transportation, v) infrastructure, and vi) environment.
Roles of the JICA Project Team	• Operational support to the Secretariat • Meeting support for WG: advice on material preparation and others

Source: JICA Project Team

(1) Steering Committee Meeting

Three steering committee meetings have been held since the project started in April 2014.

Table 1.4.2 Record of Steering Committee Meeting

Date	Meeting	Contents of Discussion
June 11, 2014	1st Steering Committee	• The members recognized the importance of the role and functions of the Steering Committee; the importance of consistency with the Spatial Planning Law and National Spatial Plan; and the importance of coordination with the Ministry of Justice which administers land issue and prepares the Land Law. • The Steering Committee approved the inception report and started the implementation of the Project. • The committee also concluded that the GoTL should make an effort to coordinate among concerned organizations in terms of information sharing and participation to the WG meetings for smooth implementation of the Project.
Jan. 20, 2015	2nd Steering Committee	• The members posed issues about environment, sanitation, airport, building controls, and administrative boundaries. • No objections have been made to the draft vision and draft scenario proposed and recommended by the JICA Project Team. However, the chairperson asked the Master Plan Team to hold additional working groups to have further technical discussions on how to reflect the comments and suggestions raised in the 2nd Steering Committee to the following study. • The 3rd Steering Committee Meeting will be held to adopt the development vision and urban structure. The study outputs of land use plan, infrastructure plan, and urban management plan to be compiled in the progress report are to be discussed in the meeting.
Mar. 17, 2016	3rd Steering Committee	• The member posed issues about future land use, future road network, detail zonings, urban environment, industry, budgeting, institutional arrangement. • The Steering Committee Members were requested to deliver additional comments on the Draft Final Report to DNHPU and the JICA Project Team by April 1, 2016. • The chairman of the committee requested DNHPU and the JICA Project Team to examine and respond all comments and questions raised in this meeting, so that they can be reflected in the Final Report.

Source: JICA Project Team

(2) Working Group Meeting

The following six working groups are formed to implement the Project. Twelve counterpart personnel, who were recruited in July 2014, are assigned to each working group. Other concerned

ministries, specified as working group members in the Record of Discussion have also been involved.

Table 1.4.3 Organizations of the Working Group Members

Working Group	Members
WG-1: Land Use	1. Department of Housing and Urban Planning, MPSI 2. Department. of Building, MoPWTC 3. ADN, MPSI 4. Department of Land Property, MOJ 5. Ministry of State Administration (MOSA) 6. Dili Municipality 7. Liquica Municipality 8. Tibar Suco 9. Other suitable members (Parliament Infrastructure Committee, professionals, spatial planning laws team)
WG-2: Institution	1. Department of Housing and Urban Planning, MPSI 2. Department of Building, MoPWTC 3. ADN, MPSI 4. Department of Land Property, MOJ 5. Dili Municipality 6. Liquica Municipality 7. MOSA 8. Tibar Suco
WG-3: Socio-economy	1. Department of Housing and Urban Planning, MPSI 2. ADN, MPSI 3. MPS, MPSI 4. Department of Industry, MCIE 5. Ministry of Tourism, Arts, and Culture 6. Ministry of Education 7. Ministry of Health
WG-4: Road and Public Transportation	1. Department of Housing and Urban Planning, MPSI 2. Department of Roads, Bridges and Flood Control, MoPWTC 3. Department of Land Transportation, MoPWTC 4. ADN, MPSI 5. MPS, MPSI
WG-5: Infrastructure	1. Department of Housing and Urban Planning, MPSI 2. Department of Roads, Bridges and Flood Control, MoPWTC 3. Department of Electricity, MoPWTC 4. Department of Water and Sanitation, MoPWTC 5. ADN, MPSI 6. MPS, MPSI 7. Department of Transportation, MoPWTC 8. Department of Environment, MCIE 9. Ministry of Health
WG-6: Environment	1. Department of Housing and Urban Planning, MPSI 2. Department of Water and Sanitation, MoPWTC 3. Department of Environment, MCIE 4. Ministry of Tourism, Arts, and Culture 5. Ministry of Health

Source: JICA Project Team

The working group meetings for each theme have been held as follows: At least one meeting could be held for each theme.

Table 1.4.4 Record of Working Group Meetings

Date	Working Group	Contents of Discussion	Participants*
May 22, 2014	All Working Groups (WG1-6)	• Introduction to the project, functions of the steering committee and working group. • Explanation of the topics to be discussed in each working group	Department of Housing and Urban Planning, MoPW
July 10, 2014	WG 6 Environment	• Introduction to the Strategic Environmental Assessment (SEA) and public consultation	Department of Housing and Urban Planning, MoPW Department of Building, MoPW Department of Environment, MCIE
July 17, 2014	WG 2 Institution	• Explanation and discussion on relationship among the Dili Urban Master Plan, Spatial Planning Law, and National Spatial Plan; Urban Planning Law in Japan; and capacity development	Department of Housing and Urban Planning, MoPW Administrative Posts Vera Cruz, Bazartete, ADN
August 19, 2014	WG 3 Socio-economy	• Explanation and discussion on socio-economic framework including population and gross domestic product (GDP) scenarios	Department of Housing and Urban Planning, MoPW ADN, MCIE SEAPRI**, SEPFOPE***
August 26, 2014	WG 1 Land Use	• Explanation and discussion on preliminary ideas of vision, options of urban spatial structure	Department of Housing and Urban Planning, MoPW Department. of Building, MoPW ADN Ministry of Agriculture and Fisheries
August 27, 2014	WG 5 Infrastructure	• Explanation and discussion on the findings of urban disaster prevention, water supply and sewerage, solid waste management, power supply, and telecommunication	Department of Housing and Urban Planning, MoPW Department of Road, Bridge, Flood Control, MoPW
September 12, 2014	WG 4 Road and Public Transportation	• Explanation and discussion on the current progress of traffic count survey, schedule of traffic demand analysis, and countermeasures to meet the increasing traffic demand	Department of Housing and Urban Planning, MoPW Department of Road, Bridge, Flood Control, MoPW Department of Transport and Telecommunication, MOTC
December 12, 2014	WG-6 Environment	The following three items were discussed: • Outline of the Spatial Structure Plan Alternatives of the Dili Metropolitan Area (DMA) • Likely Impacts for the Alternatives • Evaluation of the Alternatives	Department of Housing and Urban Planning, MoPW Department of Building, MoPW Department of Environment, MCIE, etc.
December 16, 2014	WG-2 Institution	• Institutional issues, consistency with the spatial planning law and national spatial plan, and land use management were shared. • Considering future implementation of the Dili Urban Master Plan, the establishment of a coordination board and its functions were discussed. • Necessity of land-related legislation was stressed.	Department of Housing and Urban Planning, MoPW Dept. of Building, MoPW ADN
January 28, 2015	WG-4 Road and Public Transportation	• Progress of traffic survey and transportation planning was shared. • Development of parking lots, improvement of one-way road, and improvement of traffic signal system were raised as development issues. • Congested sections were also discussed based on the tentative result of traffic demand analysis.	Department of Housing and Urban Planning, MoPW Department of Road, Bridge, Flood Control, MoPW Department of Transport and Telecommunication, MOTC

February 13, 2015	WG-5 Infrastructure (Disaster Prevention)	• Ideas for constructing disaster risk management system were shared. • Importance of applying traditional warning system such as sign of butterfly outbreak was stressed. • Necessity of establishing disaster management committee in all villages and administrative posts in DMA was also stressed.	Department of Housing and Urban Planning, MoPW Red Cross
February 16, 2015	WG-5 Infrastructure (Solid Waste Management)	• Results of demand and gap analysis, development policy, and development plan were shared. • Importance of improvement of Tibar Dump Site to improve the odor or smoke conditions and avoid health problems of the workers was discussed. • A few WG members suggested to introduce 3Rs (Reduce, Reuse, Recycle) for solid waste management of DMA.	Dili Municipality Department of Housing and Urban Planning, MoPW ADN
February 27, 2015	WG-5 Infrastructure (Water Supply/Sewerage and Drainage)	• Ideas to establish a uniform design standard of sewerage and drainage facilities were discussed. • Necessity to grasp the ground water potential for future water supply projects was also discussed. • Importance of coordinating with the current effort by the government and donor activities were shared.	Department of Housing and Urban Planning, MoPW Department of Road, Bridge and Flood Control, MoPW Department of Water and Sanitation, MoPW ADN
March 2, 2015	WG-5 Infrastructure (Seaport)	• Basic knowledge about ports such as roles and functions of ports, type of ports, and port facilities were introduced by the JICA Project Team expert. • Ideas to develop Dili Port after moving its logistic function to Tibar were discussed. • Ideas on the Waterfront Development of Coastal Area were also discussed.	APORTIL Department of Housing and Urban Planning, MPSI
March 6, 2015	WG-1 Land Use &WG-2 Institution	• Draft future land use plan was shared. • Coordination of land use plan with the Land Law to be enacted was raised as a planning issue. • Necessity of mixed land use for limited land area of DMA was shared.	APORTIL Department of Land and Properties, – Minister of Justice Department of Basic Education, Ministry of Education Department of Protection Recovery and Biodiversity, MCIE Dili Municipality Department of Housing and Urban Planning, MPSI
August 31, 2015	WG-1 Land Use	• Draft future land use plan was shared. • Coordination of land use plan with the Land Law to be enacted was raised as a planning issue. • Necessity of mixed land use for limited land area of DMA was shared.	Dili Municipality Department of Road, Bridge and Flood Control, MoPW Department of Forest Conservation, Min. of Agriculture Department of Basic Education, Ministry of Education Department of Protection Recovery and Biodiversity, MCIE Department of Housing and Urban Planning, MPSI

Note: * Names of previous organizations are shown in the meetings before February 2015.
** Secretariat of State for Support and Promotion of Private Sector (SEAPRI)
*** Secretariat of State for Vocational Training and Employment (SEPFOPE)

Source: JICA Project Team

1.5 Composition of the Final Report

The final report consists of three volumes. Dividing the final report into three volumes is very helpful for the readers to easily refer to the overall outputs of the project.

- Volume I: Current Conditions
- Volume II: The Master Plan
- Volume III: Appendix

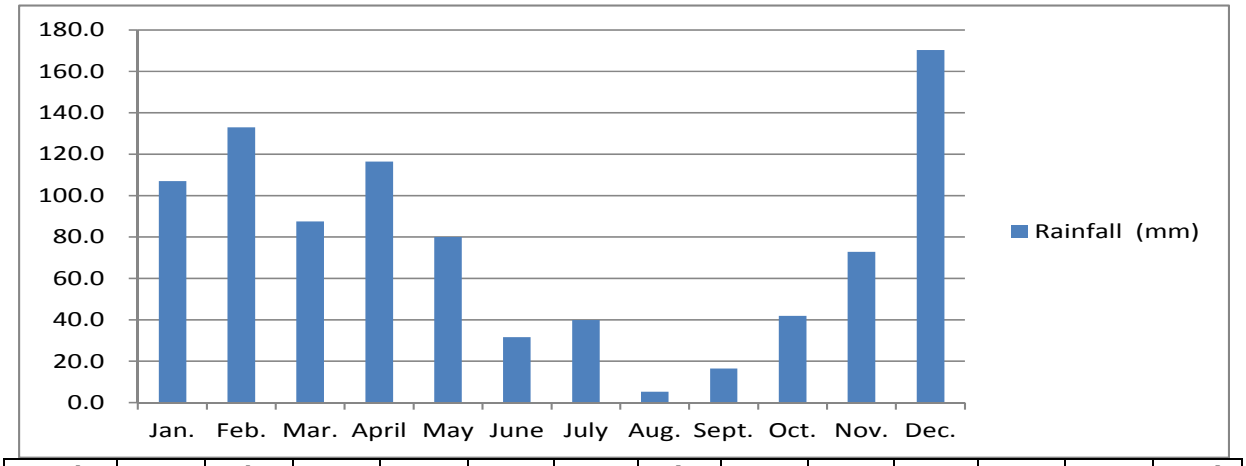
Volume I contains the current setting of the project area, urban conditions, conditions of infrastructure, urban management conditions, development and planning issues. Volume II covers the master plan such as development vision, structure plan, development roadmap, urban land use plan, infrastructure plan, urban development management, action plan, environmental and social considerations, and conclusion and recommendation. Volume III is compiled as appendix including supporting data and information such as socio-economy, land use analysis, traffic survey results, and priority project sheets.

CHAPTER 2 : CURRENT SETTING OF PROJECT AREA

2.1 Natural Conditions

2.1.1 Meteo-hydrology

Dili has a tropical climate. It has two seasons, i.e., rainy season and dry season. According to the current rainfall data at the Dili Airport, the rainy season lasts from November to April and the dry season is the remaining months of the year from May to October. Mean monthly rainfall is about 114.5 mm in the rainy season and about 35.9 mm in the dry season. Average annual rainfall amount is 902 mm from 2005 to 2013, but the annual rainfall amount varies yearly from 481.2 mm (in 2006) to 1,716.4 mm (in 2010).

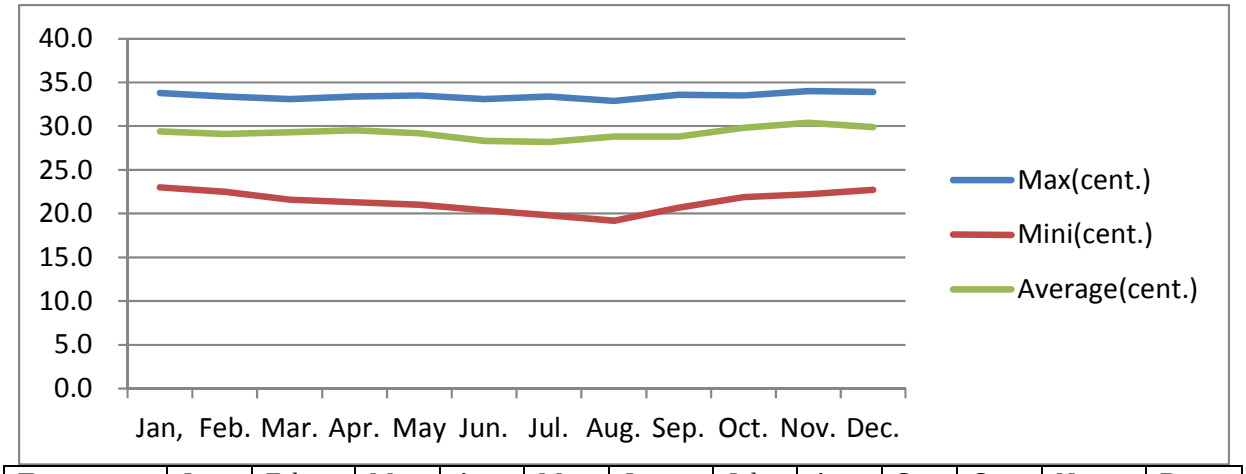


Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Rainfall	107.0	133.0	87.5	116.4	80.0	31.6	39.9	5.3	16.4	41.9	72.8	170.0	902.0

Source: JICA Project Team based on the National Directorate of Meteorology and Geophysics, Ministry of Transport and Communication (MOTC)

Figure 2.1.1 Average Monthly Rainfall Amount from 2005 to 2013

Mean monthly temperatures are approximately 28-30 ˚C, however, daily diurnal range of temperature increases from 10.8˚C to 13.8˚C. The daily diurnal range is higher in the dry season than in the rainy season.

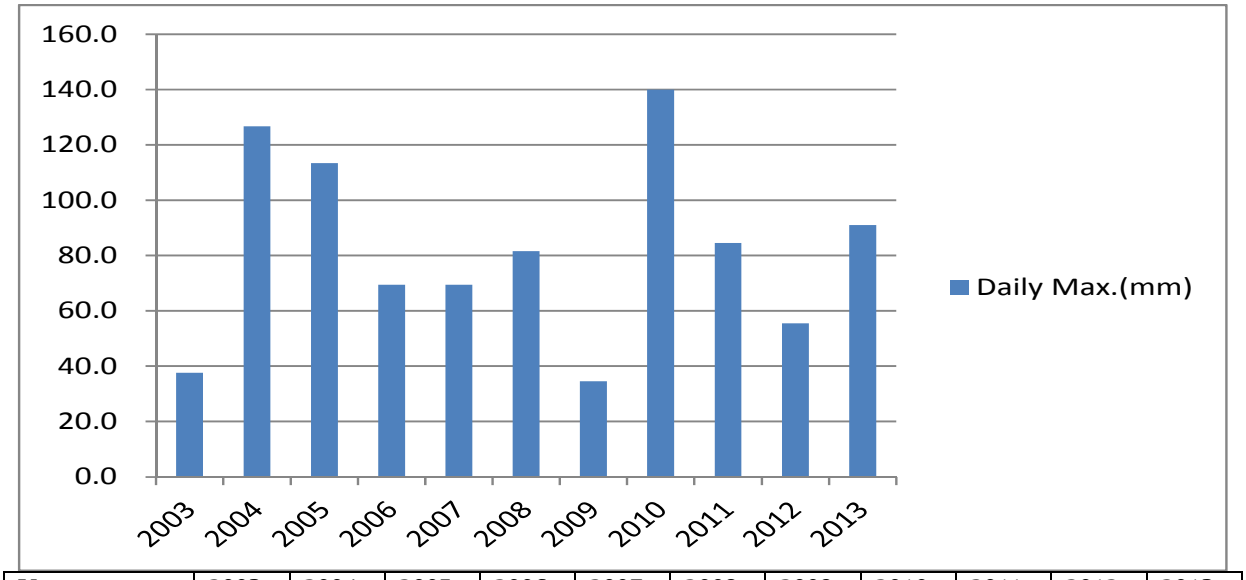


Temperature	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Maximum	33.8	33.4	33.1	33.4	33.5	33.1	33.4	32.9	33.6	33.5	34.0	33.9
Minimum	23.0	22.5	21.6	21.3	21.0	20.4	19.8	19.2	20.7	21.9	22.2	22.7
Average	29.4	29.1	29.3	29.5	29.2	28.3	28.2	28.8	28.9	29.8	30.4	29.9
Range	10.8	10.9	11.9	12.1	12.5	12.7	13.6	13.7	12.9	11.6	11.8	11.2

Source: JICA Project Team based on the National Directorate of Meteorology and Geophysics, MOTC

Figure 2.1.2 Monthly Maximum, Minimum, and Average Temperature

Daily maximum rainfall data varied from 34.6 mm/day (in 2009) to 140.0 mm/day (in 2010) according to the rainfall data from 2003 to 2013 at the Dili Airport Meteorological Station.



Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Daily Max.	37.6	126.7	113.4	69.4	69.4	81.6	34.6	140.0	84.6	55.5	91.0

Source: JICA Project Team based on the National Directorate Meteorology and Geophysics, MOTC

Figure 2.1.3 Daily Maximum Rainfall Amount (mm)

2.1.2 Landform

The project area is located along the northern coast of Timor Island and urban areas are developed on relatively flat land of 0.0–15 degree slope, having steep mountains in the rear. The project area is approximately 25 km long (east-west) and 7 km wide (north-south), but the flat area is approximately 53 km², and grading from the coast.

The river catchment and drainage basin outside the urban area is very steep, rising to around 800-900 m above mean sea level and about 9 km inland.

2.1.3 River System and Discharge Capacity

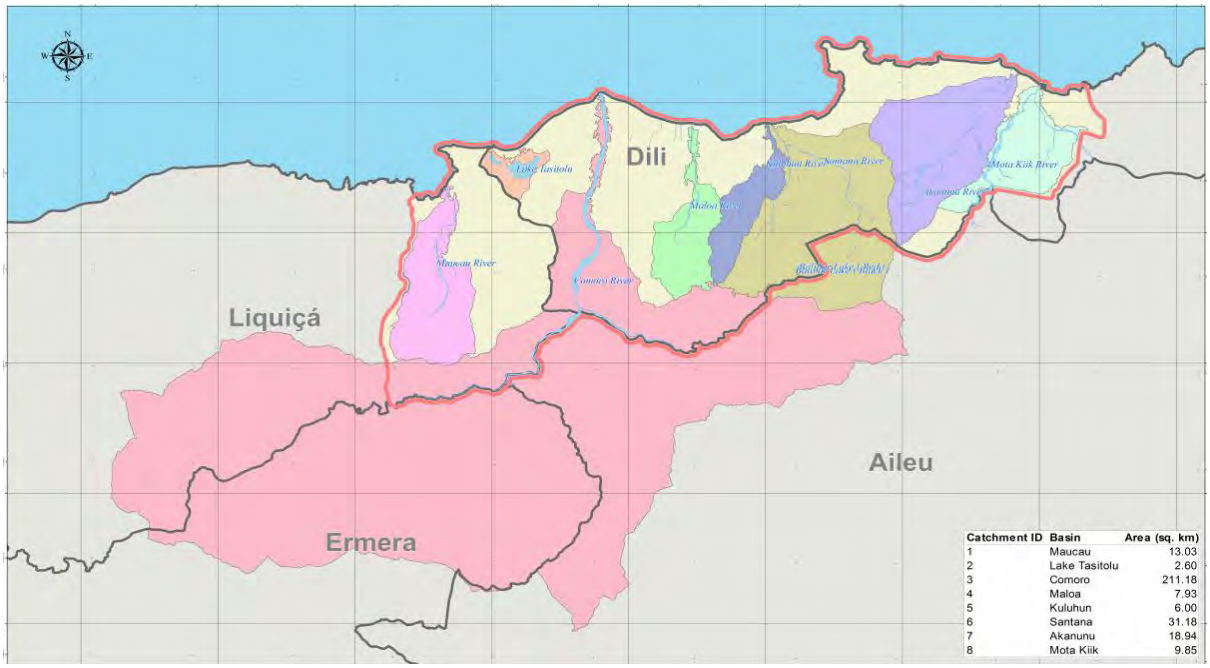
Four major rivers that flow through the city of Dili and discharge into the coastline, namely: the Comoro, Maloa, Kuluhum, and Santana rivers, of which two tributaries are the Beccora and Bemori rivers, are shown in Figure 2.1.4. Tibar is located in the Maucau River basin and Hera is located in two river basins, namely: the Akanunu River and the Mota Kiik River. Among them, the largest river is the Comoro River with a catchment area of about 211.2 km² as shown in Table 2.1.1

Table 2.1.1 River and Catchment (Unit: km²)

Area	Tibar	Dili				Hera	
River	Maucau	Comoro	Maloa	Kuluhum	Santana	Akanunu	Mota Kiik
Catchment	13.0	211.2	7.9	6.0	31.2	18.9	9.9

Source: JICA Project Team based on the National Directorate Meteorology and Geophysics, MOTC

The river channels in Dili have been improved and provided with revetments or river bank protection. These projects were implemented by the Government of Indonesia before independence and the Democratic Republic of Timor-Leste after independence. They are assessed to have a capacity to convey flood waters over a 25-year flood (*SKM October 2012*). As for Tibar and Hera, the rivers are not yet improved except some revetment works along the major roads to prevent lateral erosion caused by the rivers.



Source: JICA Project Team

Figure 2.1.4 River Basin Map

2.1.4 Natural Disaster

Timor-Leste is faced with a combination of heavy tropical monsoon rain/high winds, steep topography, prevalent deforestation, and earthquake risks making it prone to floods, landslides, erosion, drought, earthquakes, and tsunamis.

As for floods in the Dili urban area, it is said that currently, flood disaster risks have decreased because flood prevention measures were implemented for the major rivers since 1990. However, there are still remaining wide flood-prone areas to be protected along the major rivers. Also, it is observed that uncontrolled sand and gravel extraction activities are likely affecting river structures such as revetments, river walls and levees, and becoming causes of floods. Any large-scale landslides and sediment disasters have not been recorded in the urban area yet, but the area has a high possibility of disaster risks, and conservation measures will be required in the river basins. In the Hera and Tibar areas, it is reported that these are frequently suffering from riverine floods and it is suggested that flood and sediment disaster prevention plans in the areas are required before development.

Also, any large-scale earthquake hazards and associated tsunami disasters have not occurred, but the northern and southern coasts of Timor-Leste are considered to be high risk areas for earthquake hazards and associated tsunamis due to its proximity to an active subduction zone, where the Australian Continental Plate submerges under the Eurasian Plate (the Timor trough). The hazard maps prepared by the NDMD indicate that earthquake hazard level of Modified Mercalli Intensity (MMI) ranges between MMI VI (strong) and MMI VII (very strong) and tsunami height of 3~4 meters.

Urban areas are unprepared for possible disasters. This specifically posed a concern with regard to lack of earthquake resistant structures in Dili or the district capitals. A major earthquake or tsunami can cause substantial damages to lives and buildings in Timor-Leste as well as injury and fatality to residents who are not prepared.

2.2 Population and Demography

2.2.1 Overview of Current Population

Timor-Leste, with a population of some 1 million people all over the country, has nearly identical proportion of male/female structured at 51%-49%. In the 2004 census, 26% of the national population was accounted for as urban population, which has grown rapidly reaching 30% in six years in 2010.

Table 2.2.1 Urban/Rural Population Trend of Timor-Leste

Item	2004	%	2010	%
Urban	241,332	26%	316,086	30%
Rural	681,866	74%	750,323	70%
Total (Timor-Leste)	923,198	100%	1,066,409	100%

Source: Timor-Leste 2010 Population and Housing Census at Glance

Dili is the capital city of Timor-Leste and comprises six administrative posts, 31 *sucos* and 241 *aldeias*. As shown in the table below, Dili Municipality accommodates a population of 234,026 (2010 Census) with an annual population growth rate at 4.77%, which is far above the national average growth rate (2.4%) during 2004-2010. The urban population is expected to share 30% of the national population in 2020.

Table 2.2.2 Review of Two Consecutive Population Censuses

Region	2004		2010		Annual Avg. Growth Rate (2004-2010)
Timor-Leste	923,198	Share	1,066,409	Share	2.40%
Dili Municipality	175,730	19%	234,026	22%	4.77%

Source: Highlights of the 2010 Census Main Results in Timor-Leste

During the inter-censual period of six years, the population of Dili Municipality increased by 58,296. Census Result 2010 (Vol. 7: Analytical Report on Migration and Urbanization) reports that this increase is due to high fertility rate of more than 4.5 per woman (national level was more than 5.9 in 2010, 6.5 in 2004.) Population Census 2010 notes that the national population will substantially increase even if the fertility rate exhibits moderate or rapid decline onwards, because of the past and recent high level of fertility rate. On the other hand, a small but clear sign is observed for urban population concentration in Dili Municipality, as urban population share of Dili Municipality has increased from 72.8% in 2004 to 74.0 % in 2010.

High internal in-migration to Dili from other municipalities is another key factor of rapid population growth in the project area. In fact, it is estimated that 36% or approximately 85,000 of net migration shares Dili's population and 42% of incremental population of Dili Municipality is due to the internal in-migration for the period of 2004-2010 (Table 2.2.3).

Table 2.2.3 Review of Internal Migration Trend over the Two Consecutive Population Censuses

Items	2004	2010	Annual Avg. Growth Rate	Incremental Population
Census Population	175,730	234,026	4.77%	58,296
In-migration	68,887	94,349	5.24%	25,462
Out-migration	8,389	9,155	1.46%	766
Net Migration (In-out Migration)	60,498	85,194	5.71%	24,696
Net Migration / Census Population (%)	34.4%	36.4%	-	42.4%

Source: Timor-Leste 2010 Population and Housing Census Vol. 7-Analytical Report on Migration and Urbanization

The table below presents population, land area, population density, and average household size by administrative post (*suco* for Liquisa Municipality) of the project area. Dom Aleixo accommodates the largest population, followed by the Cristo Rei administrative post. Average household size in the project area is estimated at 6.7 persons per household.

Table 2.2.4 Outline of the Current Population by Administrative Posts in the Project Area

Municipality	Sub-district/ Suco	Population 2010	Land Area (ha)	Population Density (Person/ha)	No. of Household	Avg. Household Size
Dili	Vera Cruz	34,015	3,280	10.4	5,318	6.4
Dili	Nain Feto	26,592	520	51.1	4,015	6.6
Dili	Dom Aleixo	105,154	3,310	31.8	15,896	6.6
Dili	Cristo Rei	54,936	6,530	8.4	7,505	7.3
Liquica	Tibar (Suco)	3,096	4,220	0.7	429	7.2
Project Area (Est.)		**223,793**	17,862	12.5	33,163	6.7

Source: Highlights of the 2010 Census Main Results in Timor-Leste and Timor-Leste 2010 Population and Housing Census Vol. 4 - Suco Report

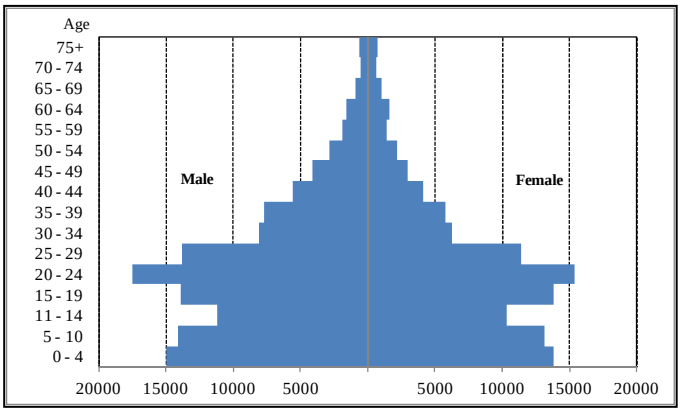
2.2.2 Overview of Current Demographic Conditions

Table 2.2.5 presents the summary of age and gender structure of the project area in 2010. Overall male population is slightly greater than female, while the age group of 15-64, which is the potential working group, is predominant in the age structure of the project area. Figure 2.2.1 identifies that young population under age 29 is prominent in the project area.

Table 2.2.5 Outline of the Age and Gender Structures of the Project Area

Age Group	0-14 (35%)	15-64 (63%)	65+ (2%)	Project Area
Project Area	77,515	141,903	4,375	223,793
Male (53%)	40,234	76,958	2,074	119,266
Female (47%)	37,281	64,945	2,301	104,527

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



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

Figure 2.2.1 Population Pyramid of the Project Area in 2010

2.3 Socio-economy and Industry

(1) Level of Education and Literacy

As of 2010, national education level has fallen to a low record in which 34% of those aged above 6 years old has never attended school. Due to the historical conflict era, the rate of no schooling for older population was higher in general. However, recent attendance rate of primary school for the children has significantly improved from 37% in 2004 to 73% in 2010. As such, when the younger generation becomes predominant in the overall population, national education level will substantially be improved for the next decades.

For Dili Municipality, whereby the project area, school attendance rate is much higher than the national level. Table 2.3.1 presents the school attendance situation in the project area for the population aged above five years. Eighty-six percent of the population aged above five years old has attended at least primary school, while 14% of the population has still not attended any school. It should be noted that Suco Tibar, which is less populated area compared with other areas, represents relatively low attendance rate with a high rate of children who never attended school.

Table 2.3.1 Population Five Years of Age and Above by School Attendance in 2010

	(1) Population > 5 yr Age	(2) At School	(3) Left School	(2+3)/(1)	(4) Never Attended School	(4)/(1)	Don't Know
Dili Municipality	198,614	84,530	83,825	85%	29,253	15%	1,006
Project Area	**189,679**	**80,955**	**81,235**	**86%**	**26,544**	**14%**	**945**
Vera Cruz	28,883	12,016	13,364	88%	3,370	12%	133
Nain Feto	22,494	9,269	10,509	88%	2,616	12%	100
Dom Aleixo	89,658	39,159	38,840	87%	11,171	12%	488
Cristo Rei	46,090	19,544	17,579	81%	8,747	19%	220
Tibar - Liquisa Municipality	2,554	967	943	75%	640	25%	4

Source: Timor-Leste 2010 Population and Housing Census Volume 4 - Suco Report

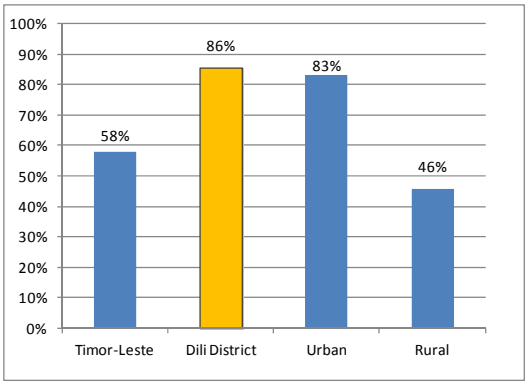
Table 2.3.2 presents the number of students by level of education. It indicates that Dili Municipality accommodates most of the university students, which accounted for 76% of the national total number of university students. This implies that Timorese most likely need to move to Dili to seek for higher or post-secondary education. In fact, Migration Monograph of Census 2010 has revealed that education purpose is one of the most important reasons for migration to Dili.

Table 2.3.2 Total Number of Students by Level of Education in Timor-Leste and Dili Municipality 2010

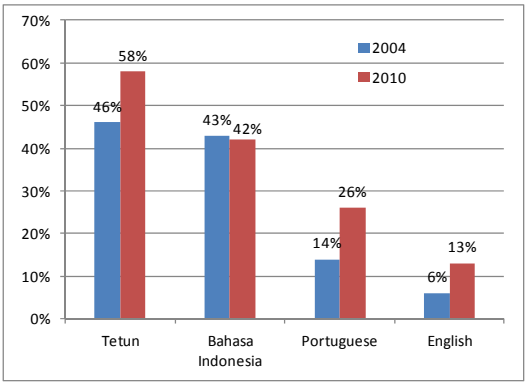
Level of School	Timor-Leste			Dili Municipality			
	Male	Female	Total	Male	Female	Total	Share to National Total
Pre-primary (age 5)	7,902	7,718	15,620	2,046	2,084	4,130	26%
Primary (age 6-11)	102,549	93,303	195,852	18,731	16,928	35,659	18%
Pre-secondary (age 12-14)	30,487	28,865	59,352	7,895	7,464	15,359	26%
Secondary (age 15-17)	25,411	23,164	48,575	10,958	9,962	20,920	43%
Polytechnic/Diploma (age 18>)	1,094	759	1,853	297	270	567	31%
University (age 18>)	9,325	6,573	**15,898**	6,878	5,176	**12,054**	**76%**
Non Formal	3,193	2,844	6,037	824	660	1,484	25%
Total	179,961	163,226	343,187	47,629	42,544	90,173	26%

Source: Timor-Leste 2010 Population and Housing Census Volume 9 - Analytical Report on Education

Figure 2.3.1 illustrates the literacy rate by region and language. Dili Municipality provides the highest literacy rate at 86%, while it is much lower at 46% for the rural area, which dominates 70% of the national population. Thus, the national average is substantially lowered at 58%.



Literacy Rate by Region (any language)



Literacy Rate by Language (2004 vs. 2010)

Source: Timor-Leste 2010 Population and Housing Census Volume 9 - Analytical Report on Education

Figure 2.3.1 Literacy Rate by the Region and Language 2010

One of the unique social characteristics of Timorese is having four languages. According to the figure, literacy rates of Tetun, mother tongue, Portuguese, and English have substantially improved during the inter-censual period. It is very much likely that literacy rates will continue to increase as the government invests more on education and the youth generation grows.

(2) Labor Force and Employment

Potential working population (age 15-64) has substantially grown almost 1.5 times since 2004 (Table 2.3.3). Overall unemployment rate in Dili Municipality has declined from 26.9% to 17.4% in 2010, while the labor force participation rate has also declined. This result implies that the economically inactive population such as housewives and students has grown more rapidly than the economically active population. Table 2.3.4 indicates that unemployment rate for the age under 30 in Dili Municipality has recorded remarkably higher than that of the national level. This implies that a substantial number of youth has entered into the labor market in Dili. Due to the great potential number of youth population, it is apparent that the working population will substantially increase for at least the next 15 years. Therefore, more job creation in Dili is an urgent issue to be concerned with in order to absorb such increasing number of working population.

Table 2.3.3 Labor Force Trend of Dili Municipality in 2004 and 2010

Year	(1) Population of Age 15-64	Economically Active			(5) Economically Inactive	Labor Force Participation Rate (2)/(1)	Unemployment Rate (3)/(4)/
		(2) Employed	(3) Unemployed	(4) Subtotal			
2004	106,446	42,179	15,559	57,738	48,708	54.2%	26.9%
2010	147,490	58,867	12,359	71,226	76,264	48.3%	17.4%

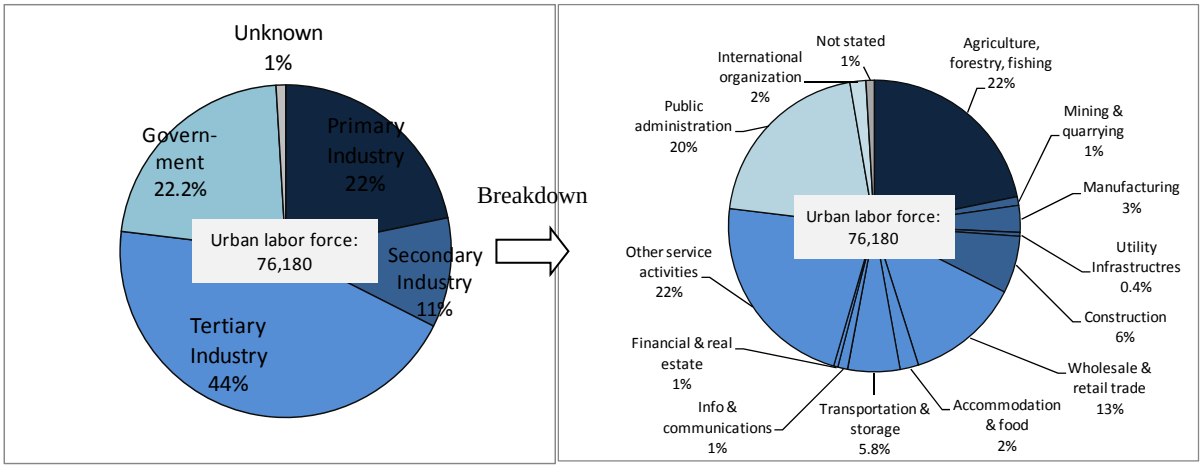
Source: Timor-Leste 2010 Population and Housing Census Volume 12 - Analytical Report on Labor Force, and Priority Tables for Dili District 2004.

Table 2.3.4 Unemployment Rates by Age and Region in 2010

Age Group	Timor-Leste (%)	Urban (%)	Rural (%)	Dili Municipality (%)
15-24	23.9	34.4	19.1	**34.6**
15-29	19.3	27.1	15.3	**26.8**
15-59	10.4	16.9	7.4	17.5
15-64	9.8	16.7	6.9	17.4

Source: Timor-Leste 2010 Population and Housing Census Volume 12 - Analytical Report on Labor Force

Figure 2.3.2 illustrates the type of industries where the urban labor forces work. Since the same data for Dili Municipality is not available in the Census 2010, the urban data is used as proxy for Dili Municipality.

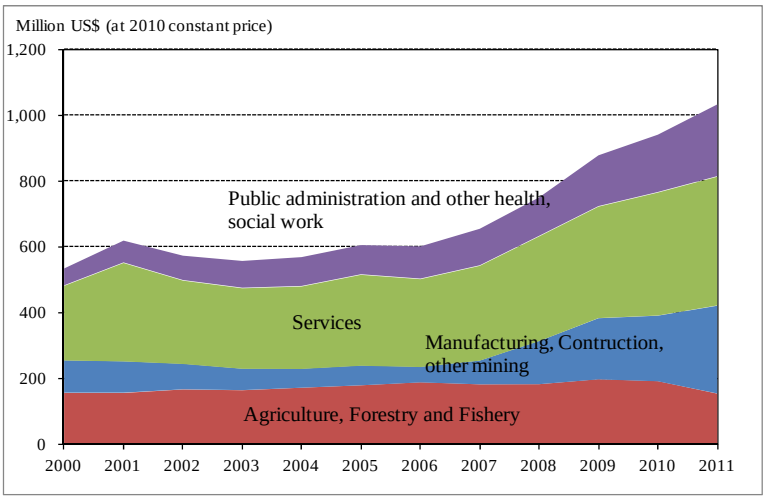


Source: Timor-Leste 2010 Population and Housing Census Vol. 12 - Analytical Report on Labor Force

Figure 2.3.2 Labor Force Distribution by Industry in 2010 (Urban)

Primary industry including agriculture, forestry and fishery is still the major sector of employment even in the urban area. However, it is slightly smaller than government employment. The largest labor force absorbing industry is the tertiary industry at 44% including various service industries such as wholesale, retailer, hotel, restaurant, and transportation. Service industry and government employment dominate more than 65% of labor distribution, while secondary industry represented by manufacturing and construction provides minimal shares of labor distribution.

(3) Industry



Source: Timor-Leste's National Accounts 2000-2011, Statistics and Analysis, May 2013

Figure 2.3.3 Trend of Sectoral GDP in Timor-Leste

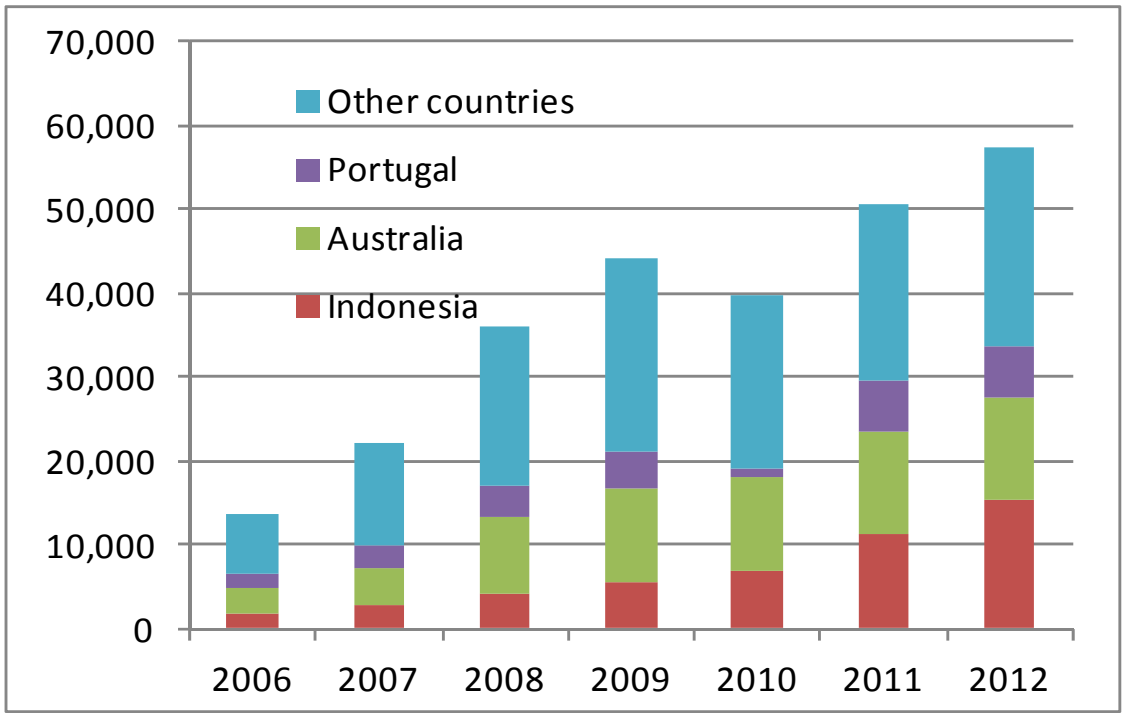
Figure 2.3.3 presents the gross domestic product (GDP) growth trend by major industries, excluding the oil sector. GDP in Timor-Leste recorded approximately USD 1 billion in 2011 (2010 constant price), performing at an average growth rate of 12.1% in the last five years.

Although agriculture, forestry, and fishery is the predominant industry employing the largest share (67%) of the national labor force, its GDP share has remained very small. In particular for Dili Municipality, there are some croplands lying in Metinaro administrative post, which is outside of the project area. In 2011, food crop (paddy and maize) production in Dili Municipality has a minimal share of only 0.5% of the national production. Therefore, the project area can be characterized as the largest food consumption center rather than production.

Secondary industry such as manufacturing, construction, and the mining industry has been growing rapidly in the last five years. Major growth contribution comes from construction subsector supported by the increasing government infrastructure investment. Manufacturing subsector has remained only at 3.6% share to the GDP in 2011. According to the "Data Collection Survey on Industrial Development for the Republic of Timor-Leste" conducted by JICA in 2014, however, there are growing small-scale manufacturing industries such as cannery and mineral water bottlers. The business model of mineral water bottling is quite similar to export processing in which raw materials (pet bottle) are imported, bottled domestically, and its partial amount of products are exported to Singapore. Thus, there is little but a certain sign of a growing manufacturing industry.

In contrast to the primary industry as the largest labor force absorber at the national level, service industry is considered as the biggest employer in the urban area or in Dili Municipality. In terms of the GDP share, the service industry has been the greatest contributor. Service industry includes hotel, restaurant, wholesaler, retailer, storage/trader, transportation, finance/insurance, real estate, information, communication and technology (ICT), and other various service activities.

Especially, since tourism is a multiplication of these service activities and rich tourism resources are embedded in Dili Municipality and Timor-Leste, the tourism development potential is very high. In fact, Atauro Island, where tourist infrastructures are underdeveloped, has attractive diving spots and undeveloped natural and tourism resources. Figure 2.3.4 presents the past trend of foreign visits to Dili Airport.



Source: Timor-Leste in Figures 2008 and Timor-Leste in Number 2012

Figure 2.3.4 Trend of Foreign Passengers Arrival at Dili Airport 2006-2012

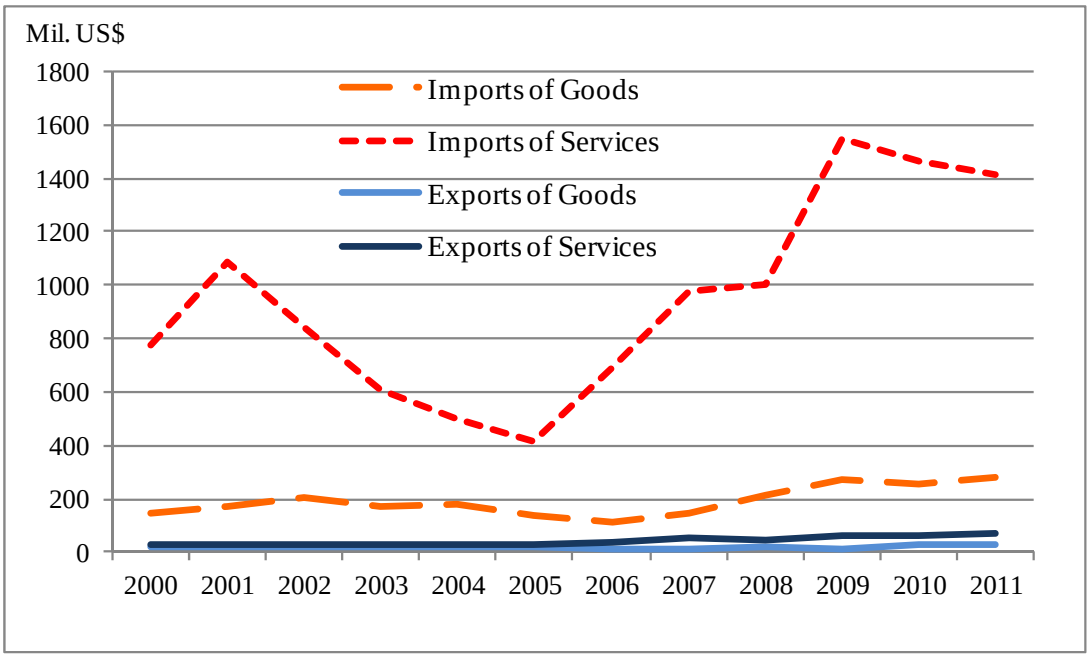
Consequently, top countries of origin are Indonesia, Australia, and Portugal, dominating 50% of all foreigners. It is presumed that foreign visits such as tourism, business, conference, and foreign assistance are major sources of foreign exchange earnings in Timor-Leste.

(4) International and Regional Trade

Timor-Leste is exclusively dependent on import for goods and services as shown in Figure 2.3.5. Dili Metropolitan Area (DMA) as a gateway plays a key role in external and internal trading.

The top export product of Timor-Leste is coffee, followed by wood/wood products. Major destinations of coffee exports are the United States of America (U.S.A), Germany, Japan, South Korea, and Indonesia.

Imported goods include daily consumables, packaged foodstuff, grains, bottled drinks, alcohol, footwear, and garments sold at the retail shops or supermarket, as well as machinery, electrical equipment, vehicle, spare parts, construction materials, and metal/glass/plastic products. Table 2.3.5 summarizes the consequent top ten import partners and corresponding goods in the last five years during 2008-2012.



Source: Timor-Leste's National Accounts 2000-2011, Statistics and Analysis, May 2013

Figure 2.3.5 Trend of International Trade 2000-2011

Table 2.3.5 Top Import Partners and Major Goods

Ranking	Country	Major Import Goods
1.	Indonesia	Diesel, motorcycle, cigarette, cement, antibiotic, dry noodles, data processing machine, crude palm oil, base metal for building, aerial parts
2.	Singapore	Diesel, vehicle and its parts, broken rice, jet fuel, medical/science equipment, data processing machine, aerial parts
3.	Australia	Vehicle and its parts, jet fuel, data processing machine, tractor
4.	China	Carrier current apparatus, cement, base metal for building, aerial parts, tractor, prefabricated buildings
5.	Vietnam	Husk rice, broken rice
6.	Japan	Vehicle and its parts, base metal for building
7.	Portugal	Data processing machine, aerial parts, base metal for building
8.	India	Antibiotic, tractor
9.	Malaysia	Diesel, cement, crude palm oil
10.	Thailand	Vehicle, husk rice

Source: External Trade Statistics: Annual Reports 2009-2012

Thus, DMA is positioned as a gateway city in international trade, whereas it is also a key function in regional trade with Timorese enclave territory, Oecusse Municipality and Atauro Island.

Regular ferry is scheduled to Atauro Island on a daily basis and readily utilized by residents in Atauro and DMA. The ferry carries not only passengers but also vehicles or motorcycles accompanied with cereals, livestock, vegetables, and consumer goods from DMA for daily consumption and retail sales in the local market. Similarly, the same ferry is weekly connecting Dili Port with Oecusse Municipality where the new seaport has been developed recently by Japanese assistance. Due to its geographic location, trading goods and services is dependent on West Timor, Indonesia, whereas Oecusse's local economy is centered on subsistence farming of paddy and maize with cattle rearing. Oecusse as enclave territory is treated by special administrative and economic arrangement under the Constitution. Therefore, the government is inclined to provide sustainable support to the enclave.

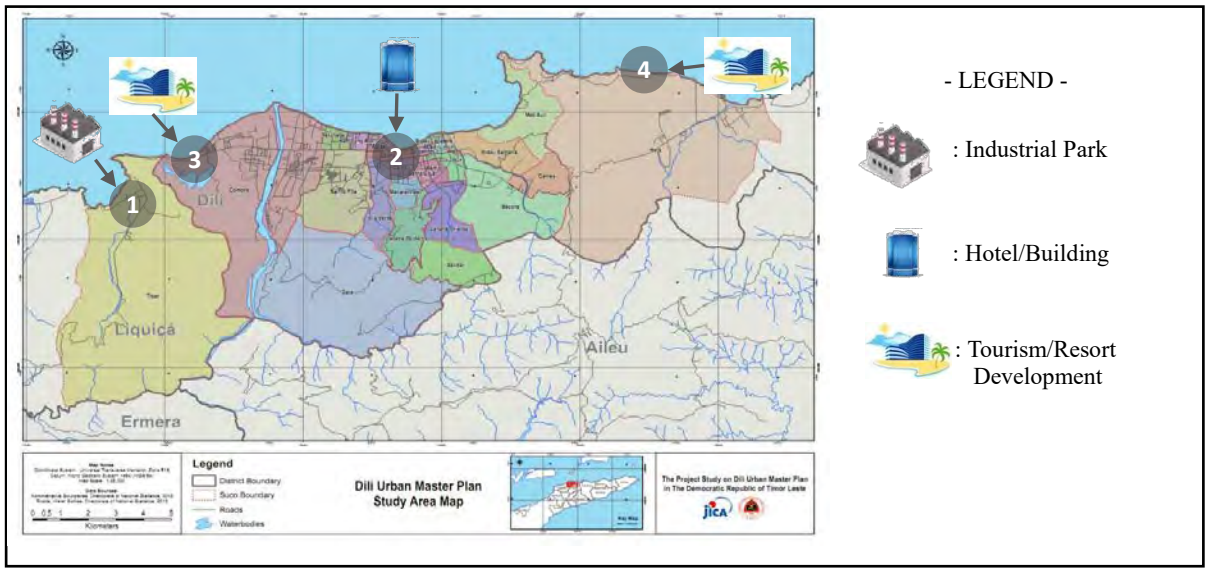
(5) Major Plans Related to Industrial Development

The following table summarizes the identified major plans related to industrial development. Target areas of the plans are located not only in DMA but also in other areas of the country.

Table 2.3.6 Major Industrial Development Plans in and around DMA

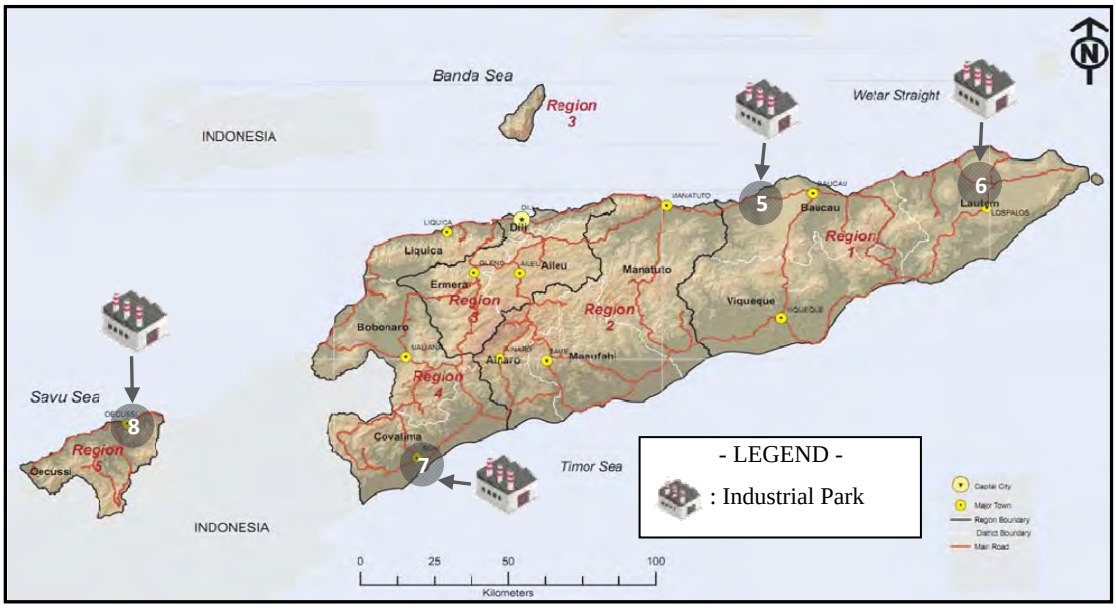
No.	Type	Location	Description
1	Industrial Park	Liquica Municipality (Tibar)	It is under the planning process for locating about 60 ha of land in Tibar area. Around 50 ha of industrial estate was initially planned to be established in Hera. However, the plan was cancelled by the Prime Minister's decision that a similar scale of industrial estate should be developed in proximity to the new Tibar Port in Liquisa Municipality. Alternatively, a vocational training center is planned to be established in some 7 ha of government land in Tibar.
2	Hotel / Building	Downtown Dili	An Indonesian investor will construct the Artha Graha Peduli (AGP) Square comprising a 26-story building. The construction commenced in 2013 and is now ongoing as appointed by the Indonesian state-owned enterprise, PT. Pembangunan Perumahan (Housing Construction).
3	Tourism / Resort Development	Dili Municipality (Comoro)	It is a 580-ha five-star hotel resort development in Tibar-Taci Tolu area by a Malaysian developer. It will create 1,500 employment and more with multiplier effects on subsidiary service industries.
4	Tourism / Resort Development	Dili Municipality (Cristo Rei)	Tourist resort development in the east of Cristo Rei includes a five-star hotel beach resort by the owner of Timor Plaza. Around 10,000 job employment is expected.
5	Industrial Park	Baucau Municipality	Industrial estate of 59 ha in Cavabela is planned. It seems that a contractor is already procured for land reclamation for the proposed site. However, the type of industries to be established has not yet been determined.
6	Industrial Park	Lautem Municipality	Industrial estate of 50 ha in Lacal is planned. It seems that a contractor is already procured for land reclamation for the proposed site. However, the type of industries to be established is not yet determined.
7	Industrial Park	Covalima Municipality	It is still on conceptual stage for locating 50 ha of land in Suai. There has been no concrete plan yet.
8	Industrial Park	Oecusse Municipality	The Special Zones of Social Market Economy (ZEESM) in Oecusse is led by the former prime minister, Dr. Alkatiri in Oecusse Municipality. It is a pilot project for comprehensive development for the enclave including the development of airport, port, power station, water and sanitation facilities, road network, hospitals, schools, culture center, industrial estate, hotels, commercial and housing area. It is planned to serve 30,000 population.

Source: JICA Project Team based on the hearing with MCIE, MOT and Former Prime Minister Office



Source: JICA Project Team based on hearing with MCIE, MOT

Figure 2.3.6 Location Map of Major Industrial Development Plans (DMA)



Source: JICA Project Team based on hearing with MCIE and Former Prime Minister Office

Figure 2.3.7 Location Map of Major Industrial Development Plans (Nationwide)

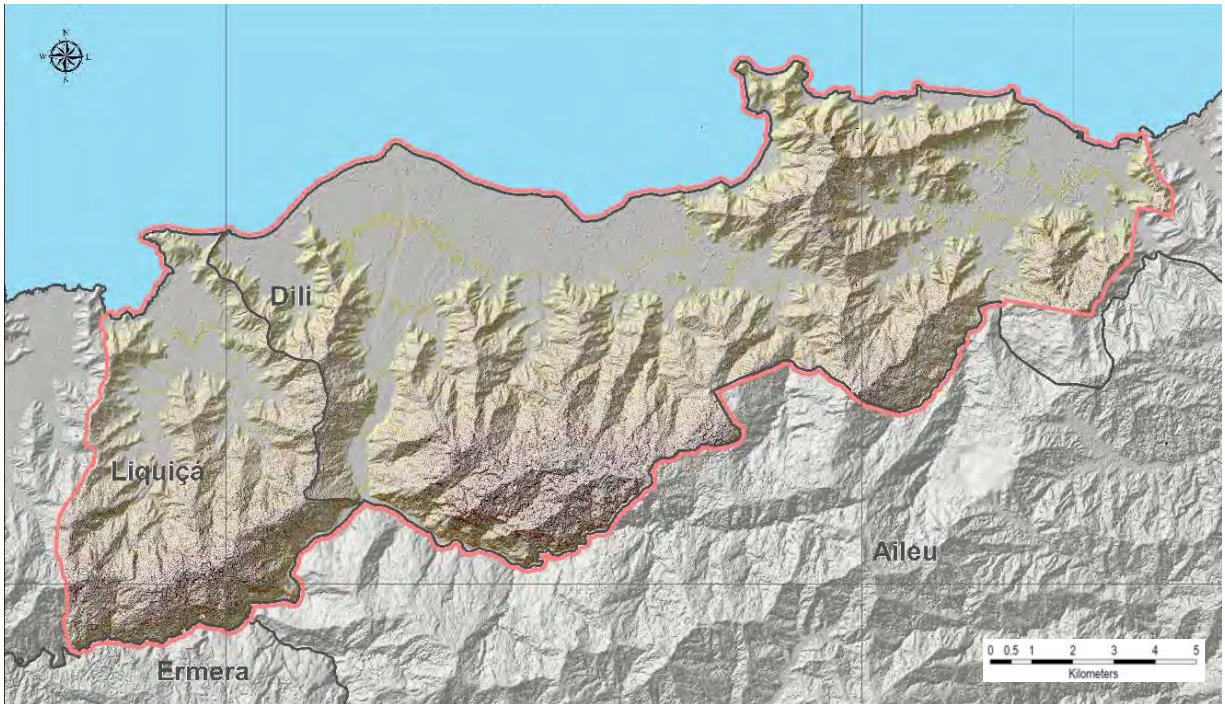
2.4 Current Social and Environmental Status

2.4.1 Natural Environment

(1) Geography and Topography

The DMA is located on the northwest coast, which faces the Ombai Strait, and is enclosed by mountains on the south side. The mountains have steep slopes with ascent of over 20 degrees from the foot of the mountains adjacent to the urbanized area. The DMA has limited flatland, as it is about 4 kilometers even in the longest distance from the coast to the foot of the mountains. Furthermore, DMA is divided into three areas, i.e., Tibar, Dili, and Hera from the west by ridges reaching the coast.

Geological condition of Timor-Leste is mostly derived from limestone and metamorphosed marine clays. Rocky hills of elevated coral reef spreads on the northern coastal area. The rocky hills consist of schist, meta-gabbro, dolerite, and/or gneiss on the northern coast. The rocky slopes are covered by thin topsoil of regolith and the topsoil on the steep slopes is very susceptible to erosion.



Source: JICA Project Team

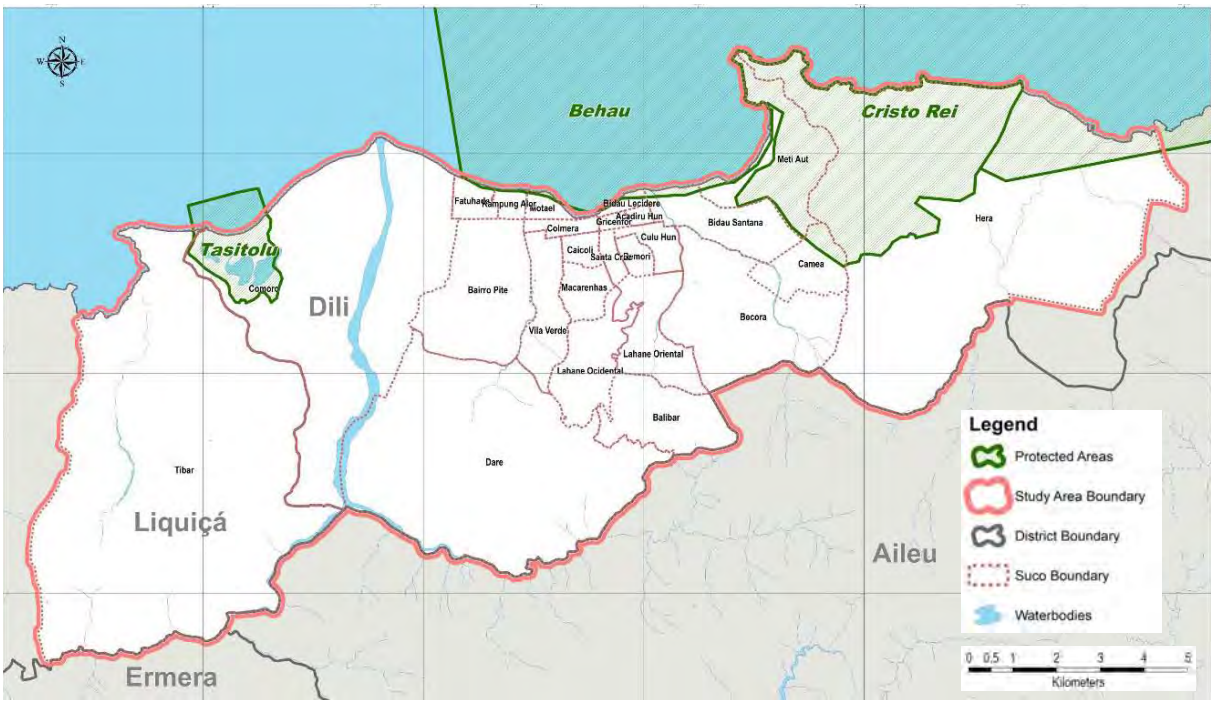
Figure 2.4.1 Topographic Features of the DMA

(2) Flora, Fauna, and Biodiversity

1) Protected Areas

The protected areas of Timor-Leste are managed by the Department of Protected Areas and National Parks (DPANP) of the National Directorate of Forestry and Nature Conservation (NDFNC) in the Ministry of Agriculture and Fisheries. Fifteen protected areas were designated in the UNTAET Regulation No. 19/2000 on Protected Places in 2000. The DPANP identified the other 17 protected areas in 2007, and three of these protected areas which are designated in the UNTAET Regulation No. 19 were combined and named as the Nino Konis Santana National Park located at the eastern boundary of Timor-Leste. This resulted to a list of 30 protected areas and three of them, namely: Cristo Rei Protected Area, Tasitolu and Behau, are located in DMA.

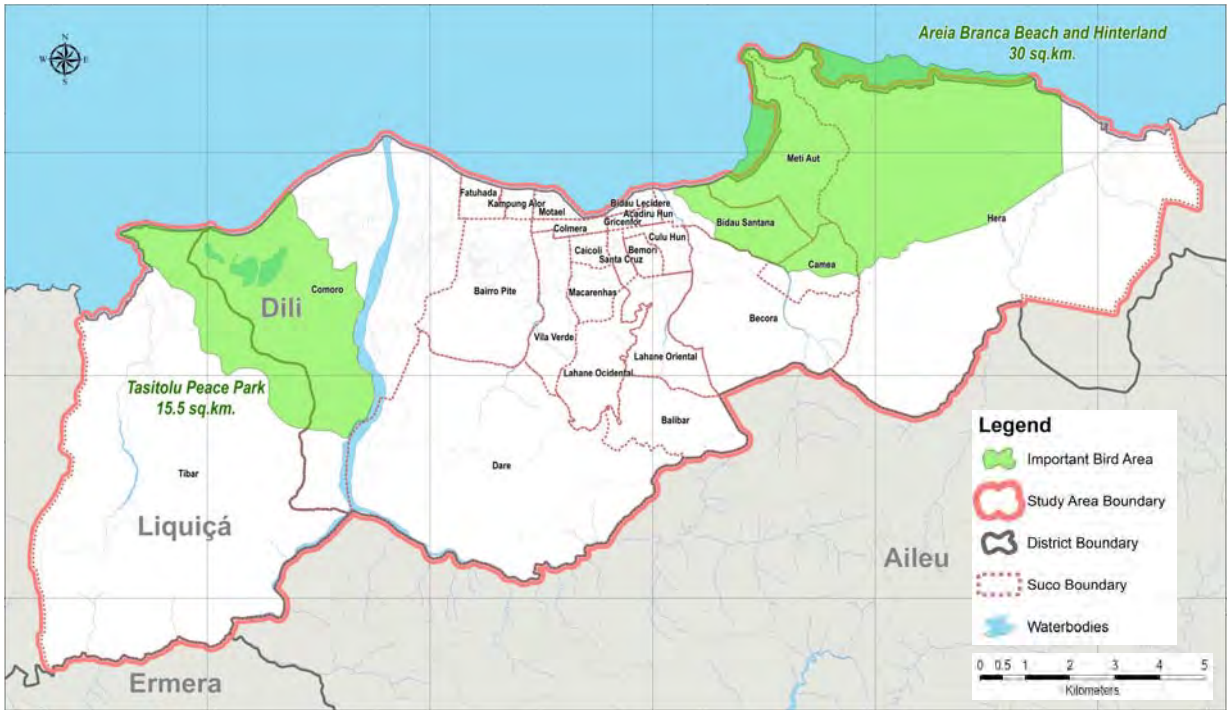
The NDFNC is going to review the list of protected areas, and they will propose a total of 50 protected areas in the country. Behau will be abolished and two mangrove areas will be listed in Dili Municipality although those detailed locations are unclear. Considering the vegetation distribution of mangroves, two mangrove areas would be located in Metinaro Administrative Post adjacent to DMA.



Source: JICA Project Team, UNEP-WCMC 2012

Figure 2.4.2 Protected Areas in the DMA

An international non-government organization (NGO), BirdLife International, undertook a survey and designated 16 important biodiversity areas (IBA) to conserve important habitats of bird populations in 2007. Two IBAs, namely: Tasitulo and Areia Branca Beach and Hinterland, are located in DMA, which mostly cover the protected areas of Cristo Rei Protected Area and Tasitolu as shown in Figure 2.4.3.



Source: JICA Project Team, Bird Life International

Figure 2.4.3 Important Biodiversity Areas (IBA) in DMA

2) Flora

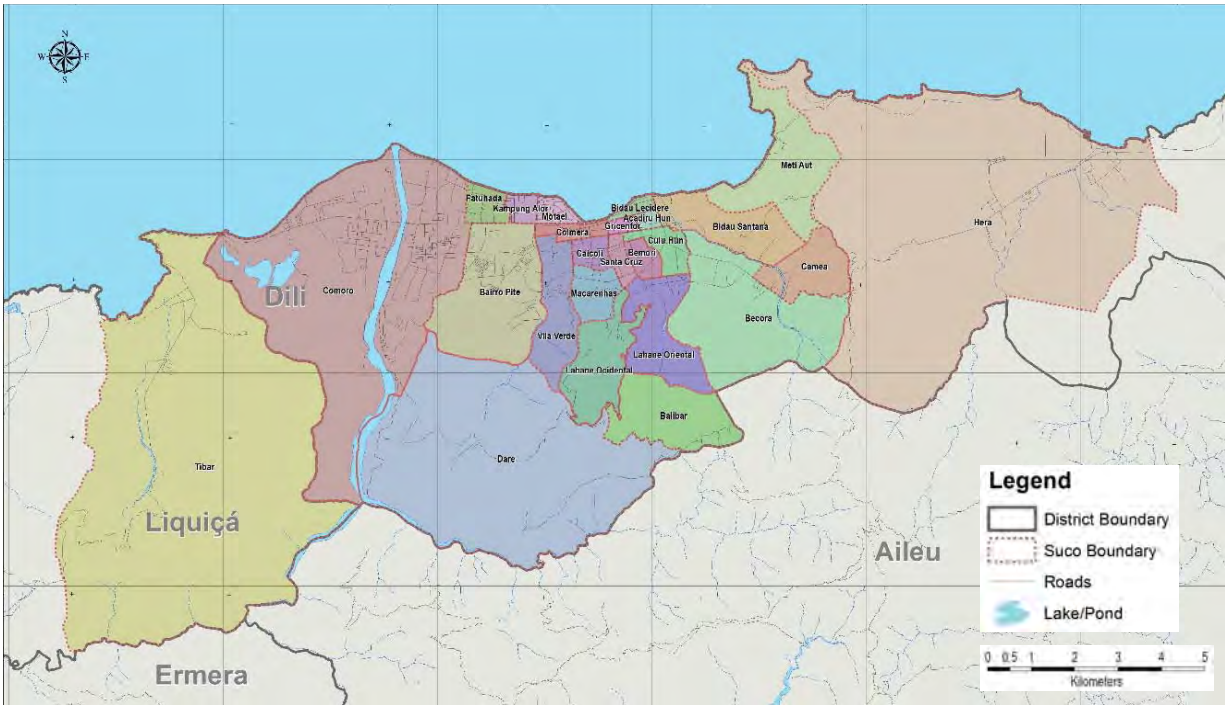
Along the areas of north coast to the low-to-middle altitudes, typical trees of the lowland slopes include tropical chestnut, *Sterculia foetida*, guttiferae (*Callophyllum teysmanii*), and candlenut (*Aleurites moluccana*). *Eucalyptus alba* (especially on the rocky slopes), palm and/or acacia are also typical in this area. Eucalyptus tree is typically used for firewood as cooking fuel, while the candlenut is used as a source of energy for lighting in the households although it has been minimal.

On the other hand, other floras can be seen in the Dili urbanized area, which include fruit trees (banana, mango, coconut and/or papaya), broad-leaf trees like *Alstonia scholaris*, *Albizia julibrissin* and/or *Ficus microcarpa*. Mangrove trees are not lushly vegetated on the coast of Tibar Village located in the west end of DMA.

2.4.2 Social Environment

(1) Administrative Boundary

Timor-Leste has an administrative system consisting of municipality, administrative post, and suco (village level). There are 25 suco(s) under 5 administrative posts and 2 municipalities in DMA, which has about 180 km^2 as shown in Table 2.4.1. Tibar is a suco of Bazartete Administrative Post in Liquica Municipality and the other administrations belong to Dili Municipality. The administrative boundaries are shown in Figure 2.4.4. Meanwhile, two administrative posts, Atauro (island) and Metinaro (in the east end), belong to Dili Municipality, are excluded from DMA.



Source: JICA Project Team

Figure 2.4.4 Administrative Boundaries

Table 2.4.1 Administrative Structure in DMA

Municipality	Administrative Post	Suco
Dili	Vera Cruz	Lahane Ocidental, Vila Verde, Mascarenhas, Caicoli, Colmera, Motael, Dare
	Nain Feto	Santa Cruz, Acadiru Hun, Bemori, Lahane Oriental, Bidau Lecidere, Gricenfor
	Dom Aleixo	Fatuhada, Kampung Alor, Comoro, Bairropite
	Cristo Rei	Culu Hun, Becora, Camea, Hera, Balibar, Meti Aut, Bidau Santana
Liquica	Bazartete	Tibar

Source: JICA Project Team

(2) Land Use

The existing land use conditions are explained in Chapter 3. Three-fourths of the land use is dominated by the natural areas in DMA, which mostly stretches on the hilly and mountainous areas. Most parts of this area have steep slopes and are not suited for habitation.

(3) Living Conditions

The living conditions of DMA are mostly urbanized. However, firewood is still mainly used as source of cooking fuel in the households, and most residents do not use septic tank as means of waste disposal in DMA. These contribute to water pollution and deforestation.

1) Sources of Drinking Water

There are several sources of drinking water in DMA, which are not sourced from rainwater, spring water, or surface water. About 90% of the households in DMA use some water utilities like pipe, pump, public tap or well/borehole. However, about 50% of the households in the country use well, spring, or surface water.

Table 2.4.2 Distribution of Sources of Drinking Water for Households

Item	Pipe or Pump Indoors	Pipe or Pump Outdoors	Public Tap	Tube Well/ Borehole	Protected Well or Protected Spring	Rainwater Collection	Bottled Water	Not Protected Well or Spring	Water Vendors /Tank	River, Lake or Stream	Other	Total (%)
DMA	17.0%	23.5%	26.6%	22.3%	3.8%	0.1%	2.3%	1.1%	0.4%	1.9%	1.1%	100.0%
Timor-Leste	5.4%	16.4%	23.1%	6.2%	13.7%	0.5%	0.6%	19.4%	0.9%	12.9%	0.9%	100.0%

Source: Population and Housing Census 2010

2) Sources of Energy for Lighting

Electricity is supplied over DMA. The major source of energy for lighting is dominated by "electricity" in DMA as 92.3% of households use electricity for lighting. On the other hand, "kerosene" which is used by 48.9% of households is the major energy for lighting in the country.

Table 2.4.3 Distribution of Sources of Lighting Energy for Households

Item	Electricity	Bio Gas	Kerosene	Candle	Wood	Candlenut/ Candle Berry Tree	Solar	Other	Total (%)
DMA	92.3%	0.9%	2.8%	0.8%	2.8%	0.1%	0.1%	0.1%	100.0%
Timor-Leste	36.7%	0.7%	48.9%	1.3%	3.1%	5.2%	3.9%	0.2%	100.0%

Source: Population and Housing Census 2010

3) Sources of Cooking Fuel

The source of cooking fuel was dominated by firewood at 66.2% and was followed by "kerosene" at 17.3% in DMA. Firewood is the most popular source of cooking fuel in the nation, where 89.6% of the households used it throughout the country.

Table 2.4.4 Distribution of Sources of Cooking Fuel for Households

Item	Electricity	Cooking Gas	Bio Gas	Kerosene	Wood	Other	Total (%)
DMA	10.1%	4.9%	1.1%	17.3%	66.2%	0.5%	100.0%
Timor-Leste	2.8%	1.2%	0.6%	5.6%	89.6%	0.2%	100.0%

Source: Population and Housing Census 2010

4) Type of Human Waste Disposal (Toilet)

About 30% of the households used septic tank for human waste disposal in DMA and other major types are "pit latrine with slab (40%)" and "ventilated improved pit latrine (17%)". Majority of the households in DMA still do not use septic tank and discharged their water without any treatment, which can contribute to the risk of deteriorating the groundwater and surface water quality. However, the situation to use sanitation and toilet facilities is worse in the country. About 50% of the households in the country still practice a primordial manner of "no facility or bush (28%)" and "hanging toilet/latrine (21%)" types of human waste disposal.

Table 2.4.5 Distribution of Type of Human Waste Disposal

Item	Pit latrine with slab	Ventilated improved pit latrine (VIP)	Pour flush to septic tank/pit	Pour flush to elsewhere/ DK	Pit latrine without slab/open pit	Hanging toilet/ latrine	No facility or bush	Other	Total (%)
DMA	39.4%	17.3%	30.3%	4.2%	4.0%	1.5%	2.7%	0.5%	100.0%
Timor-Leste	17.6%	11.0%	10.6%	2.0%	8.4%	21.3%	28.4%	0.6%	100.0%

Source: Population and Housing Census 2010

5) Housing Materials

Most houses have artificial building structure as 71.6% of the households used concrete/bricks for external wall of their houses. However, natural materials such as bamboo and/or palm trunk, are major housing materials for the external wall in the country as about 60% of the households used those natural materials.

Table 2.4.6 Distribution of Types of External Wall Material of Houses

Item	Concrete /Brick	Wood	Bamboo	Corrugated Iron/Zinc	Clay	Palm Trunk/ Bebak	Rock	Other	Total (%)
DMA	71.6%	4.6%	1.5%	4.2%	0.2%	16.3%	0.7%	0.9%	100.0%
Timor-Leste	29.6%	4.2%	31.0%	3.2%	1.4%	28.2%	1.4%	1.0%	100.0%

Source: Population and Housing Census 2010

(4) Cultural Heritage

There are no specific designated cultural heritages like historical urban districts identified in DMA, although churches and cultural monuments are scattered in the area. However, according to the State Secretariat of Arts and Culture (SSAC) under the Ministry of Tourism, there are architectural heritages of the Portuguese colonization period. The SSAC is surveying, recording, making an inventory, mapping, and classifying the architectural heritages of Portuguese colonization period in Dili and

Liquicia municipalities. They are going to use the results to conserve and manage these cultural heritages.

Meanwhile, many local people state that they have sacred/holy places of old trees, rocks and/or traditional houses in the communities. Other cultural heritages, traditional architectures, articrafts (woodcarving, textile) and dances are spread over the country. Ancient rock arts before a few thousand up to twelve thousand years ago are also significant cultural heritages of Timor-Leste, and most arts are located at the Nino Konis Santana National Park.

2.4.3 Pollution

(1) General Conditions

As Timor-Leste has not established its environmental standards, emission standard, and effluent standard, as well as not conducted monitoring activities, it is difficult to study the present situation of air/water pollution in DMA without any concrete data. However, it is assumed that the serious air pollution and water pollution with chemical substances have not been more serious because the secondary industry has not been developed as mentioned above under section “Economic Activities”, and not many factories are located based on the existing land use conditions in DMA.

Especially in the dry season, dust generated from unpaved roads and road construction sites may affect air quality in the limited areas. Smoke generated by garbage burning performed everywhere in the residential areas may also be an air pollution source. In addition, water pollution of groundwater in shallow layer and surface water is a concern because most domestic water is discharged without treatment and majority of the households do not have septic tanks as mentioned in the section “Living Conditions”. Similarly, there are places where offensive odor is generated from the discharged water accumulated in the drainage.

(2) Legislative Conditions

In the Decree-Law No. 26/2012 of 4 July on Basic Law on Environment, Article 14 declares that the State shall issue and publish standards of environmental quality, and ensure appropriate measures which include environmental quality standards, emission and other environmental legislations into force in order to avoid, minimize, and reduce the environmental and social impacts caused by pollution targeting air pollution, climate change, water pollution, noise and vibration, landscape, hazardous chemical, solid waste management, landfills, wastewater, and hazardous waste. However, these activities have not been promoted yet.

Meanwhile, a draft Decree Law Amendments to Decree Law 26/2012, Article 67 states that the standards endorsed by the World Health Organization (WHO) or the World Bank (WB) shall be applied until environmental quality standards are domestically established. Similarly, the standards endorsed by the WHO, WB, or international best practice shall be applied until environmental emission and discharge standards are domestically established.

2.5 National Plans and Programs

2.5.1 Strategic Development Plan

Long-term strategy of the Strategic Development Plan (SDP) 2011-2030 launched by GoTL envisions the utilization of oil revenues to foster economic and social development and diversification of the economy. Timor-Leste aims to transition from lower to upper middle-income status by 2030. The SDP targets the development of three core sectors, namely: petroleum, agriculture, and tourism. It aims at achieving targeted investments in infrastructure, education and human, social capitals. The SDP classifies the necessary actions to be taken corresponding to the 2030 economic vision as presented below.

Table 2.5.1 SDP 2030 Economic Vision and Action Areas

2030 Economic Vision	Action Areas
Investment in core infrastructure	- Roads and Bridges - Water and Sanitation - Electricity - Telecommunications
Bottlenecks removed	- Sea Ports - Airports
Penetration of broadband	- Telecommunications
Market economy and strong private sector	- Rural Development - Agriculture
Reform of the agriculture sector	- Rural Development - Agriculture
Self-sufficiency in food	- Agriculture
Industrial base anchored by the petroleum sector	- Petroleum
Light industries	- Culture and Heritage - Private Sector Investment
Small and micro businesses	- Agriculture - Private Sector Investment
Thriving tourism sector	- Tourism
Educated and skilled workforce	- Education and Training

: Area closely related to Dili Metropolitan Area

Source: SDP 2011-2030

The GoTL has developed a five-year investment plan while the line ministries will formulate the mid-term plans in line with successful achievement of the SDP. The five-year investment plan is being materialized as it appears in the state budget allocation for each plan and program.

2.5.2 Infrastructure Fund

One of the major fiscal programs is the Infrastructure Fund (IF) of which primary objective is to finance the implementation of infrastructure development that requires significant investments in multi-year projects of over USD 1 million. Table 2.5.2 presents the expenditure performance of the previous year, as of 2014, and the next five-year expenditure plan.

Table 2.5.2 Past Expenditure Performance and Five-Year Plan of Infrastructure Fund (2014-2018)

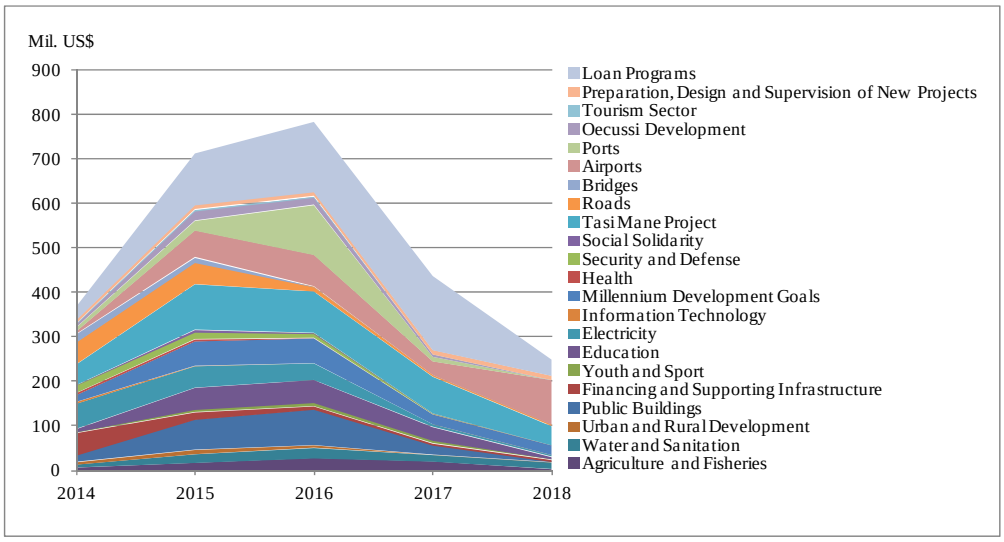
(Unit USD in millions)

Item	Previous Performance			Five-Year Plan				
	2013 Budget	Rollover from 2013	Addition for 2014	2014 Budget	2015	2016	2017	2018
Own Finance	560.8	202.9	134.6	337.5	596.1	625.9	270	212.4
Foreign Loan Programs	43.6	18.1	12.9	31.1	117.3	158.5	167.5	37
Total Budget of Infrastructure Fund	604.4	221	147.6	368.6	713.4	784.4	437.5	249.4

Source: State Budget 2014 Book 1, MOF

According to the State Budget 2014, 2012 budget experienced rollover at USD 54.7 million and 2013 budget at USD 202.9 million. Finally, the 2014 budget ended up with USD 337.5 as own finance portion. Source of the finance for the IF is from annual oil and non-oil revenue and partial withdrawal from the Petroleum Fund of which balance has been accumulated to some USD 14.1 billion. As for 2014, the GoTL has reduced the IF budget from previous years, since it wished to concentrate on the institutional capacity on the most important projects in order to improve efficiency of project implementation; and the amount allocated for 2014 is more realistic than in the previous years and should lead to a higher execution rate.

This five-year plan is split into the respective development areas which can be summarized as illustrated in Figure 2.5.1 below.



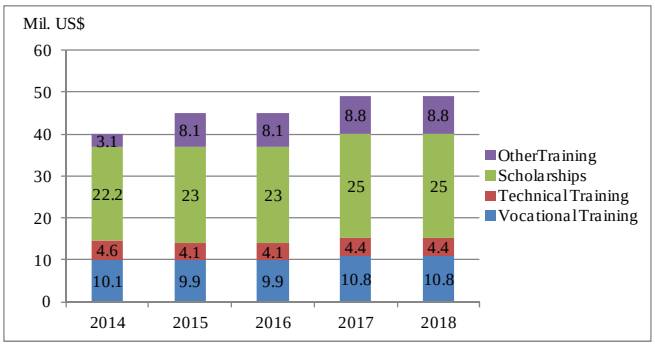
Source: State Budget 2014 Book 1, MOF

Figure 2.5.1 Structure of the Infrastructure Fund Investment Plan (2014-2018)

The investment volume of the IF is expected to peak in 2016 and gradually diminish towards 2018. Such actions in infrastructure development are expected not only to reduce capacity constraints and assist in facilitating more productive economy, but also create a framework to lower transaction costs, create jobs and generate income, stimulating domestic market integration and increasing demand in rural areas. One of the most challenging issues is whether to execute the projects and programs as these are budgeted. It may require substantial improvement in institutional capacity and efficiency with respect to government expenditure.

2.5.3 Human Capital Development Fund

Another major program is the Human Capital Development Fund (HCDF). The main programs funded by the HCDF are as follows:



Source: State Budget 2014 Book 1, MOF

Figure 2.5.2 Structure of HCDF (2014-2018)

(1) Scholarship was designed for the general public, public servants, and children of veterans;

(2) Vocational training is designed for public servants in the following areas: criminal lawyers, auditors, judges, notaries, private lawyers, translators, and inspectors. It also supports the training of manpower to work abroad, particularly in construction, provides training for trainers in Tibar Center and other centers, and supports basic training in languages and math skills;

(3) Technical training comprising training activities for public administration and delivered by higher education and polytechnics; and

(4) Other types of training covering programs for young teachers in higher education and polytechnic education, health, police and defense force officers.

2.5.4 Other Programs

Regional developments are carried out under the Development Program of Decentralization (PDD). Under this program, the Integrated District Development Plan (PDID) and the National Suco Development Plan (PNDS) are implemented over the country. PDD aims at boosting the local private sector, and promoting a decentralized decision-making framework.

In 2013, the GoTL launched the Registry and Verification of Enterprises Service (SERVE) in order to facilitate the administrative aspects for enhancing the national business environment. According to the State Budget 2014, SERVE reported that it has accelerated private sector development and about 1,500 companies were newly created in 2013. Most of these companies are said to be national companies.

2.6 Institutional Framework

In Timor-Leste, the Constitution, which was approved by the Constituent Assembly in 2002, and Strategic Development Plan 2011-2030 (SDP), which was approved in 2011, are considered as the two main documents for constituting and building Timor-Leste. The Constitution defines fundamental principles, rights, duties, political organization, economic and financial organization, national security, and other fundamentals of administering the country. Various laws (Decree Laws) are under preparation in concerned sectors based on the Constitution. The SDP shows a 20-year vision of the country covering social sector, infrastructure development, economic development, and institutional framework. Sector plans and action plans are under preparation by concerned ministries for showing sector development programs and projects. Details of the Constitution and SDP are described below.

2.6.1 Constitution of Timor-Leste

The Constitution of Timor-Leste is composed of seven parts, followed by title, chapter, and section. Outline of the Constitution is summarized below.

Table 2.6.1 Outline of the Constitution

Part	Title	Chapter
Part 1 Fundamental Principles	-	-
Part II Fundamental Rights, Duties, Liberties and Guarantees	Title I General Principles Title II Personal Rights, Liberties, Guarantees Title III Economic, Social and Cultural Rights and Duties	-
Part III Organization of Political Power	Title I General Principles	-
	Title II President of the Republic	-
	Title III National Parliament	Chapter 1 Status, Election, and Appointment Chapter II Competencies Chapter III Organization and Functioning Chapter IV Standing Committee
	Title IV Government	Chapter I Definition and Structure Chapter II Formation and Responsibility Competencies
	Title V Courts	Chapter I Courts, Public Prosecution and Lawyers Chapter II Public Prosecution Chapter III Lawyers
	Title VI Public Administration	-
Part IV Economic and Financial Organization	Title I General Principles	-
	Title II Financial and Tax System	-
Part V National Defense and Security	-	-
Part VI Guarantee and Revision of the Constitution	Title I Guarantee of the Constitution Title II Constitutional Revision	-
Part VII Final and Transitional Provisions	-	-

Source: Constitution of Timor-Leste

Right to private property (Section 54), right to housing (Section 58), environment (Section 61) of the "Fundamental Rights, Duties, Liberties and Guarantees" and natural resources (Section 139), land (Section 141) of "Economic and Financial Organization" are closely related to Dili Urban MP. The items to be considered for Dili Urban MP are summarized from the section of the Constitution.

- Every individual has right to private property, and requisitioning and expropriation of property for public purposes shall only take place following fair compensation in accordance with the law.
- Everyone has right to a house that meets satisfactory standards of hygiene and comfort and preserves personal intimacy and family privacy.
- Everyone has right to a humane, healthy, and ecologically balanced environment and the duty to protect it and improve it for the benefit of future generation.
- Resources of soil, sub soil, territorial waters, continental shelf, and exclusive economic zone which are essential to economy, shall be owned by the State and shall be used in a fair and equitable manner in accordance with national interests.
- Ownership, use and development of land as one of the factors for economic production shall be regulated by law.

Spatial Planning Law, which is the responsibility of the Ministry of Public Works, is under preparation based on the Constitution (detail is described in Section 6.1).

2.6.2 Outline of SDP 2011-2030

The SDP shows the development strategy towards 2030 and is a base for all sector development. The Dili Urban MP should adapt strategies mentioned in the SDP. Outline of SDP is summarized below.

Strategies and Action

The strategies and actions set out in the Strategic Development Plan aim for the transition of Timor-Leste from a low income to upper middle income country, with a healthy, well-educated, and safe population by 2030.

Key words in SDP

- Timor-Leste will be a prosperous society with adequate food, shelter, and clothing for all people.
- People will be literate, knowledgeable, and skilled. They will be healthy and living long productive lives.
- People will no longer be isolated.
- Production and employment will increase in all sectors.
- Living standard and service will improve for all Timorese.

National Strategic Zones

In national strategic zone, “Dili-Tibar-Hera” is identified as one of the six national strategic zones with focus on service trading and development such as Tibar commercial port, industrial estate, higher education, marine tourism, and business (CBD), and upgrading of international airport.

CHAPTER 3: URBAN DEVELOPMENT CONDITIONS AND TRENDS

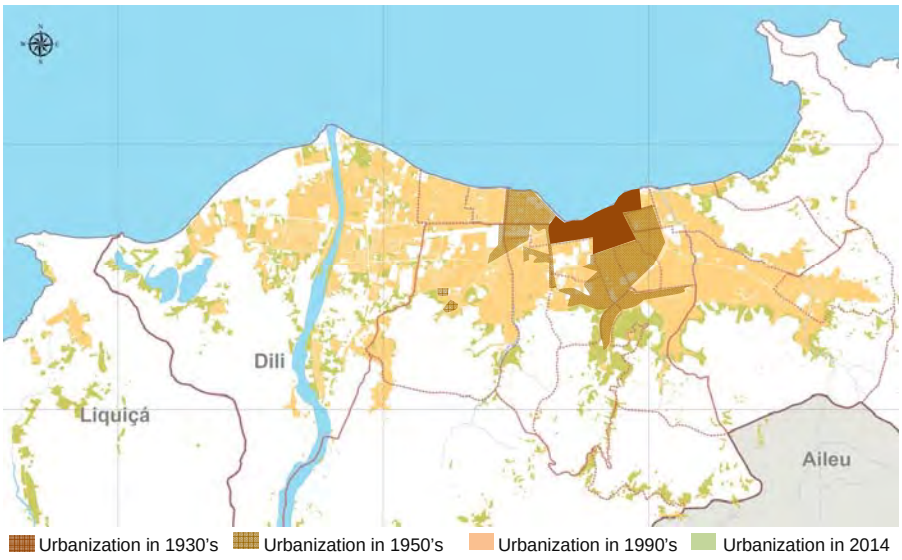
3.1 Development Trend in Dili Metropolitan Area (DMA)

(1) Urbanization Transition of Dili

The urbanization of Dili started when the Portuguese colonial government moved its center from Lifau in Oecussi to Dili in 1769. The central area of Dili accommodates the facilities of government administration, commercial and business, churches, and other road networks, wherein at that time has been maintained and succeeded as representation of historical legacy of Timor-Leste, where visitors can enjoy and think of the old times as an attractive historical area.

Urban expansion of Dili has begun mainly in 1950 after the Second World War from its city center as the colonial administrative center consisting currently of nine *sucos, namely:* Bidau Lecidere, Acadiru Hun, Gricenfor, Bemori, Culu Hun, Santa Cruz, Motael, Colmera, and Caicoli to the northward direction (sucos of Macarenhas and Lahane Oriental). In the 1990s Indonesian occupation, urbanization was promoted into suburban areas by land subdivisions, mainly in Comoro Suco, and urban sprawl created unplanned settlements in the eastern part of Dili mainly in Becora Suco, while in other sucos of Kampung Alor and Fatuhada in the western part high dense development occurred.

It is envisaged that the existing urban form of Dili has been completed mostly till the 1990s, as infill developments are still majority in further urban expansions densely within in its urban form. However, undesirable settlements are increasingly occurring in hilly or mountainous areas, which are considered landslide prone.



Source: Urbanografia de Díli no Tempo da Administração Portuguesa 2011/ Departamento de Arquitectura da FCTUC

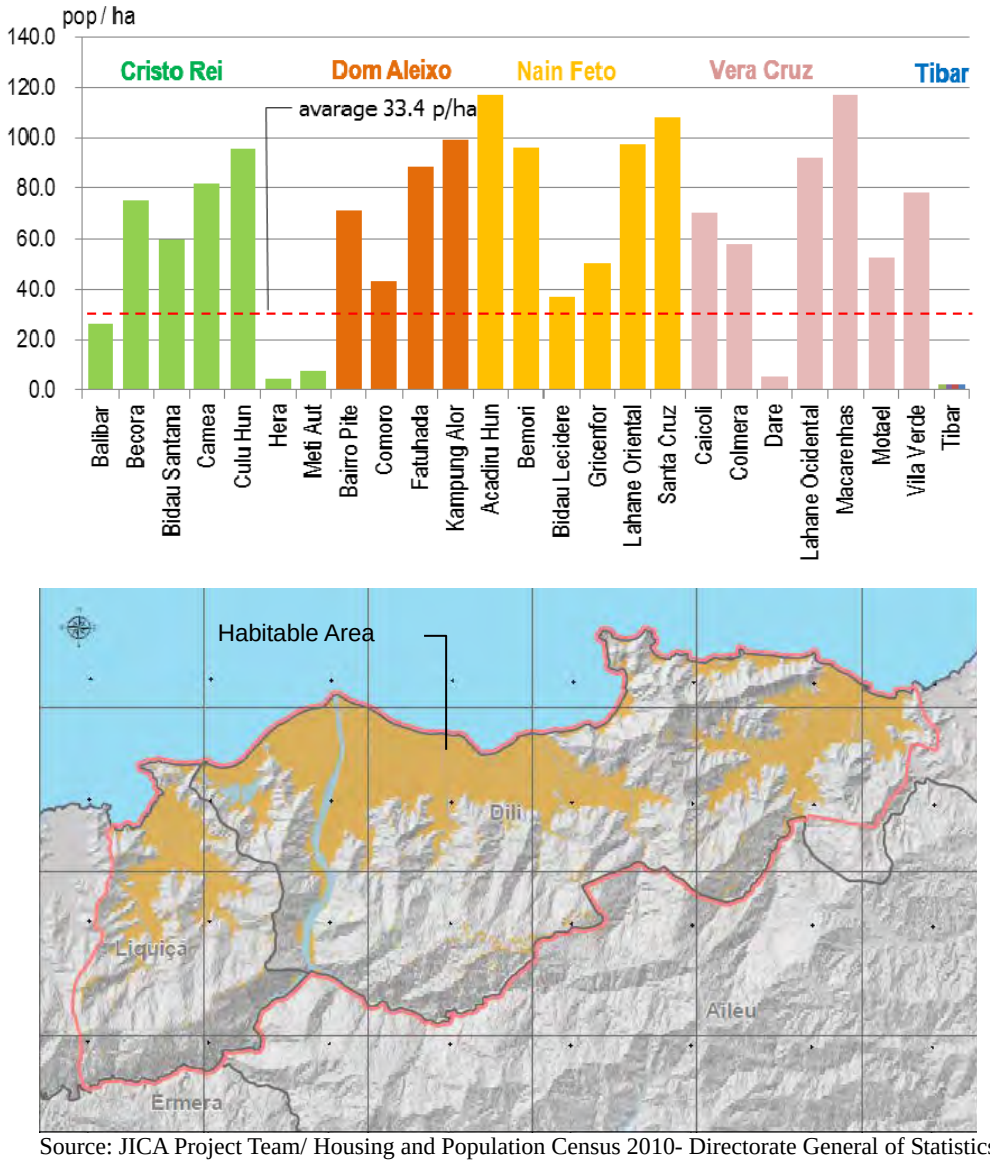
Figure 3.1.1 Evolution of the Dili Area (18th Century–20th Century)

(2) Current Urbanization Conditions

Current urbanization by infill development can be seen mainly in vacant lands or abandoned properties after the Indonesian occupation, of which some lands have been recovered by improvements or new developments for commercial, business, and residential use. The following are some examinations in the identification of distinctive features of Dili urbanization.

1) Settlement density

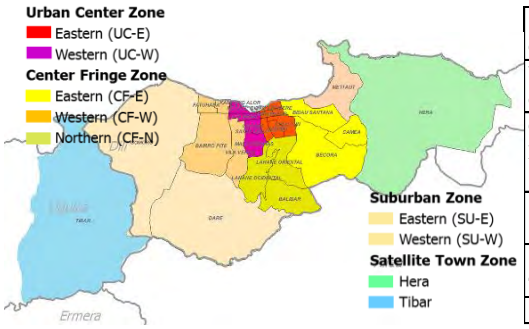
The settlement density is examined by the condition of habitable land that is defined by desirable slope for settlement (under 15°) excluding Comoro River and the Tasitolu lakes. In case of mountainous lands, it is considered at desirable level of minimum settlement by agglomeration of population (5,000 persons by 125 ha) under 15° slope, taking into account a lot of scattered small villages in that condition. As a result, the gross density in habitable areas in the Dili Metropolitan Area (hereinafter referred to as DMA) as the project area, is estimated at 6,698 ha (37% out of the total DMA), and its gross population density becomes 33.4 persons per hectare of habitable land.



Source: JICA Project Team/ Housing and Population Census 2010- Directorate General of Statistics (DGE)

Figure 3.1.2 Gross Population Density of Habitable Area and its Distribution in DMA

Table 3.1.1 Gross Population Density of Habitable Area in DMA



Catergory	Urban Block	Project Area (ha) Total	Habitable	share	Population 2014*	Density pop/ha
URBAN CENTER	Eastern (UC-E)	281	277	99%	25,940	93.5
	Western (UC-W)	300	231	77%	17,810	77.2
CENTER FRINGE	Eastern (CF-E)	1,429	508	36%	41,210	81.1
	Western (CF-W)	1,067	643	60%	57,030	88.7
	Northern (CF-N)	1,042	220	21%	18,160	82.6
SUBURBAN	Eastern (SU-E)	489	92	19%	900	9.8
	Western (SU-W)	4,907	1,835	37%	81,050	44.2
SATELLITE TOWN	Hera	4,123	1,566	38%	10,130	6.5
	Tibar	4,224	1,328	31%	5,400	4.1
Total		17,862	6,698	37%	257,630	38.5

Note: UC-E=Urban Center East, UC-W=UC West, CF-E=Center Fringe East, CF-W=CF West, CF-N = CF North, SU-E = Suburban East, SU-W=SU West,
Population 2014 is estimated based on Housing and Population Census 2010-DGE, existing land use by Satellite Image 2014, Areas by Urban Block are estimated by GIS data 2014.
Source: JICA Project Team

2) Settlement pattern

Three types of settlement are identified based on areas affected by historical urbanization transition in each era of Portuguese colonial, Indonesian occupation, and after the independence of Timor-Leste, where population density in each type has been formulated by different spatial standard or condition of settlements except for unplanned settlement.

Table 3.1.2 Typical Settlement Pattern by the Three Areas Based on Different Historical Backgrounds (1)

Type of Settlement	Indicator		Map of Typical Settlement in 2014
Planned Settlement developed in Portuguese Era	Basic Information		
	Location	Motael Suco	
	Area	27.6 ha	
	Land Use	Residential incl. office, shop	
	Indicators		
	Population Gross Density	130 p/ha	
	Gross Building Coverage Ratio	34%	
	Average Area / person (net)	26.9 m^2	
Planned Settlement developed in Indonesian Era	Basic Information		
	Location	Comoro Suco	
	Area	17.1 ha	
	Land Use	Residential incl. office, shop	
	Indicators		
	Population Gross Density	130 p/ha	
	Gross Building Coverage Ratio	31%	
	Average Area / person (net)	24.7 m^2	

Note: Gross Building Coverage Ratio (BCR) is estimated by the formula BCR= total building area/site area; Population density is assumed by formula (Average number of households in the suco x number of buildings with one household)
Source: JICA Project Team based on the GIS utilizing LiDER data of DNSB/MoPWTC, Housing and Population Census 2010

Table 3.1.3 Typical Settlement Pattern by Three Areas Based on Different Historical Backgrounds (2)

Type of Settlement	Indicator		Map of Typical Settlement in 2014
Unplanned Settlement in the 1990s	Basic Information		
	Location	Santa Cruz Suco	
	Area	11.4 ha	
	Land Use	Residential incl, office, shop	
	Indicators		
	Population Gross Density	310 p/ha	
	Gross Building Coverage Ratio	41%	
	Average Area / person (net)	13.4 m^2	

Note: Gross Building Coverage Ratio is estimated by a formula (BCR= total building area/site area), Population density is assumed by a formula (average number of household in the suco x number of building with one household)
Source: JICA Project Team based on the GIS analysis utilizing LiDER data of DNSB/ MoPWTC, Housing and Population Census 2010

Tables 3.1.2 and 3.1.3 indicate that old settlements in the Portuguese colonial era and Indonesian occupation have been developed by comparatively larger plot subdivision, where population densities are obviously lower than the typical unplanned settlement such as Santa Cruz Suco. High density settlement (310 population/ha) in the unplanned settlement generates also the smallest unit building area per population as 13.4 m^2 by half of the building unit area built in Portuguese colonial era.

3) Current urban development trend

After recovering the deterioration of urban facilities from the Indonesian occupation, small-scale private sector investments (e.g., retail, restaurant, and wholesale) seem to have become brisk in recent years. However, large-scale estate developments including housing estate, industrial estate, do not seem to be active in Dili except for commercial and tourism sectors such as Timor Plaza as commercial complex development in 2011 by an Australian investor and hotel developments in the city and planned large-scale tourism investment projects.

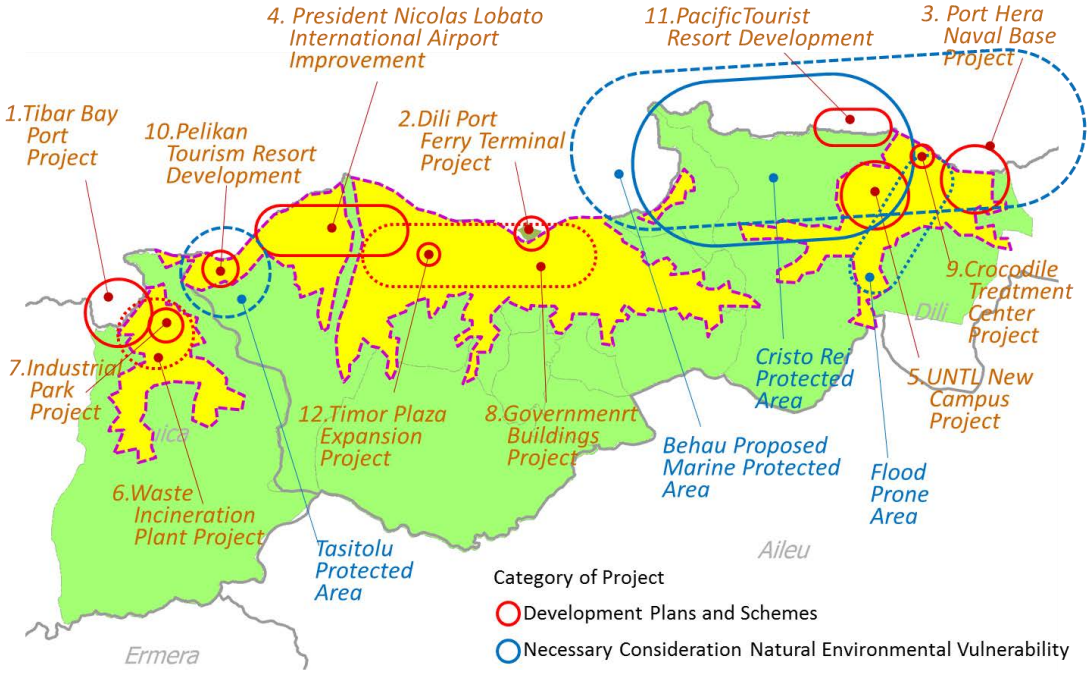
On the other hand, public sector investments are very active in recent years. Major infrastructure programs and projects by the Tibar Bay New Port Development, the President Nicolau Lobato International Airport (hereafter referred to as PNLIA) improvement, the University of National Timor Lorosa'e (hereinafter referred to as UNTL) campus development in Hera and the Hera Naval Base development have taken off, while national trunk road improvements connecting Liquica and Baucau from the Dili urban area have also been launched. Table 3.1.4 shows the current major urban and infrastructure developments in DMA.

Other detailed information of infrastructure developments are described in Chapter 4 (Conditions of Road and Transport) and Chapter 5 (Conditions of Infrastructure).

Table 3.1.4 Major Large-scale Property Development Projects in DMA

Sector	Name of Project/Plan	Area (ha)	Location	Status / Description
Public/ Government Sector	1.Tibar Bay Port Project	40.6 ha (reclamation land of the bay)	Tibar Bay Area in Tibar Suco, Liquica Municipality	Bidding stage for PPP project
	2.Dili Port Ferry Terminal Project	Pier and platform	Dili Port in Motael Suco	Preparatory study stage
	3. Port Hera Naval Base Project	28 ha (excluding future expansion area)	Existing Hera Naval Base expansion in Hera Suco, Cristo Rei AP	Further engineering stage based on the master plan by the government assisted by the Australian Navy
	4.President Nicolas Lobato International Airport Improvement	around 175 ha (GIS measured by JPT)	Existing Airport area in Comoro Suco, Dom Aleixo AP	Technical study stage for PPP project (pending for the project)
	5. UNTL (National University of Timor Lorosa'e) New Campus Project	367 ha	Cristo Rei in Hera Suco, Cristo Rei AP	The government has approved the plan, some parts of the buildings are under detailed design at present.
	6.Waste Incineration Plant Project	12 ha	Tibar Bay Area in Tibar Suco, Liquica Municipality	Under implementation (property acquisition stage)
	7.Industrial Park Project	40 ha	Tibar Bay Area in Tibar Suco, Liquica Municipality	Under planning stage by the Ministry of Commerce, Industry and Environment
	8.Government Buildings Project	Several sites of the ministries (area is not available)	Mainly in Vera Cruz and Comoro AP	Under construction (MOF, MOJ), plan and design (MOPW, etc) and many other ministries
	9.Crocodile Treatment Center Project	7 ha	Matarlido in Hera Suco	Under planning stage
Private Sector	10. Pelikan Tourism Resort Project	606.8 ha (total including 178 ha in Tibar Suco)	Tasitolu Area and in Comoro Suco, and Tibar Suco in Liquica Municipality	Concession by the Prime Mister Office and under process for development approval
	11. Pacific Tourist Resort Project	Unofficial (around 100 ha)	Cristo Rei Beach in Hera Suco, Cristo Rei AP	Concession by the Prime Mister Office and under planning stage
	12. Timor Plaza Expansion	Unofficial (around 10 ha)	Comoro Suco	Not available

Note: AP (Administrative Post as ex-sub district)
Source: Tibar Bay Port Project / Project Brief 2012-IFC/GoTL, President Nicolas Lobato International Airport Project / Project Brief 2012-IFC/Government of Timor Leste, Port Hera Naval Base Master Plan 2011 Revision 7/Ministry of Defense, Other projects were by hearing with relevant organizations.



Source: JICA Project Team

Figure 3.1.3 Constraints and Opportunities of Habitable Area in DMA

4) Issues of urban development in programming and planning stage

Although the above programs and projects are expected to play a significant role in strengthening the functions of the capital of Timor-Leste and leading economic development, several issues on major developments are identified as constraints in project management as follows:

- Lack of transparency in the administrative process to share and exchange information on time among relevant ministries and agencies such as permission, appraisal and/or registration by strong obstacles of vertical and independent management.
- Lack of planning coordination among relevant ministries and agencies in terms of natural environmental protection and infrastructure provision in integrated manner such as development in the natural protected areas.
- Inappropriate plans and projects without considerations for the sites by appropriate future development direction, spatial framework and negative environmental impacts.

3.2 Existing Land Use Conditions in the Dili Metropolitan Area

(1) Existing Urban Structure of DMA

The existing urban structure of DMA is affected fundamentally by geographical features of limited flat plain as part of an alluvium layer facing the Ombai Straits and mountains occupying majority (70%) of the total land area of DMA. Hera and Tibar are separated also by mountains where passing through these mountain or narrow peninsula route forces to connect inefficiently on both sides from Dili. As common features of Timor-Leste, several rivers from the mountains to the sea are penetrating the limited flat plains, where flood and inundation have occurred frequently in the rainy season.

National highways linking with each flat plain of Dili, Hera, and Tibar and the southern coastal areas of Timor-Leste play an essential role in promoting socio-economic development in the country as well as serve as key spines of DMA in association with the hubs of Dili Port and Dili International Airport. The existing urban structure of DMA has evolved from a single urban center in the old quarter of Dili, to another urban core with commercial and business functions along the national highway (A03) toward the western side of DMA.

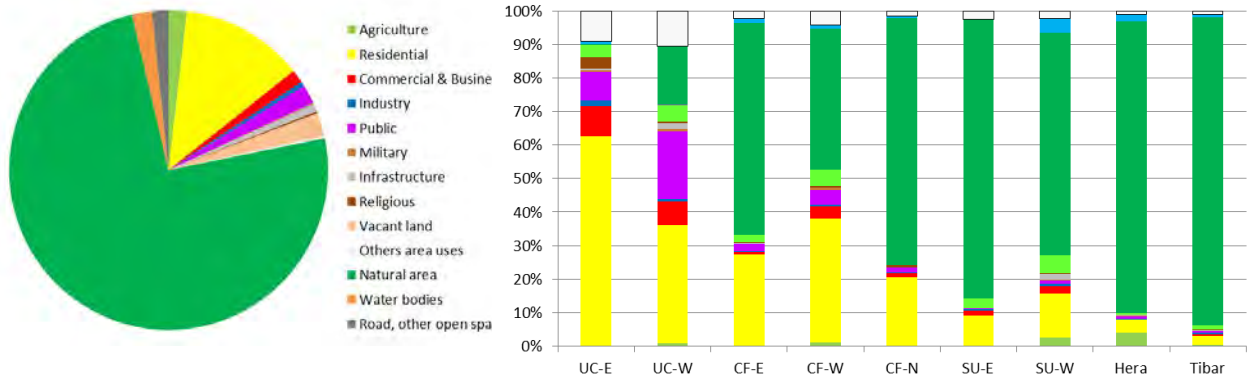
(2) Existing Land Use

1) General land use conditions

According to the Land Use Survey for DMA by the JICA Project Team (hereinafter referred to as JPT) in August 2014, the composition of existing land uses was identified as shown in Figure 3.2.1 and Table 3.2.1. The survey result revealed that natural area including forest and natural bush covers around 74.5% of total DMA; and the other predominant use, among other land uses, is residential and mixed residential use with other uses sharing 12.5% of total DMA land.

This land use composition differs according to each urban area. DMA is characterized by nine urban blocks (Urban center with 1) East and 2)West, Center Fringe with 3) East, 4) West and 5) North, Suburban with 6) East and 7) West, 8) Hera, and 9)Tibar) shown in Table 3.1.1. The land uses of the urban center blocks are mainly for residential areas and government land followed by commercial and business use, where the Government of Timor-Leste (hereinafter referred to as GoTL) and public administration in the west side

occupy small areas. The majority of land use is mountain or other natural area in the urban blocks of Center Fringe, Suburban, Hera, and Tibar as large sucos with large natural lands shared by 50% to over 90% of total urban block area. Another character of Dili is to have a lot of religious properties as a Catholic country by not only having churches or cathedrals but also other relevant facilities operated by religious groups.



DMA Total　　Aggregated SUCO Land Use by Urban Block

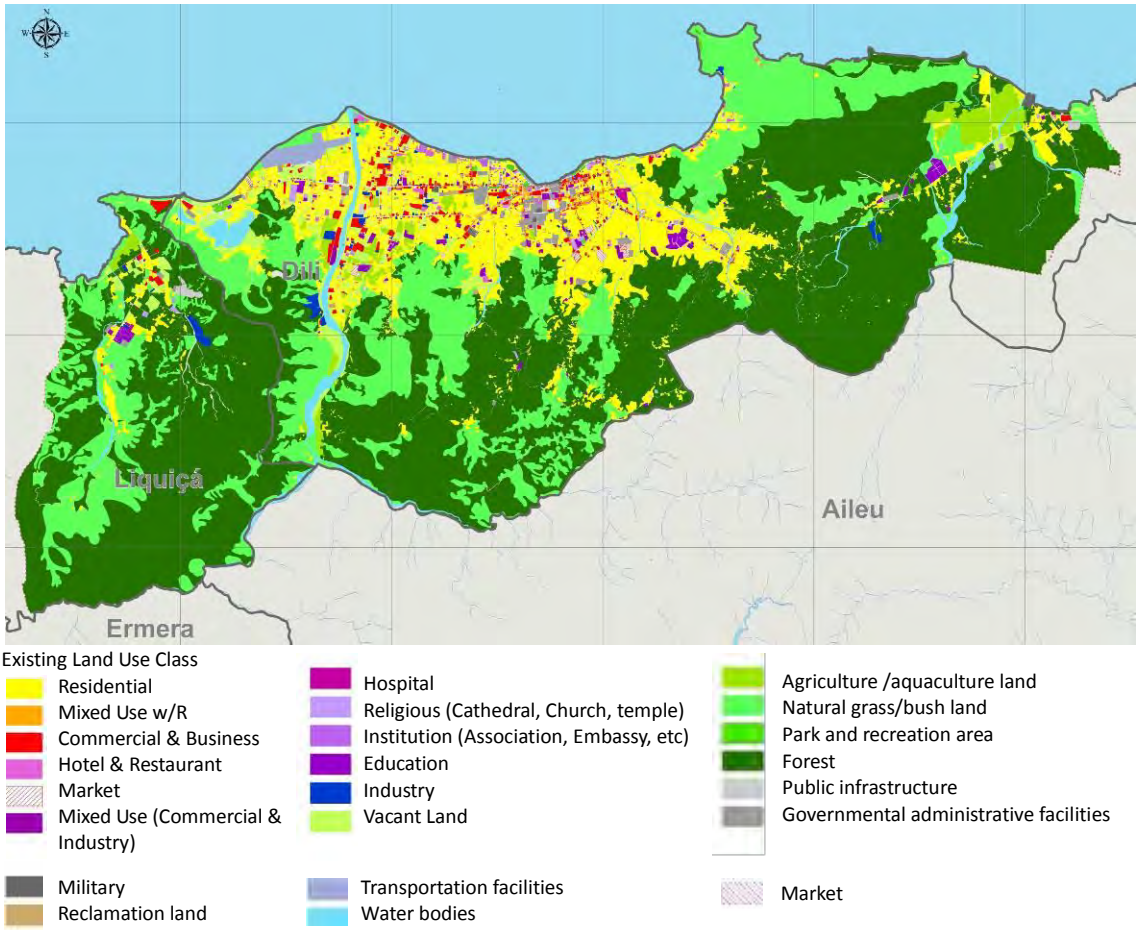
Note: UC-E=Urban Center East, UC-W=UC West, CF-E=Center Fringe East, CF-W=CF West, CF-N = CF North, SU-E = Suburban East, SU-W=SU West,
Source: JICA Project Team (Land Use Survey: August 2014)

Figure 3.2.1 Existing Land Use Composition in DMA

Table 3.2.1 Existing Land Use Composition in DMA

Category	Existing Land Use Classs	Area (ha)	share (%)
Agriculture/ Aqua-culture Area		329	1.8%
Residential	Residential (Detached, Semi-detached, Collective)	2,157	12.1%
	Mixed Use (R + Retail and Business, or Cottage Industries)	77	0.4%
	sub-total	2,234	12.5%
Commercial	Commercial (Business, Retail, Wholesale)	171	1.0%
& Business	Hotel/ Restaurant	45	0.3%
	Market	23	0.1%
	sub-total	239	1.3%
Industry	Industrial Area (Cottage industry, light industry)	74	0.4%
	Mixed use (factory, cottage industry with storage)	12	0.1%
	sub-total	87	0.5%
Public	Education (Preschool, Primary, Secondary, Tertiary, Vocatio	124	0.7%
	Public Administration (Gov, Local office, Admin)	131	0.7%
	Hospital	15	0.1%
	Institution (Research, Embassy, NGO, AID)	12	0.1%
	sub-total	282	1.6%
Military	Military (Naval, Military bases)	21	0.1%
Infrastructure	Public Infrastructure (WS/ SW plant, Electricity Station)	30	0.2%
	Transportation (Terminals, parking lots)	90	0.5%
	sub-total	120	0.7%
Religious	Religious (Church, temple, mosque)	34	0.2%
	Cemetery	12	0.1%
	sub-total	46	0.3%
Open Land	Park and Recreational	24	0.1%
	Reclamation Land	20	0.1%
	Vacant land (Abandoned, no use)	420	2.4%
	sub-total	464	2.6%
Natural Area	Natural grass, Forest and Water Surface (temporal)	13,308	74.5%
Water bodies		362	2.0%
Roads, other open spaces		369	2.1%
	Total	17,860	100.0%

Source: JICA Project Team based on the Land Use Survey August 2014 and adjusted by GIS calculation



Source: JICA Project Team

Figure 3.2.2 Existing Land Use 2014 in DMA

(3) Land Property and Tenure Status

Land tenure has become one of the significant issues in Timor-Leste due to land dispute mainly affecting stable and peaceful socioeconomic activities. The tenure system of Timor-Leste has been suffered by confusion and lack of registration of lands due to insufficient land management for long periods of time from Colonial Portuguese Regime up to Indonesian occupation. The GoTL is preparing the Land Bill in association with the establishment of cadastral information system through surveys and "*Ita Nia Rai* (Our Land)" program. In case of DMA, the National Directorate of Land, Property and Cadastral Services (hereinafter referred to as DNTPSC) states that database for land registration is still in undeveloped condition with inconsistent data, although 70% of the total land of Dili District has been identified in 2014, therefore, they have not published them yet.

Government lands as one of considerable assets are expected to be led and managed in a well-organized urban development through public space organization or stipulation of private sector development. Therefore, it is important for future urban development to manage government-owned lands through appropriate asset management measures. However, property information for government lands is not available by cadastral data as aforementioned. In case of the land use survey by JPT, government land use and other land use classes are indicated by only the uses of buildings and government facilities area, which is not equivalent to public ownership.

Box: Various Certificates and Claimants of Land Property in Timor-Leste

Type 1: Parcel without Certificate
Type 1 refers to a land parcel to which formal rights have never been issued. This type corresponds to the majority of cases in Timor-Leste. Most Timorese live and work on land to which formal rights have never been issued. This type of case can be resolved by identifying the current possessor recognized as a consensual owner through a systematic cadastral survey and issuing an ownership title.

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Type 2: Parcel with Certificate; Right Holder in Possession
Type 2 corresponds to a land parcel to which a formal right has been issued and the right holder is in possession (LLP). This type of case can also been resolved by identifying the title holder/current possessor through a systematic cadastral survey and issuing an ownership title.

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Type 3: Parcel with Certificate; Right Holder not in Possession
Type 3 refers to a land parcel to which a formal right has been issued but the title holder is not in possession of the property. Although it is estimated that this type corresponds to a minority of cases, these are the most complex and contentious situations. The resolution of type 3 cases will depend on policy options to be selected by legislators. This technical framework presents such policy options in detail.

Previous System Title Holder (TH): Holders of rights granted under the colonial Portuguese regime or the Indonesian administration. Subsequent holders to whom the property has been legitimately transferred are also considered as previous system title holders. Legitimate transfers are voluntary transfers from the title holder to a third party, by sale, donation, inheritance, trade, or other. Claimants recognized as previous system title holders may be granted an ownership right or be entitled to compensation in accordance with the law.

Last-in-time, Long-term Peaceful Possessor (LLP): Claimant that took possession before 26th of April 2006, as a result of the absence of the previous possessor, without his or her authorization, without resorting to violence or threats, and has maintained such possession in good-faith for at least five consecutive years. Claimants identified as LLP will be granted an ownership right.

Simple Claimant (SC): Claimants that do not meet the requirements to be qualified as any of the claimant types above are considered simple claimants.

Source: Technical Framework for a Transitional Land Law for East Timor / USAID/ARD Strengthening Property Rights in Timor-Leste Ita Nia Rai Project 2008

1) Government use lands

- The land use for government facilities according to the land use survey is frequently seen in the blocks of the Urban Center and Center Fringe by the six sucos of Gricenfor, Colmera, Caicoli, Macarenhas, Vila Verde, and Bairro Pite.
- The total government land use in six sucos as aforementioned reaches 50% of the total government land use in DMA, although government land use shares only 3% of the total land excluding water bodies, mountainous areas, and other land.

2) Community lands

- Community lands have played an important role in managing properties of community residents rather than modern land management by administration system and regulation. "*Chefe de Suco*" as community authority in urban areas rather than rural sucos has become less influential in land management, however, this remained in some sucos to maintain their communities in DMA.
- Urban development including infrastructure provision is envisaged to be increased in the future in association with resettlement sometimes by expropriation from private properties. Community land system can contribute to modern land administrative system by flexible measures including customary ways to be able to offer common land for involuntary resettlement.

(4) Land Occupation in Vulnerable Areas

It is observed that unsuitable settlements in vulnerable areas in DMA have occurred in such steep slope hilly or mountainous places, and river side flood prone areas. It is envisaged that recent population concentration into the Capital City has caused those settlements due to limited plain land in DMA in association with insufficient land management control.

Especially, the southern part of the city center in sucos of Macarenhas and Lahane Occidental is one of the distinct urban sprawl areas, where scattered houses are built typically on steep slope lands of mountainous places along the National Highway No.A02. It is envisaged that these urban sprawls have happened after the 1990s era. These settlements in natural hazard prone areas should be strictly controlled and managed by adequate public administration guidance and regulations to protect the natural areas and safeguard people's living environment.

(5) Urban Environment and Conservation Status

1) Protected Areas

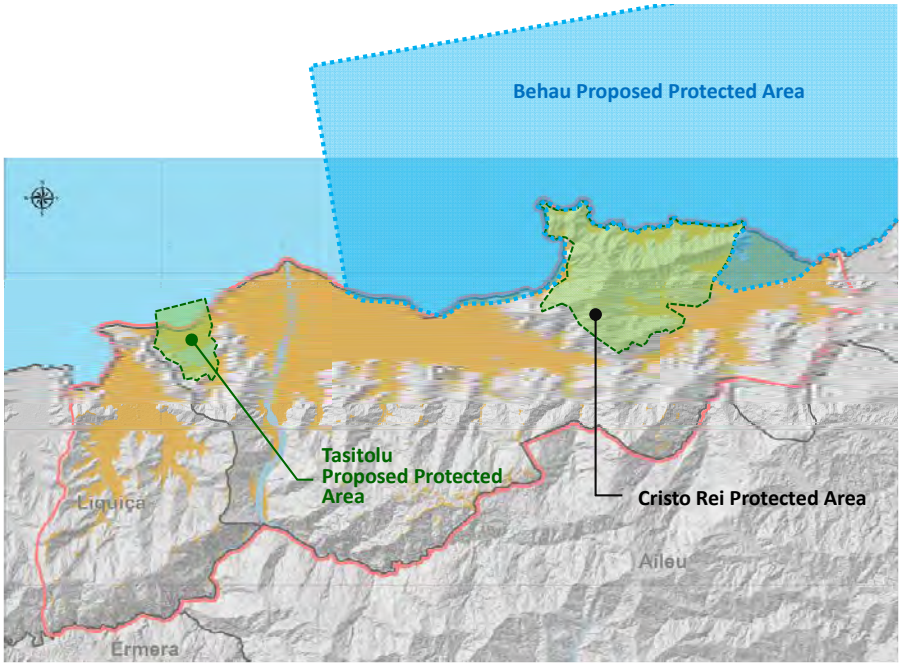
There are two protected areas designated by the Ministry of Agriculture and Fishery (National Directorate of Forest) and one proposed protected areas in DMA. Table 3.2.2 shows the current status of important natural areas in conjunction with current development projects in those areas, where urban development projects would be able to contribute to considerable economic development (especially tourism development) utilizing attractive and competitive natural resources.

From the point of view of sustainable economic development, careful environmental impact assessment (EIA) of these development projects are required and necessary mitigation measures for physical development in the existing or proposed protected areas.

Table 3.2.2 Environmental Protected Areas in DMA

Name of Area	Area	Status of Authorization	Consideration
1.Tasitolu Protected Area	3.8 km^2	Proposed in 2002 and Legislation by DNE 2014	Land concession to Pelikan Tourism Resort Project has been given by the Prime Minister Office where careful assessment and mitigation measures need to be taken. This is still under arrangement by the GoTL through the study of Tasitolu Master Plan for the protection and recreational development as a national holy place.
2. Cristo Rei Wild Protected Area	18.1 km^2	National Legislation by UNTAET 2000	Land concession to UNTL campus development has been proposed by the university where careful assessment and mitigation measures need to be taken.
			Land concession to Pacific Tourist Resort Project has been given by the Prime Minister Office where careful assessment and mitigation measures need to be taken.
3. Behau Proposed Protected Area	274.9 km^2	Proposed in 2008	Land concession to Hera Port of Naval Base Project has been given by the Prime Minister Office.

Note: National Directorate of Environment (DNE), Ministry of Commerce, Industry and Environment
Source: JICA Project Team, based on the www.protectedplanet.net (UNEP/IUCN joint URL)



Note: Tasitolu Proposed Protected Area has been approved officially by GoTL in 2014. Boundaries of both protected areas are temporal information.
Source: JICA Project Team, based on the www.protectedplanet.net (UNEP/IUCN joint URL)

Figure 3.2.3 Nature Protected Area and Proposed Areas in DMA

2) National Biodiversity Strategy and Action Plan

The GoTL has formulated the National Biodiversity Strategy and Action Plan (NBSAP) in line with the SDP in order to guide the framework to conserve its biodiversity and serves as safeguard in achieving the country's development agenda in the next two decades. It is consistent with the country's other sector policy frameworks such as the National Adaptation Program of Action on Climate Change (2010), the National Action Program to Combat Land Degradation (2009), and the Fisheries Sector Plan and the Forestry Sector Plan.

The success of implementing the strategy involves close coordination among the key directorates of GoTL concerned in biodiversity conservation and natural resources management, relevant economic sectors of GoTL, and with the private sector. It also involves updating the current programs and setting priorities for programming and funding.

The priority strategies and targets of the NBSAP will be implemented for a period of ten years (2011-2020) and will involve working not only among environment agencies but more particularly with key critical sectors such as agriculture and tourism, and engaging local communities, harnessing traditional knowledge, and providing livelihood to address conservation and income for poor and disadvantaged communities. The following are five priority strategies in the action plan:

- Priority Strategy 1: Mainstreaming biodiversity into sector plans and programs to address the underlying causes of biodiversity loss.
- Priority Strategy 2: Protecting biodiversity and promoting sustainable use.
- Priority Strategy 3: Building climate-resilient ecosystems through effectively managing protected areas and reducing threats to biodiversity.

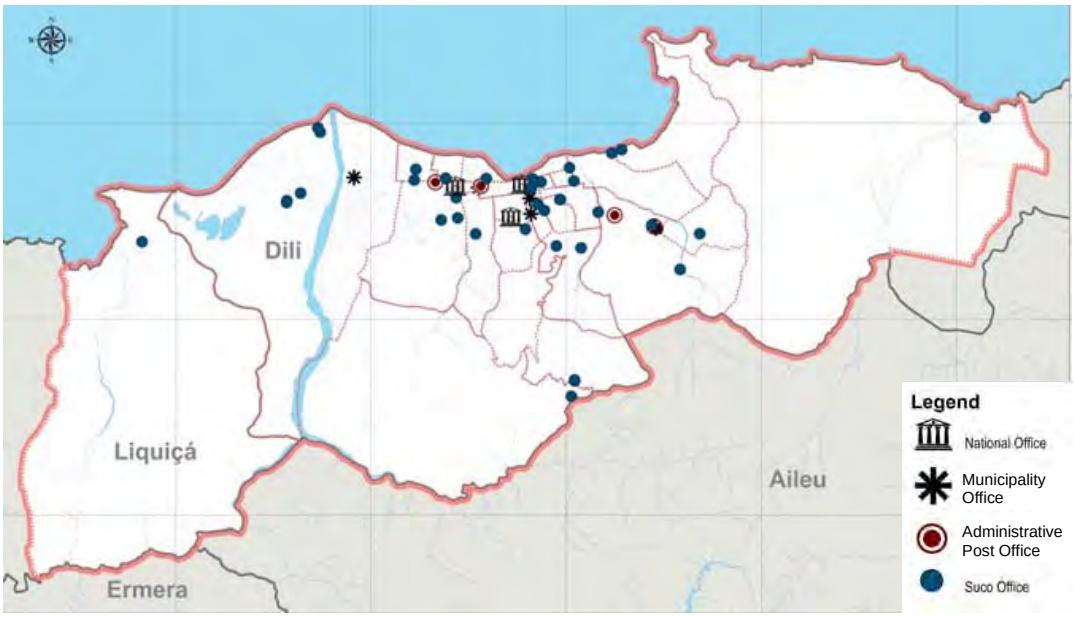
- Priority Strategy 4: Enhancing biodiversity and ecosystem services to ensure benefits to all.
- Priority Strategy 5: Enhancing implementation of NBSAP through participatory planning, knowledge management, and capacity building, including district and sub-district and community levels.

As NBSAP aims at implementing sector-wide programs, it is expected that various measures taking into account the protected areas, potential natural environment, and eco-friendly technology for urban and infrastructure development would be applied to DMA.

3.3 Existing Conditions of Key Public Facilities and Services

(1) Government Facilities and Administrative Services

The central government facilities are concentrated in the city center mainly in the sucos of Gricenfor, Colmera, and Caicori. Some government facilities utilizing unique colonial historic buildings are characterized as attractive heritage landscape of the capital city of Timor-Leste. Local public offices are located in each capital of the municipality (previous name of district was changed in 2014), administrative post (previous name of sub-district was changed in 2014), and suco administration.



Source: JICA Project Team, based on the geo-database of the General Directorate of Statistics (DGS), Ministry of Finance （MOF）

Figure 3.3.1 Key Government Facilities in DMA

Table 3.3.1 Government Administrative Facilities in DMA

Administrative Post (AP)	Suco	Government /Agencies	Municipality Office	AP Office	Suco Office	Total
CRISTO REI	Balibar	3	--	--	1	4
	Becora	5	--	2	1	8
	Bidau Santana	2	--	--	1	3
	Camea	1	--	--	1	2
	Culu Hun	2	--	--	1	3
	Meti Aut	0	--	--	1	1
	Hera	8	--	--	1	9
DOM ALEIXO	Bairro Pite	3	--	1	2	6
	Comoro	24	1	--	5	30
	Fatuhada	3	--	--	1	4
	Kampung Alor	2	--	--	1	3
NAIN FETO	Acadiru Hun	1	--	--	1	2
	Bemori	1	--	--	1	2
	Bidau Lecidere	2	--	--	1	3
	Gricenfor	2	--	--	2	4
	Lahane Oriental	2	--	--	1	3
	Santa Cruz	9	1	--	1	11
VERA CRUZ	Caicoli	25	--	--	1	26
	Colmera	18	--	--	1	19
	Dare	2	--	--	2	4
	Lahane Ocidental	1	--	--	1	2
	Mascarenhas	8	--	--	1	9
	Mottael	7	--	--	1	8
	Vila Verde	13	--	--	1	14
BAZARTETE	Tibar	6	--	--	1	7
TOTAL		150	2	3	32	187

Source: JICA Project Team, based on the geo-database of DGS (MOF)

(2) Education Services and Facilities

1) Education Sector Overview in Timor-Leste

Education in Timor-Leste has evolved through four periods, i.e., Portuguese colonial rule, Indonesian occupation, the United Nations Transitional Administration, and the independent Government of Timor-Leste. After the deterioration of the education system and facilities due to the Indonesian occupation, the government has made vigorous efforts to recover the education system in cooperation with the United Nations and other international donors. Table 3.3.2 shows the progress of education development and improvement using selected indicators.

Despite these achievements, the level of education in Timor-Leste is still not satisfactory as literacy rate was at 50% for the adult population, gross enrolment rate (2011) for secondary education at 56% and gross tertiary school enrolment at 16.5% (2009). It should be noted that the current population increase would bring further challenges not only to address the current issues but also to provide additional school facilities and teachers.

The education system in Timor-Leste is applied by using the four-level education system, namely: 1) pre-school education (4-5 ages) without compulsory status, 2) basic education (6-14 ages) as compulsory primary school with nine grades, 3) secondary education (15-17 ages) with three grades, and 4) higher education by university, college, or polytechnic school. One of the distinctive characteristics of schools in Timor-Leste is the role and share of private schools, which are mainly established by Catholic Church organizations.

Especially, Catholic schools in Dili District share 32% of the total schools while national share reaches 15% of total schools in Timor-Leste.

Table 3.3.2 Key Education Development Indicators in Timor-Leste

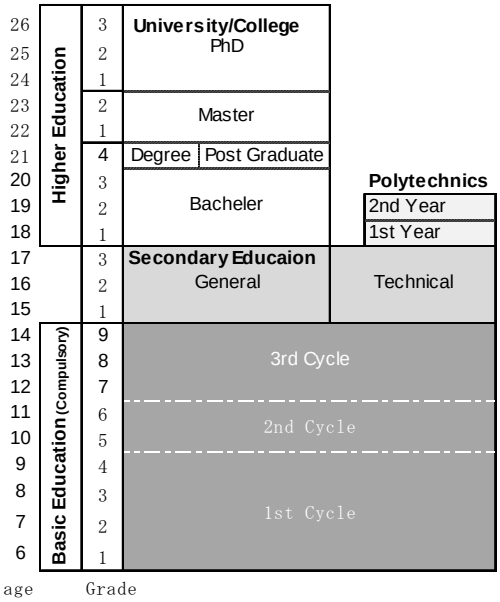
Category	Indicators	2001	2007	2009	2011
Literacy	Literacy rate, adult female (% of females ages 15 and above)	30.0	42.5	--	--
	Literacy rate, adult male (% of males ages 15 and above)	45.3	58.5	--	--
	Literacy rate, adult total (% of people ages 15 and above)	37.6	50.6	--	--
Primary School	Primary completion rate, total (% of relevant age group)	--	--	65.4	71.0
	Pupil-teacher ratio, primary	61.9	--	29.8	31.4
	School enrollment, primary (% gross)	118.2	--	106.1	125.0
	School enrollment, primary (% net)	--	--	77.3	91.1
	School enrollment, primary, private (% of total primary)	--	--	13.1	13.4
	Children out of school, primary	--	--	44,888	16,117
Secondary School	Lower secondary completion rate, total (% of relevant age group)	--	--	57.2	56.9
	Pupil-teacher ratio, secondary	28.0	--	--	24.3
	School enrollment, secondary (% gross)	36.5	--	56.7	56.6
	School enrollment, secondary (% net)	--	--	36.5	37.7
	School enrollment, secondary, private (% of total secondary)	--	--	22.2	26.5
Tertiary School	School enrollment, tertiary (% gross)	8.6*	--	16.5	--
	Public spending on education, total (% of government expenditure)	--	--	9.1	7.7
Budget	Public spending on education, total (% of GDP)	--	--	11.3	9.4

Source: Development Indicators, World Bank

Table 3.3.3 Education System and its Composition by Schools (2011) in Timor-Leste

Municipality	Total			Pre-school		Basic School			
						Cluster Center		Filial School	
		Public	Private	Public	Private	Public	Private	Public	Private
Dili	147	100	47	14	12	14	8	59	17
Liquica	91	64	27	1	19	7	1	54	6
Others	1,316	1,161	155	74	22	181	34	857	80
Total	1,554	1,325	229	89	53	202	43	970	103

Municipality	Secondary School				Gross Enrolment Rate	Net Enrolment Rate	Student per Teacher
	General		Technical				
	Public	Private	Public	Private			
Dili	11	10	2	0	111.48	39.66	24.88
Liquica	1	1	1	0	38.71	9.01	24.33
Others	32	18	17	1	n.a.	n.a.	n.a.
Total	44	29	20	1	38.08	11.74	n.a.



Source: National Education Strategic Plan 2011-Ministry of Education (MOE)

2) Education Facilities and Manpower in DMA

The statistical information of the Ministry of Education indicates key numbers of school facilities and teachers in DMA as shown in Table 3.3.4. There are some gaps in the numbers of schools and teachers among administrative posts in terms of insufficiency of facilities and staff against the existing number of pupils or students indicated by students-teachers ratio. The gap of insufficiency of school service by teachers becomes wider between public and private schools, of which private sector is lower than the public school.

Figure 3.3.2 shows spatial distribution of key education facilities in the level of basic, secondary, and higher education in DMA. Current spatial distribution of the education facilities implies that basic education facilities area dispersed equitably in each administrative post of DMA while some universities and colleges located in suburban area in DMA such as the Faculty of Technical Engineering of UNTL in Hera and Tibar National Job Center in Tibar Suco.

Table 3.3.4 Key Education Facilities and Relevant Indicators for 2013 in DMA

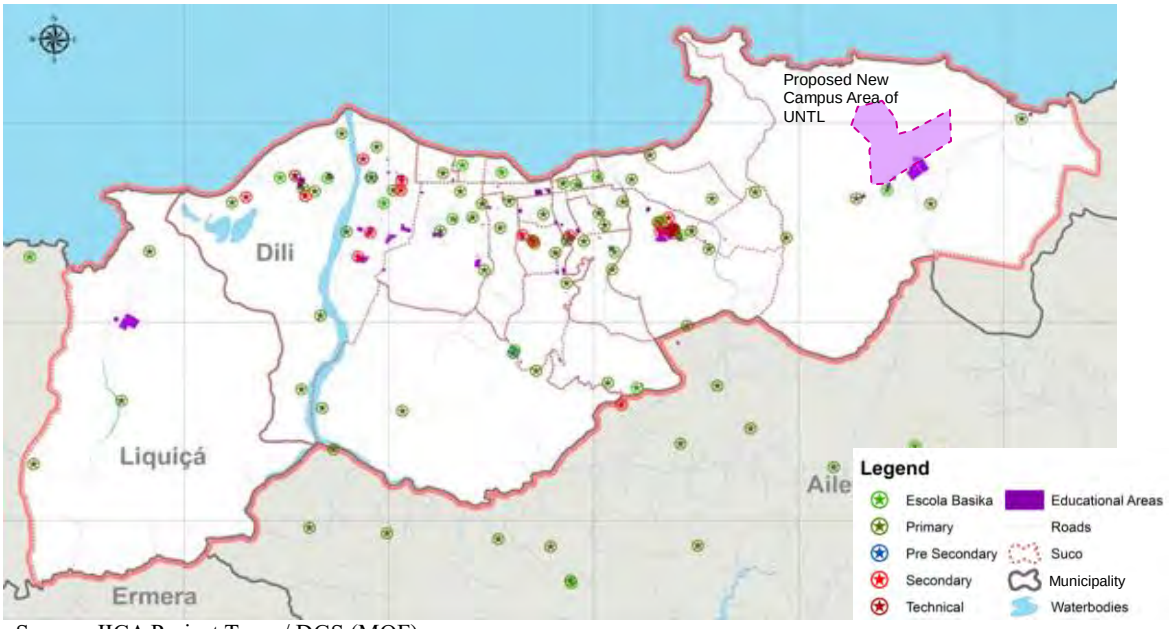
Number of Schools by Administrative Post

School Municipality	Administrative Post	Operation	Type of School				Total	School per 10,000 p
			Basic (B)	Primary (P)	Secondary (S)	Technical		
Dili	Cristo Rei	Public	4	13	3	3	23	5.6
		Private	0	4	4	0	8	
	Nain Feto	Public	1	5	0	0	6	4.9
		Private	0	2	5	0	7	
	Vera Cruz	Public	1	7	1	0	9	4.1
		Private	0	2	3	0	5	
	Dom Aleixo	Public	4	13	2	0	19	4.2
		Private	0	10	14	1	25	
	sub-total	Public	10	38	6	3	57	4.6
		Private	0	18	26	1	45	
Liquica (Bazartete)	Tibar Suco	Public	0	4	0	0	4	19.4
		Private	0	0	2	0	2	
Total		Public	10	42	6	3	61	4.8
		Private	0	18	28	1	47	
			10	60	34	4	108	

Student and Teacher Ratio by Administrative Post

School Municipality	Administrative Post	Operation	Students / Teacher Ratio				Average
			Basic (B)	Primary (P)	Secondary (S)	Technical	
Dili	Cristo Rei	Public	32	48	22	15	30
		Private	0	66	28	0	43
	Nain Feto	Public	35	57	0	0	50
		Private	0	51	55	0	54
	Vera Cruz	Public	45	39	28	0	35
		Private	0	40	59	0	53
	Dom Aleixo	Public	29	61	29	0	44
		Private	0	30	85	57	50
	sub-total	Public	32	53	26	15	37
		Private	0	39	60	57	50
Liquica (Bazartete)	Tibar Suco	Public	0	43	0	0	43
		Private	0	0	24	0	24
Total		Public	32	53	26	15	37
		Private	0	39	59	57	50
			32	49	39	19	87

Source: Ministry of Education, 2013



Source: JICA Project Team / DGS (MOF)

Figure 3.3.2 Education Facilities in DMA

3) Education Sector Policies and Strategy

Key national policies and strategies are stated in the SDP and the National Education Strategic Plan 2011-2030 (hereinafter referred to as NESP) being reflective of State's commitment to the Millennium Development Goals (MDG) and for the provision of education for all. The NESP 2011-2030 illustrates goals to achieve "Quality", "Equity", "Access", "Social and Economic Relevance", "Co-participation", "Social partnership", and "Flexibility. The following are key measures stated in the NESP to implement as priorities programs.

- The reform of the education system, seeking to: (i) improve the quality of education and (ii) ensure equal access to all Timorese in various levels of education.
- The reform of the education management and administration system, with the main goals of: (i) decentralizing education services, (ii) creating regional inspection services and defining the role of the school inspector, (iii) drafting a new teacher training policy, and (iv) improving the quality of management and administration in the ministry.

4) New Campus Master Plan of University of Timor Lorosa'e (UNTL)

The UNTL has developed the master plan of the "University City" in Hera approved by GoTL, where the campus including the two faculties of Technical Engineering and Agronomy located in administrative post of Cristo Rei close to Hera Town. It should be noted that the utilization program of existing campus sites of UNTL in Dili City is not fixed yet, although UNTL mentioned that higher level of education such as advanced research institute or doctorate education facilities. Also, it is observed that the planned campus property area of UNTL covers the mountain areas as part of the Cristo Rei Protected Area.

The University City covers a proposed site of 367 ha and located at 8 km from the city of Dili. The master plan illustrates its development framework as follows:

- Maximum capacity of 55,000 students, involve a faculty of 1,200 teachers/researchers.

- Maximum capacity of 4,000 night population including residents for administrators and teachers and some dormitories for students.

Source: Urban Master Plan for University City / University National Timor Lorosa'e 2012

Figure 3.3.3 Urban Master Plan for University City in Hera

(3) Health Services and Facilities

1) Health Sector Overview in Timor-Leste

Timor-Leste faces numerous challenges for people's health and well-being, where 70% of the population lives in the rural areas with small and dispersed villages and poor access roads isolated by mountainous terrain. The country has made steady progress in the health sector in the last decade by the reconstruction of health facilities and expansion of community-based health services known as "*SISCa*[1]" program. Achievements can be seen in Table 3.3.5 such as reduction in infant mortality rate from 88 to 44/1,000 live births, elimination of maternal, reduction of incidence and prevalence of malaria, tuberculosis, etc.

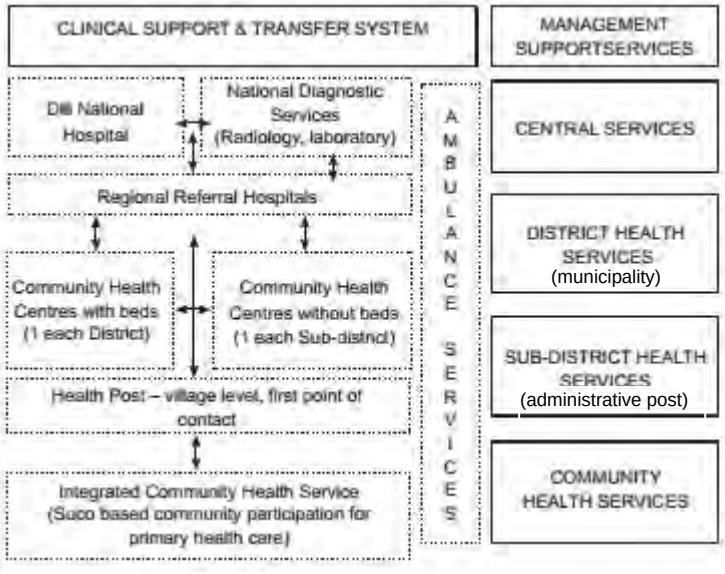
Table 3.3.5 Key Health Indicators in Timor-Leste

Key Health Indicators	Unit	2001	2007	2009
Under-5 Mortality Rate	% per 1,000 live birth	125.0	92.0	64.0
Infant Mortality Rate	% per 1,000 live birth	88.0	60.0	44.0
Proportion of Children Immunized against Measles	%	39.0	63.0	68.2
Maternal Mortality Rate	per 10,000 population	66.0	n.a.	45.0
Proportion of Children Immunized against Measles	%	19.0	19.0	29.6
Contraceptive Prevalence Rate	%	8.0	19.8	22.4
Antenatal Care Coverage at Least One Visit	%	42.5	55.4	86.0
Incidence associated with Malaria	per 1,000 population	113.0	206.0	113.0
Incidence associated with Tuberculosis (TB)	per 10,000 population	25.0	250.0	14.5

Source: JICA Project Team / Timor-Leste Human Development Report 2011-UNDP

[1] SISCa: Servisu Integradu da Saúde Communitária ("Integrated Community Health Services")

The National Health Service in Timor-Leste is organized by hierarchical services in each level of nation, municipality (ex-district), administrative post (ex-sub-district), and suco (community). The health service in DMA covers all levels of services from the Dili National Hospital as one of the central services to health posts as primary health care program in each suco of DMA.



Note: Health administrative system is based on the National Health Sector Strategic Plan in 2011.
Source: National Health Sector Strategic Plan 2011-2030 (NHSSP)

Figure 3.3.4 Current National Health Service in Timor-Leste

2) Health Facilities and Staff in DMA

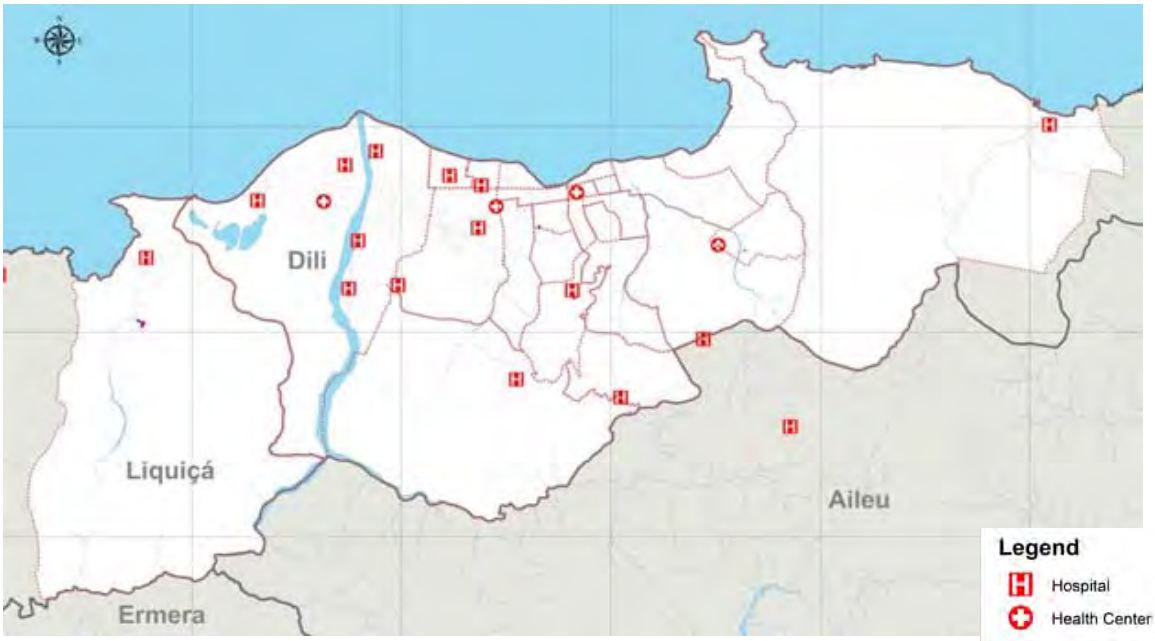
The statistical information of the Ministry of Health indicates key numbers of health facilities and staff in DMA. There are some gaps in the level of health services among administrative posts in terms of insufficiency of facilities and staff for health services against the number of population. The administrative posts of Vera Cruz and Dom Aleixo have comparatively better services beyond the national average, while Cristo Rei and Nain Feto are under or close to the national average as shown in Table 3.3.6.

Figure 3.3.5 shows the spatial distribution of key health service facilities of hospital and health center in DMA. Current distribution of the health facilities implies that the eastern part of DMA with high-density settlement have comparatively insufficient health facilities.

Table 3.3.6 Health Service Facilities and Staff for 2014 in DMA

School Municipality	Administrative Post	Key Health Facilities			Key Staff of Health Facilities				Hospital per	Medical Staff
		Hospital	Health Center	Total	Medical	Nurse	Midwife	Total	100,000p	per 10,000p
Dili	Cristo Rei	1	1	2	10	18	21	49	3.6	1.82
	Nain Feto	0	1	1	0	7	5	12	3.8	0.00
	Vera Cruz	3	0	3	10	15	14	39	8.8	2.94
	Dom Aleixo	9	2	11	10	23	19	52	10.5	0.95
	sub-total	13	4	17	30	63	59	152	7.7	1.36
Liquica	Tibar Suco	1	0	1	0	1	1	2	32.3	0.00
	Total	14	4	18	30	64	60	154	8.0	1.34
Timor-Leste Total		48	92	140	184	1007	431	1,622	4.5	1.73
								Japan	21.9	6.81

Source: Ministry of Health 2014, Japan Medical Survey 2011, and Population is based on the Census 2010



Source: JICA Project Team based on the Geo-database of General Directorate of Statistics (MOF)

Figure 3.3.5 Government Facilities in DMA

3) Health Sector Policies and Strategy

Key national policies, strategies, and legislations for the health sector of Timor-Leste are in place. The SDP and National Health Sector Strategic Plan 2011-2030 (hereinafter referred to as NHSSP) are reflective of the state's commitment to the MDG and provision of free universal health coverage. The NHSSP 2011-2030 illustrates a vision towards a "Healthy East Timorese People in a Healthy Timor-Leste". The following are specific goals stated in the NHSSP:

- To have a comprehensive primary and hospital care services with good quality and accessibility to all Timorese people.
- To provide adequate support system to health care service delivery.
- To promote higher community partnership and participation in the improvement of national health system.

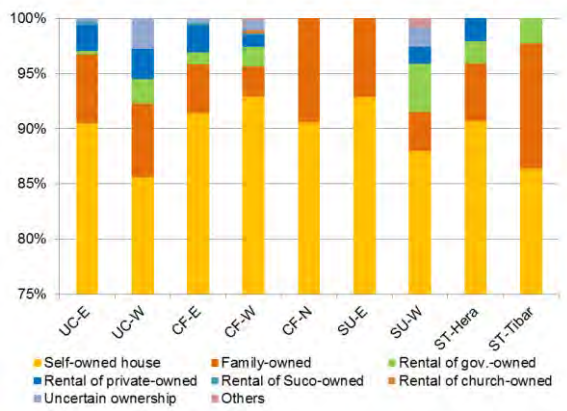
(4) Existing Living Environment Conditions by Key Indicators

In spite the recovery of public service in DMA after the deterioration of urban service system and facilities due to Indonesian occupation, there are still insufficient basic urban services and facilities such as water supply, sanitation, drainage system, although the government has made vigorous efforts to reconstruct urban service in cooperation with UN and other international donors.

Figure 3.3.6 shows the current status of living environment in DMA by selected indicators according to the Household Survey conducted by the JICA Project Team (September – December 2014). It can be observed that natural living environment was accepted by the people in DMA in general, although people's answers indicated their experiences of natural hazard, land subsidence, and lack of infrastructure and public services such as water supply, waste collection, and school and health services. Especially, Hera and Tibar showed comparatively negative results in many questions.

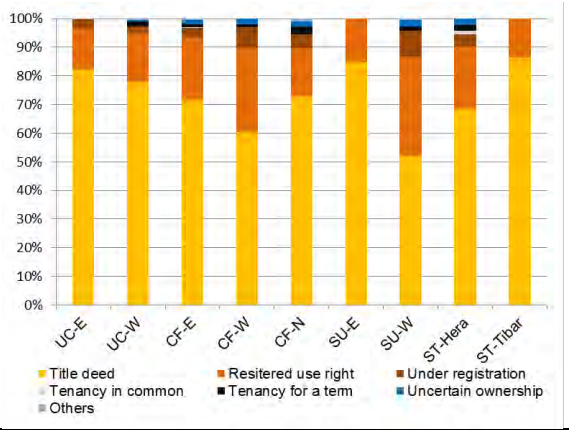
House Ownership

- Most of the buildings/houses (over 90%) are self-owned followed by family-owned status in every urban block.
- Another distinct status for house ownership is house rental from government housing and private-owned housing



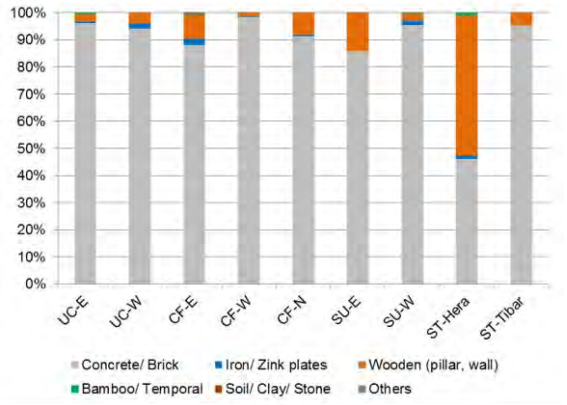
Land Tenure Status

- Majority of people in every urban block claim their land rights by possession of title of deeds or use rights despite the fact that official land tenure data system has not been established yet.
- There is comparatively large portion of tenancy status in the suburban – west urban block.



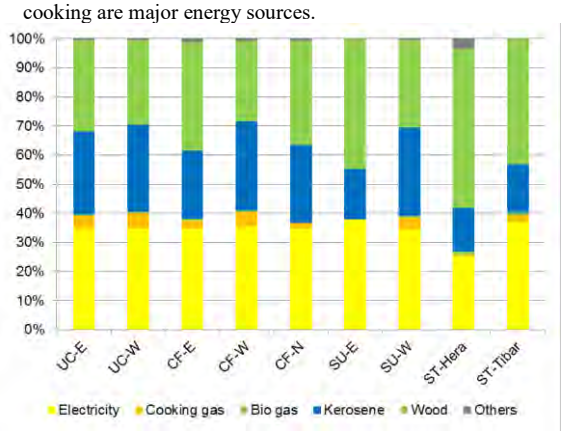
Building Structure

- Buildings are predominantly made by concrete block except in Hera where wooden structure is shared by over 50%.



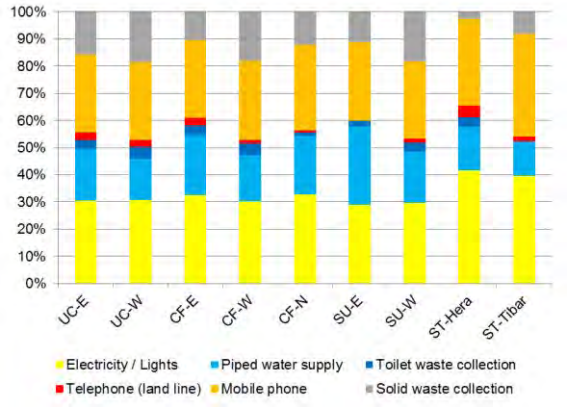
Cooking Energy Source

- Energy sources for cooking is composed mainly of wood, electricity and kerosene, while electricity and wood use for cooking are major energy sources.



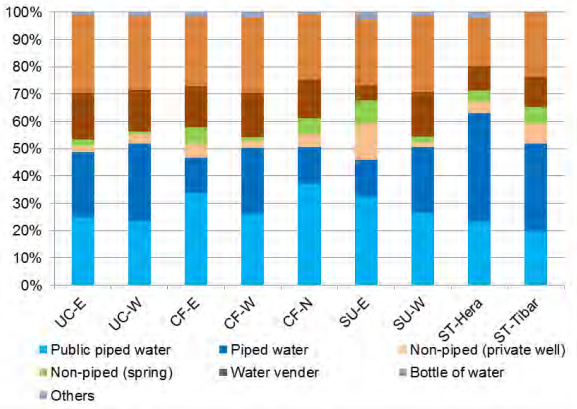
Urban Services Share by Beneficiaries

- Every key urban service is basically of the same proportion as their availability shares in every urban block.
- Electricity and mobile phones are obviously main urban service facilities in every urban block rather than other utilities such as water supply and waste collection services.



Drinking Water Source

- Public water pipe supply in each urban block is under 40% share, while private piped water supply or well is observed even in urban blocks in the city center.
- Commercial water by vender or plastic bottle water provision is also counted over 40% even in the urban center block.

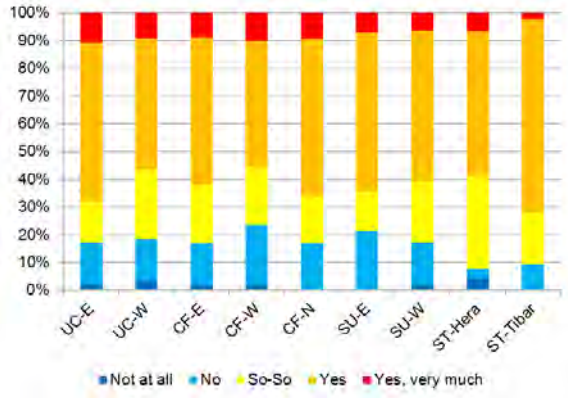


Source: JICA Project Team (Household Survey 2014)

Figure 3.3.6 Existing Living Environment Conditions-1 in DMA by Household Survey 2014

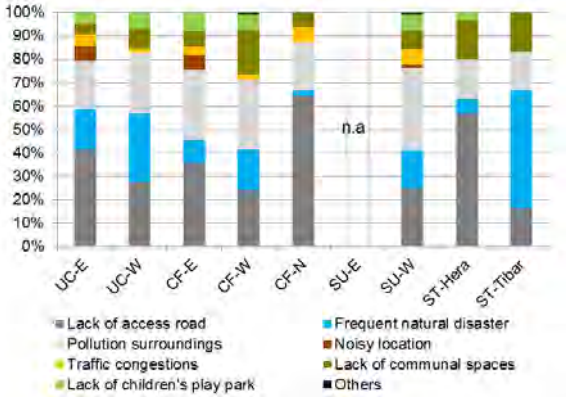
Environment Satisfaction in House Surroundings

- With regard to the question on satisfaction in the surrounding environment, over 80% of the people in every urban block answered "yes very much", "yes" and "so-so".



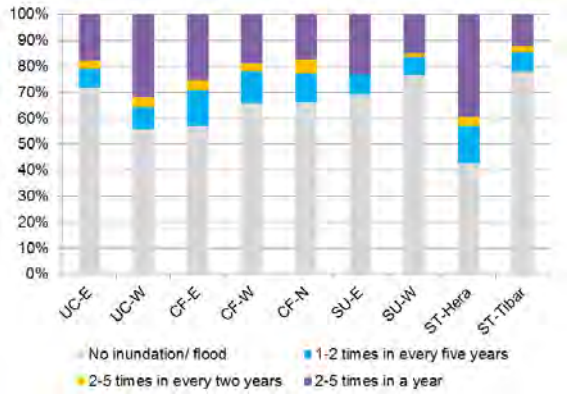
Reasons by Not Satisfaction in Surroundings

- Among the reasons for unsatisfied surrounding environment, lack of access road is the major negative element followed by "pollution" and "natural disaster".



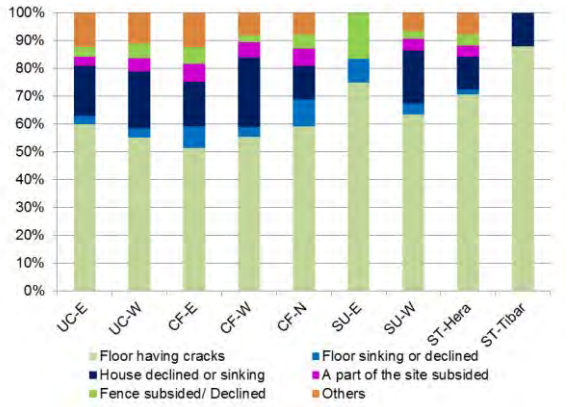
Frequency of Inundation / Flood

- Hera is one of the areas most frequently experiencing flooding or inundation among the urban blocks followed by the Urban Center West block (e.g., Colmera, Caicoli Suco, etc) according to peoples' answers.
- Majority answered that the frequency of water hazard is "2-5 times in a year".



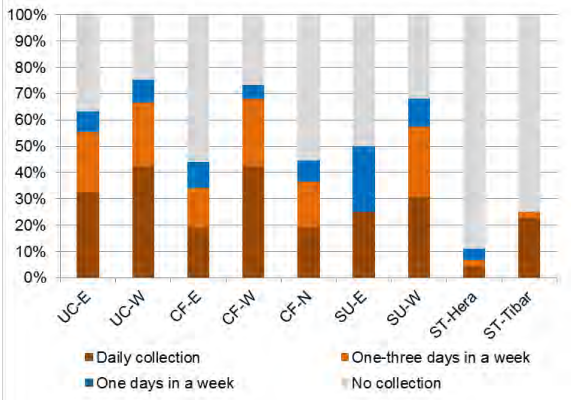
Land Subsidence Occurrence

- People in every urban block answered there is land subsidence, where the urban center and fringe areas have been suffering this occurrence.



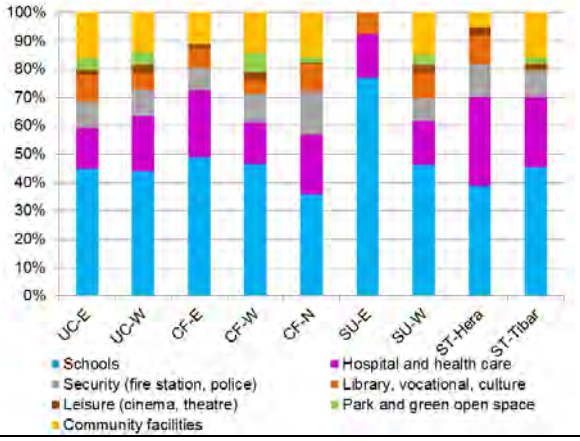
Frequency of Waste Collection

- Waste collection in the urban center and fringe areas shows better frequency except in the Central Fringe East and North blocks.
- Hera and Tibar blocks show obviously lack of opportunity for waste collection according to people's answers.



Needs Priority of Urban Service / Facilities

- School is the most important priority service or facility, especially in the Suburban East block.
- Hospital and health care are the second priority for necessary urban service in every urban block.



Source: JICA Project Team (Household Survey 2014)

Figure 3.3.7 Existing Living Environment Conditions-2 in DMA by Household Survey 2014

3.4 Historical and Cultural Heritages and its Conservation

Timor-Leste has various historical and cultural heritages in terms of both tangible and intangible assets. Intangible assets include artifacts such as dances and songs, woodcraft, pottery, and weaving skills, and other 'ritual language' poetry by different ethno-linguistic groups in the country. On the other hand, tangible assets are represented mainly by historical and cultural buildings in the colonial influences of Portuguese, Indonesian, and others of which buildings remain as administrative buildings, graves, monuments including pre-colonial heritages and archeological and rock art sites.

(1) Institutional Framework for Historical and Cultural Heritages in Timor-Leste

GoTL emphasizes the importance of conserving the nation's cultural heritage and supporting communities to increase income and social well-being from their cultural heritage assets. The Timor-Leste Strategic Development Plan (SDP) states the strategy for culture and heritage as follows: "to achieve our aim for Timor-Leste to become a prosperous, developed nation by 2030, we will need to encourage our cultural diversity and build respect for our cultural heritage and shared history, while integrating what works for us from other cultures to enrich our own" (pp. 63 in the SDP).

Currently, there is no Law on Cultural Heritage and the Government Resolution 25/2011 as effective guidance until the establishment of the Cultural Heritage National Law, stipulated policies and guidance related to the protection of cultural heritage. On the other hand, the National Policy for Culture (2009) describes key recommendation policies as shown below, while the GoTL established the State Secretariat of Arts and Culture (SEAC) under the Ministry of Tourism, Arts and Culture to conserve and promote the cultural heritage of Timor-Leste.

- Strengthen the legal framework and institutional capacity for protecting and developing cultural heritage.
- Build knowledge and understanding of the value of cultural heritage.
- Empower communities to conserve and develop their cultural heritage assets.
- Develop markets for sustainable tourism and creative industries.

(2) Historical and Cultural Heritages in DMA

Dili Municipality is characterized as one of the richest tangible heritage places in Timor-Leste, where many historical buildings of the Portuguese colonial facilities and facilities in Indonesian occupation are concentrated in the city center and still being utilized mainly by government administration.

The SEAC has made efforts to identify heritages in conjunction with the project of "*The Road to Promoting Cultural Heritage for Development"* supported by the World Bank and other cultural projects. The heritage inventory in Dili under the project has initially been made, although it is still underway to list all tangible and intangible cultural and historical heritages at present. Figure 3.4.1 shows the distribution of cultural heritages as the preliminary result of the survey by SEAC.

(3) Attractive Historical Townscape in Dili

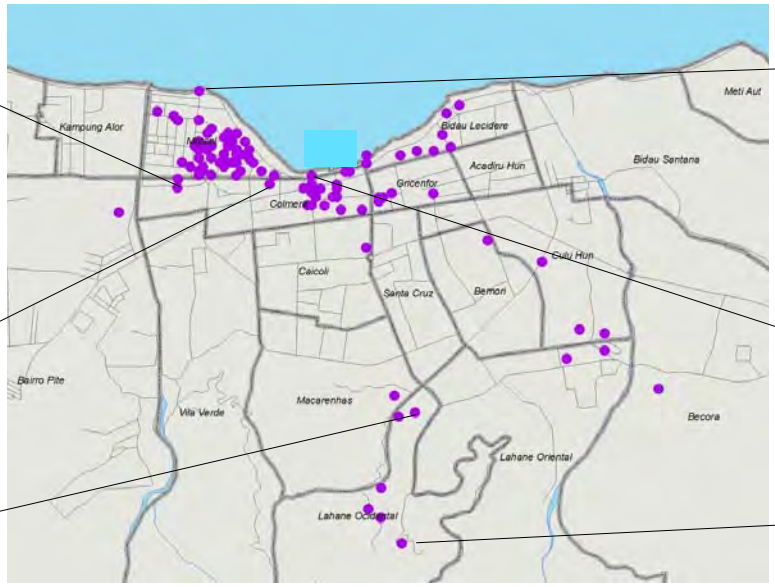
The townscape of Dili, especially in the city center area, has attracted visitors, not only foreign tourists but also people of Timor-Leste as one of their national identity. Visitors are enjoying the historical environment in the city center where many Portuguese colonial buildings are distributed mainly in sucos of Motael, Gricenfor, and Bidau Lecidere. It is necessary and important for these heritages not only to protect the buildings but also to conserve the historical environment with townscape ensemble in consideration with building controls such as height, colors, and materials to harmonize the

neighboring buildings with the heritage. On the other hand, urban management measures also have to be introduced into this historical townscape area by walkway network, traffic control, and parking system to enhance the attractiveness of the historical environment.

Tempo da Administracao Portuguesa

Antigo Posto da Alfandega

Antigo Paiol de Lahane Ocidental



Legend: ● Historical buildings identified by SEAC.

Farol de Dili

Palacio de Governo Timor Leste

Antigo Hospital Dr. António de Carvalho

Source: JICA Project Team, based on the State Secretariat of Arts and Culture (SEAC)/ Ministry of Tourism, Arts and Culture (MOTAC)

Figure 3.4.1 Historical Cultural Heritages in Dili City Center

CHAPTER 4 : CONDITIONS OF ROAD AND TRANSPORT

4.1 Road and Urban Transportation

4.1.1 Review of Current Conditions (Including Donor Activity)

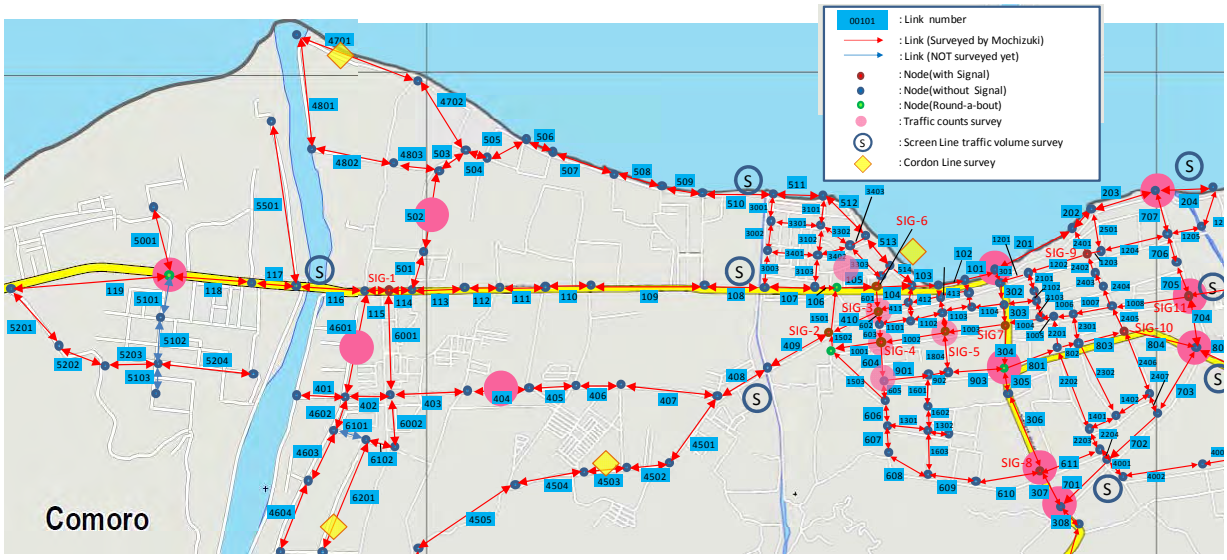
(1) Conditions of Development of Road Network (Dili Metropolitan Area)

The current road network in Dili Metropolitan Area (DMA) is shown in Figure 4.1.1. In the road network, National Road A01 (called Presidente Nicolau Lobato Avenue shown as link number 107 to 116 in Figure 4.1.1 and shown in Figure 4.1.2) and "Banana-Road" (shown as link number 402 to 406 in Figure 4.1.1) have four lanes, but the other roads have less than four lanes.

Furthermore, many one-way streets can be seen in the eastern part of DMA (the old town), shown as unidirectional arrow links in Figure 4.1.1.

Currently, the ring road is not developed in DMA. Although the shapes of Estrada De Balide (shown as link number 606 to 610 in Figure 4.1.1) and Rua Ponte Meira (shown as link number 701 to 707 in Figure 4.1.1) are as ring roads, these roads have unpaved, one-way and narrow sections (shown in Figure 4.1.2) . Therefore, these roads are hardly functioning as ring roads.

The condition of road congestion in DMA is notably not serious because the current number of vehicles in Dili is still small. However, the current road capacity, especially along the east-west direction, is limited. For example, there is only one street across the Comoro River. Therefore, traffic congestion in the future due to motorization is a matter of concern.



Source: JICA Project Team

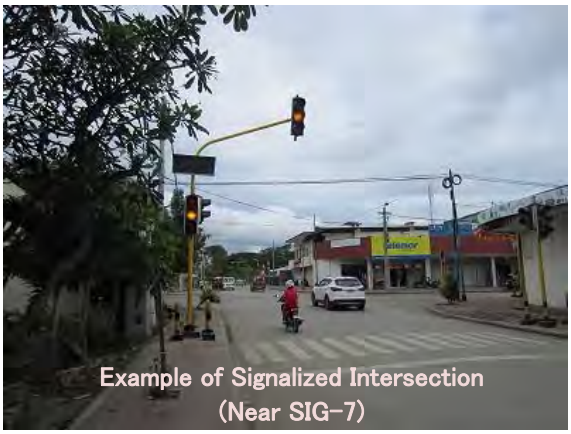
Figure 4.1.1 Current Road Network in Dili Metropolitan Area (Excerpt)

Source: JICA Project Team

Figure 4.1.2 Pictures of Current Road Network Condition in Dili Metropolitan Area

DMA has 11 signalized intersections including the ones under construction as shown in the left photo of Figure 4.1.3. All signals are stand-alone controlled (single-point signal controlled), and these are not optimally controlled in accordance with traffic volume or other signals.

DMA also has four rotary intersections (roundabout) as shown in the right photo of Figure 4.1.3.



Source: JICA Project Team

Figure 4.1.3 Pictures of Signals and Rotary Intersection in Dili Metropolitan Area

(2) Conditions of Development of Road Network Title (Inter-city)

Figure 4.1.4 shows the current inter-city national road network in Timor-Leste. The inter-city road network connects radially between the capital city Dili and other major cities.

Four national roads exist through Dili Metropolitan Area:

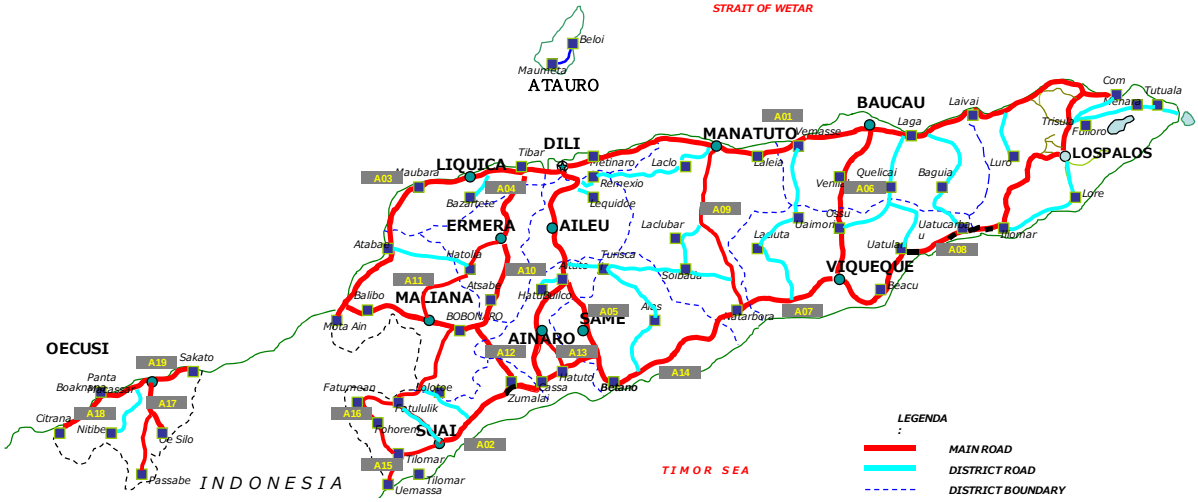
National Road A01: from DMA to Hera District, Baucau City and Com City (eastern part of Timor-Leste)

National Road A02: from DMA to Aileu District, Suai City (southern part of Timor-Leste)

National Road A03: from DMA to Tibar District, Liquica City and Mota-Ain (western part of Timor-Leste)

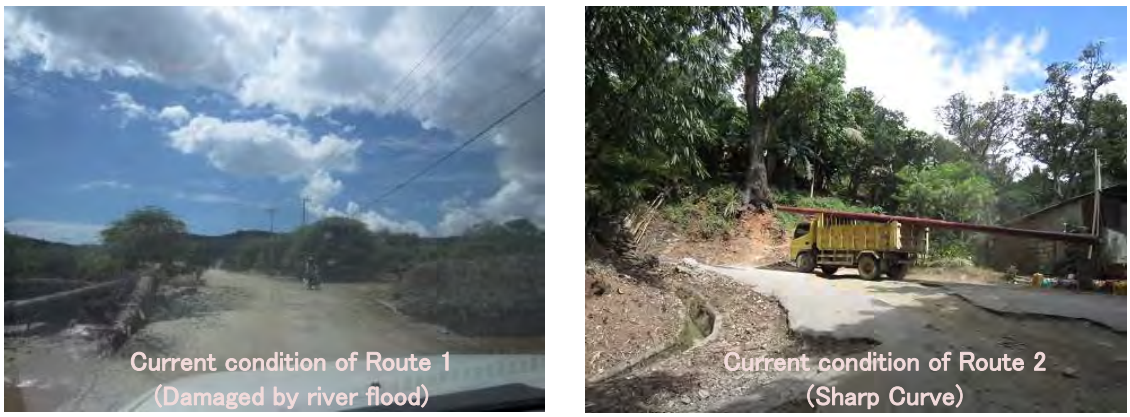
National Road A04: from DMA to Ermera District (south of Liquica district)

All of these national roads have sections that are bumpy, steep sloped, and lacked road management as shown in Figure 4.1.5, because these pass through precipitous areas or rivers flooded repeatedly. National Road A02, in particular, is across mountain areas and has many hairpin turns and narrow sections. Vehicles can hardly pass each other.



Source: Ministry of Public Works (MoPW)

Figure 4.1.4 Inter-city National Road Network in Timor-Leste



Source: JICA Project Team

Figure 4.1.5 Pictures of Current Inter-city Road Network Condition

(3) Conditions of Development of Toll Road

At present, no toll road exists in DMA. According to an interview with a Ministry of Public Works, Transport and Communications (MoPWTC) staff, there is an idea to introduce road pricing at Comoro Bridge in the future.

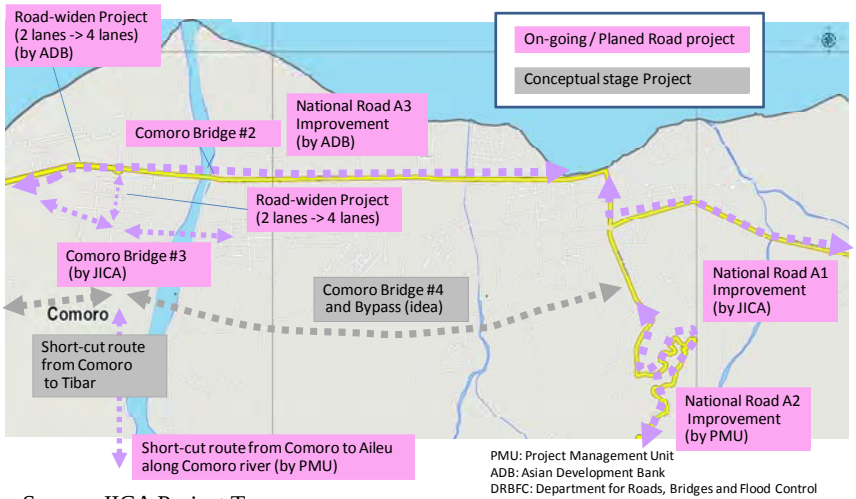
(4) Conditions of Road Construction Projects

According to an interview with MoPWTC, road construction projects in DMA (including those at the initial conceptual stage) are as shown in Table 4.1.1 and Figure 4.1.6.

Table 4.1.1 Road Construction Projects in Dili Metropolitan Area

Project Name	Project Outline	Donor
The upper river Comoro bridge (Comoro Bridge #3)	New bridge construction project at the upstream of the existing Comoro Bridge. The bridge will connect to Banana-road, and it will be formed as newly east-to-west axis of road network of Dili Metropolitan Area.	JICA
Comoro Bridge #4	New bridge construction project at the upstream of Comoro Bridge #3 (Details are unknown)	ADB
Right bank road of Comoro River	It will create a short-cut from Comoro to Aileu along Comoro River (Widening of existing narrow road)	R4D and Rural government
National Road A03 Road widening project	Road widening from 2 lanes to 4 lanes in the western part of the entrance to Dili Presidente Nicolau Lobato International Airport	ADB
National Road A01 Road improvement project	Road improvement of National Road A01 (Mainly improvement of disaster prevention and pavement, details are to be confirmed)	JICA
National Road A02 Road improvement project	Road improvement of National Road A02 (Mainly improvement of disaster prevention and pavement, details are to be confirmed)	WB
National Road A03 Road improvement project	Road improvement of National Road A03 (Mainly improvement of disaster prevention and pavement, details are unknown) *There is a conceptual idea of short-cutting by tunnel near Tiber.	ADB (From Airport roundabout to Tibar junction) PMU(from Tibar junction to westbound)

Source: Ministry of Public Works, Transport and Communications (MoPWTC) and JICA Project Team and PMU(Project Management Unit)



Source: JICA Project Team

Figure 4.1.6 Road Construction Projects around Central Dili

(5) Conditions of Development of Public Transportation

At present, there is no track-based transportation system in DMA, therefore the mini-bus called "Microlet" is the only public transportation.

Each Microlet is operated by small private enterprise, and operated along a fixed route licensed by MoPWTC. In DMA, there are 10 licensed Microlet routes. There is no fixed timetable of Microlet. It runs at about 1-2 min intervals during daytime of weekdays and at about 5-10 min intervals during holidays. Figure 4.1.7 shows a typical Microlet.

Bus stops almost do not exist along road sides; moreover, passengers are also not informed of routes and fare. It could be concluded that Microlet is a difficult mode of transportation for visitors.

Riding capacity of Microlet is small (about 10 persons), therefore overcrowded situation (such as passengers loaded out of the vehicle) can often be seen during peak hours. Due to overcrowded situation, Microlets may pass the bus stops even though there are persons waiting.

There are other modes of transportation such as taxis and inter-city buses connecting Dili and other cities.

In addition, "passenger truck", on which deck passengers are loaded, can be seen mainly during inter-city trip.

There are currently neither airport-downtown shuttle bus nor sightseeing round-trip bus services in DMA. Visitors are expected to use taxis mainly for inner-city traveling.

Source: JICA Project Team

Figure 4.1.7 Pictures of Public Transportation (Microlet) in Dili Metropolitan Area

4.1.2 Institutional and Regulatory Conditions

(1) Related Laws and Regulations

Each road construction project is carried out based on road design standards in Timor-Leste (e.g., 30-m right of way should be ensured for national roads), but these standards are yet not formally approved.

There is no road-related tax revenue system in Timor-Leste, unlike Japan that has road-related tax revenue system for supporting road construction.

Regarding land acquisition for road construction projects, there is no legal system like the land expropriation law in Japan; and there is no system for making the value of land public, therefore one-on-one negotiations with landowners are required. As a result of these, delays on land acquisition and consequently, of the project can be often seen.

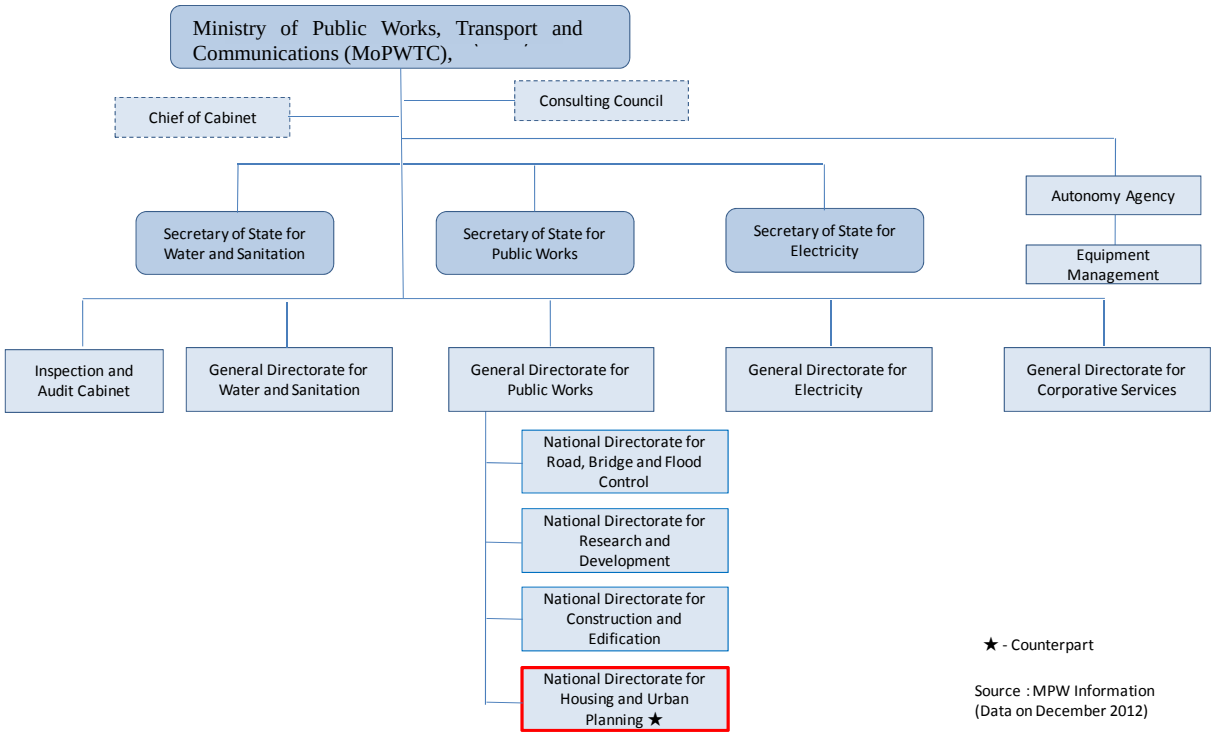
(2) Roles and Tasks of Related Organizations

The National Directorate for Road, Bridge and Flood Control (DRBFC) which is under MoPWTC is the institution in charge of road development including survey, planning, and construction of national roads and other roads in DMA, as shown in Figure 4.1.8.

DRBFC has an organizations' headquarters and there are 13 local road administrators all over the country. DRBFC is also in charge of road maintenance, e.g., for maintenance of pavements.

There are other institutions related to road construction projects such as the Institute of Equipment Management (IGE), State Secretary for Support and Promotion of Private Sector (SEPFOPE), and Ministry of State of Administration (ESTATAL).

DRBDC is trying to hold working group meetings to share information with the other institutions, however, their road project information is not completely shared with each other.



Source: JICA Preparatory Survey for the Construction of Upriver Comoro Bridge in the Democratic Republic of Timor-Leste

Figure 4.1.8 Organizational Chart of Ministry of Public Works, Transport and Communications (MoPWTC)

The National Directorate of Land Transport (DNTT) which is under MoPWTC is the institution in charge of public transportation. DNTT is the authority issuing licenses of Microlets; and also in charge of public transportation facility improvement planning including bus shelter and traffic safety facilities such as parking lots, road signs, and road surface markings.

There is no transportation bureau in DMA as can be found in developed countries and the neighboring country, Indonesia. Each public transportation mode is operated independently and financially by the private sector.

4.1.3 Traffic Survey

(1) Objectives for Traffic Survey

The major objectives of traffic surveys are as follows:

・To identify road transport issues based on the traffic flow composition on a weekday; and

・To formulate a database for traffic forecast in 2030.

(2) Outline of Traffic Survey

Two types of surveys were conducted as shown in Table 4.1.2, a Household Interview Survey consisting of Person Trip Survey and Stated Preference Survey, and a Traffic Count Survey consisting of a Cordon Line Survey, Screen Line Survey, Traffic Count Survey, and Travel Speed Survey. The traffic survey has a total of six kinds of survey.

Table 4.1.2 Summary of Traffic Survey

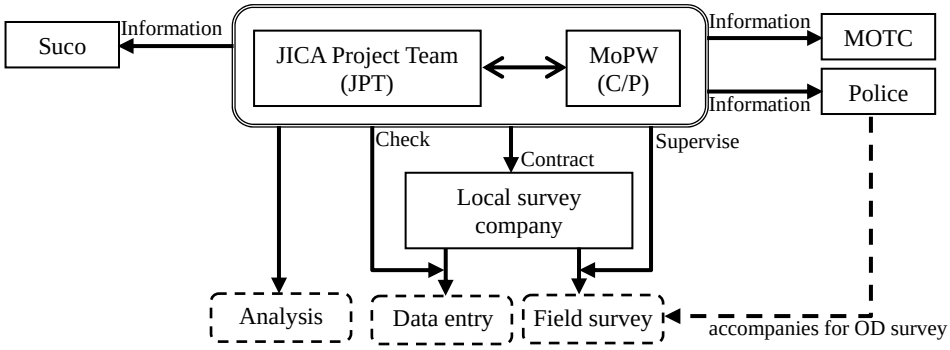
Type	No	Name	Objectives	Method	Contents of Survey
Household Interview Survey	1	Person Trip Survey	To acquire information of residents on the travel activities such as origin, destination, trip purpose, and travel time.	Interview of sampled household members at their home and conduct interview survey.	Interview to 3,000 households (response rate is more than 80%)
	2	Stated Preference Survey	To obtain factors for preference of traffic mode selection to an installation of a new traffic system	Interview to household members in the person trip survey	Interview to 500 samples
Traffic Count Survey	3	Cordon Line Survey	To capture inbound and outbound traffic of the project area and supplement the result of the person trip survey	Interview to persons at the major road crossing the boundary of the project area (the cordon line of the project area)	Roadside interview survey (12hrs, 6:30 – 18:30): 13 survey points
					Roadside Traffic Counts survey (12hrs, 6:30 – 18:30): 7 survey points
					Roadside Traffic Counts survey (24hrs, 6:30 – 6:30): 6 survey points
	4	Screen Line Survey	To supplement the person trip survey by capturing traffic variations by vehicle type and different timeline	Traffic count at the road crossing the screen line	Roadside Traffic Counts survey (12hrs, 6:30 – 18:30): 5 survey points
					Roadside Traffic Counts survey (24hrs, 6:30 – 18:30): 6 survey points
	5	Traffic Count Survey	To grasp general movement of traffic and to upgrade the traffic model	Roadside traffic count at major roads and traffic count at major intersections	Roadside Traffic Counts survey (12hrs, 6:30 – 18:30): 3 survey points
					Intersection Traffic Counts survey (12hrs, 6:30 – 18:30): 17 survey points
	6	Travel Speed Survey	To analyze an impact on vehicle travel speed affected by traffic congestion	Investigation of travel speed that is equivalent to travel time for specific distance estimated by traveling actual routes.	10 routes, three times a day (morning, afternoon and evening) for both directions

Source: JICA Project Team

(3) Organization and the Concerned Agencies for a Traffic Survey

The implementing organization and the concerned agencies for the traffic surveys are shown in Figure 4.1.9. In the Household Interview Survey and Traffic Count Survey, the plan of survey and supervision and analysis were prepared by the JICA Project Team and C/P in MoPW. A field survey and data input

were conducted by a local survey company experienced in Timor-Leste. For the field survey, JPT and C/P coordinated with MOTC (Currency has changed to DNTT) and police. Especially for OD survey which stops drivers, the police officers have accompanied.



Source: JICA Project Team

Figure 4.1.9 The Organization and Concerned Agencies for Traffic Surveys

(4) Zoning

Zoning in the study area is based on the districts of the National Census in 2010. Zones vary in size: large zone, medium zone and small zone. In addition, zone numbers in the survey is consistent with the zone number of the National Census in 2010. Figures of zoning and sampling number of each zone are shown in Appendix 6.1.

(5) Household Interview Survey Method

1) Sampling Ratio

According to the National Census in 2010, the total number of households was 33,163 in the study area. Household sampling of 5.3% (1,758) is required to enhance reliability of the survey used in the calculation formula below based on guidelines by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) in Japan. Household sampling of 9% (3,000) was made in the survey.

$$RSD(A) = K\sqrt{(ZK-1)\cdot(1-r)/r/N}$$

Where	RSD(A)	: Relative error (Less than 20%)
	K	:Confidence coefficient (1.96)
	N	:Size of population (population of above 5 years old multiple production rate)
	ZK	:Number of category (number of zone × number of trip purpose × number of travel mode)
	r	: Sampling Ratio

Interview was made to cover persons of age 5 years and above. One out of ten households was chosen randomly based on the sampling ratio in each road block section.

2) Survey Process and Items

The processes of the Household Interview Survey are listed below according to the order of implementation. When the local survey company visited households, JICA Project Team and C/P in MoPWTC accompanied and supervised the survey.

- Making survey plan
- Establishment of survey zoning, number of samples, and survey items
- Making survey sheets (attached in Appendix A6.2)
- Selection of a local survey company, contract, and discussion
- Confirmation of the survey zoning and questionnaire by the local survey company
- Recruitment and training of the surveyors by the local survey company
- Explanation of survey outline and visit to each Suco leader
- Pre visit survey, confirmation of problem, and sharing of countermeasure
- Random sampling of households to visit
- Household visit survey (accompanied by JICA Project Team and C/P)
- Data entry and data check (revisited if needed)
- Random confirmation of revisiting by JICA Project Team and C/P
- Tabulation and reporting

Major items of household interview survey are summarized in the table below. Survey sheets are attached in Appendix A6.2.1. In addition, Stated Preference survey sheets are also attached in Appendix A6.2.2.

Table 4.1.3 Major Items for Household Interview Survey

Type	Items	Contents
Person Trip Survey	Household Information	・Zone number ・Number of household members ・Income ・Number of ownership of vehicles ・Ownership of household ・Length of stay ・Race
	Household Member Information	・Age, Sex, Occupation ・Address of work or school ・Monthly income ・Driver license ・Vehicle for your own use, type and monthly cost ・Needed new transport system in the future and cost
	Trip Information	・Zone number of origin and destination ・Travel mode and cost ・Trip purpose and
Type	Items	Contents
Stated Preference Survey	For Bus and Microlet Users	・Ridership of bus and Microlet ・Availability of existing alternative transport mode ・Usability of new transport and cost
	For Private Car and Motorcycle Users	・The reason of ownership of car ・Parking fee, fuel price, availability of payment of charged passing ・Availability of alternative mode ・Usability of new transport system and cost

Source: JICA Project Team

3) Number of Samples

In the person trip survey of the household interview survey, the ratio of the number of visited households to the number of households in the distribution plans is shown in Table 4.1.4. The numbers of visits for the Person Trip Survey were 3,035 households, and the visit rate was 101.2% as the households were visited more than the number of plans. Also, for the Stated Preference Survey, the visit rate was 106.2%, as the household interview was made at the time of each visit, and the answer has been gotten from all the visited households. The necessary number for assuring the reliability of analysis is therefore obtained.

Table 4.1.4 Visit Rate of Household Interview Survey

Type	Number of Household	Number of Visited Household (Achievement)	Visited Rate
Person Trip Survey	3,000	3,035	101.2%
Stated Preference Survey	500	531	106.2%

Source: JICA Project Team

(6) Traffic Count Survey Method

1) Survey Method and Points

Four kinds of surveys (Cordon Line Survey, Screen Line Survey, Traffic Count Survey and Travel Speed Survey) were conducted through the methods as shown in Table 4.1.5. Survey was conducted three days in a weekday (from Tuesday to Thursday excluding public holidays).

Table 4.1.5 Survey Method for Traffic Count Surveys

Type		Survey Method
Traffic Count Survey	(Cordon Line Survey), (Screen Line Survey), (Traffic Count Survey)	The traffic which passes through a survey point is counted every 30 minutes by type-of-car and direction.
Interview Survey	(Cordon Line Survey)	The vehicles passing through the boundary of a study area are interviewed about OD. The same census zone as the Household Interview Survey is used for the OD zone.
Travel Speed Survey		A car with surveyor runs on a major road, passage time is surveyed for each link, and the travel speed on each network is calculated.

Source: JICA Project Team

The survey points, shown in Table 4.1.6, and the routes were selected for four kinds of survey. Each survey position and route is shown in Appendix A7.1.2.

Table 4.1.6 Survey Point for Traffic Count Surveys

Type		Survey Point
Traffic Count Survey	Cordon Line Survey	Survey points for cordon line survey are located at the boundary of the study area along the major arterial roads.
	Screen Line Survey	Survey points for screen line are located at traffic barriers such as rivers.
	Traffic Count Survey	Survey points for traffic count are located at the city center intersection to capture the traffic movement/congestion and to grasp the traffic volume along the arterial roads, including those outside the city center.
Travel Speed Survey		Survey route which connects the suburban area and the city center is selected to grasp the necessary time of major travel routes.

Source: JICA Project Team

2) Survey Process and Items

The processes of the Traffic Count Surveys are listed below according to the order of implementation. When the local survey company conducted the counting, JICA Project Team and C/P in MoPW accompanied and supervised the survey. Moreover, it is confirmed that survey precision is actually verified through the counting by JICA Project Team and C/P at survey points where survey was conducted while JICA Project Team members were not assigned in Timor-Leste.

- Making survey plan
- Establishment of survey points and survey types
- Selection of a local survey company, contract, and discussion
- Recruitment and training of the surveyor by the local survey company
- Explanation of survey outline to the police and request for cooperation with the work
- Confirmation of the placement position of the surveyor by the local survey company, JICA Project Team and C/P
- Traffic Count Survey (supervision by JICA Project Team and C/P)
- Data entry and data check (Recounts if needed)
- Confirmation of the routes and sections for travel speed survey by the local survey company, JICA Project Team and C/P
- Travel Speed Survey (riding together by JICA Project Team and C/P)
- Tabulation and reporting

4.1.4 Development Issues and Directions

(1) Recommended items to be developed in DMA in the transportation field

In DMA, the traffic demand is expected to increase in the future for the following reasons:

(i) Increase in population:

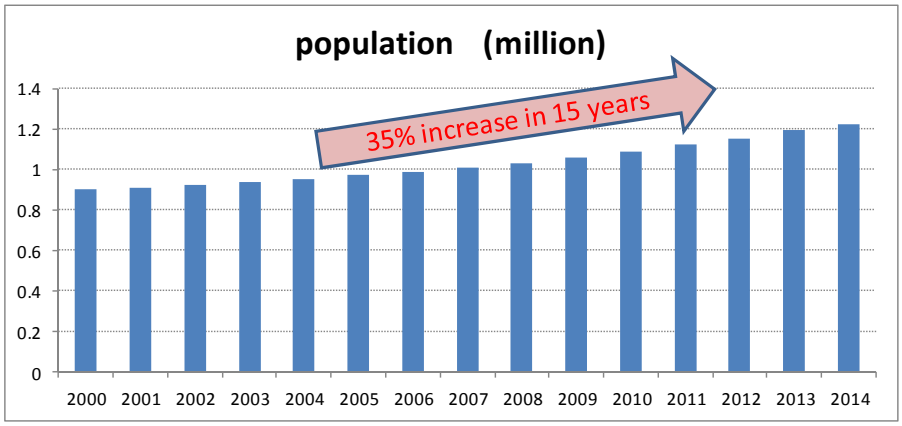
The population of Timor-Leste has increased by 35% in 15 years as shown in Figure 4.1.10.

(ii) Increase on car ownership:

In case economic growth is achieved, car ownership is expected to grow like the neighboring countries, for example, Indonesia as shown in Figure 4.1.11.

(iii) Increase of transportation demand:

Increase of transportation demand caused by the development of Tibar Port, resorts area, and urban development such as university town in Hera.



Source: IMF-World Economic Outlook Databases (2014)

Figure 4.1.10 First Factor of Increasing Traffic Volume (Increase of Population in Timor-Leste)

■Timor-Leste (*1)
1,500 vehicles(500 passenger car) ≒ 2,384 persons per vehicle

■Indonesia (*2)
10,970,000 vehicles ≒ 22.8 persons per vehicle

■Japan (*3)
75,361,000 vehicles ≒ 1.7 persons per vehicle

Source: Databook of the World (2012)(*1),NNA news (2011)(*2), MLIT Japan(*3)

Figure 4.1.11 Second Factor of Increasing of Traffic Volume (Car ownership)

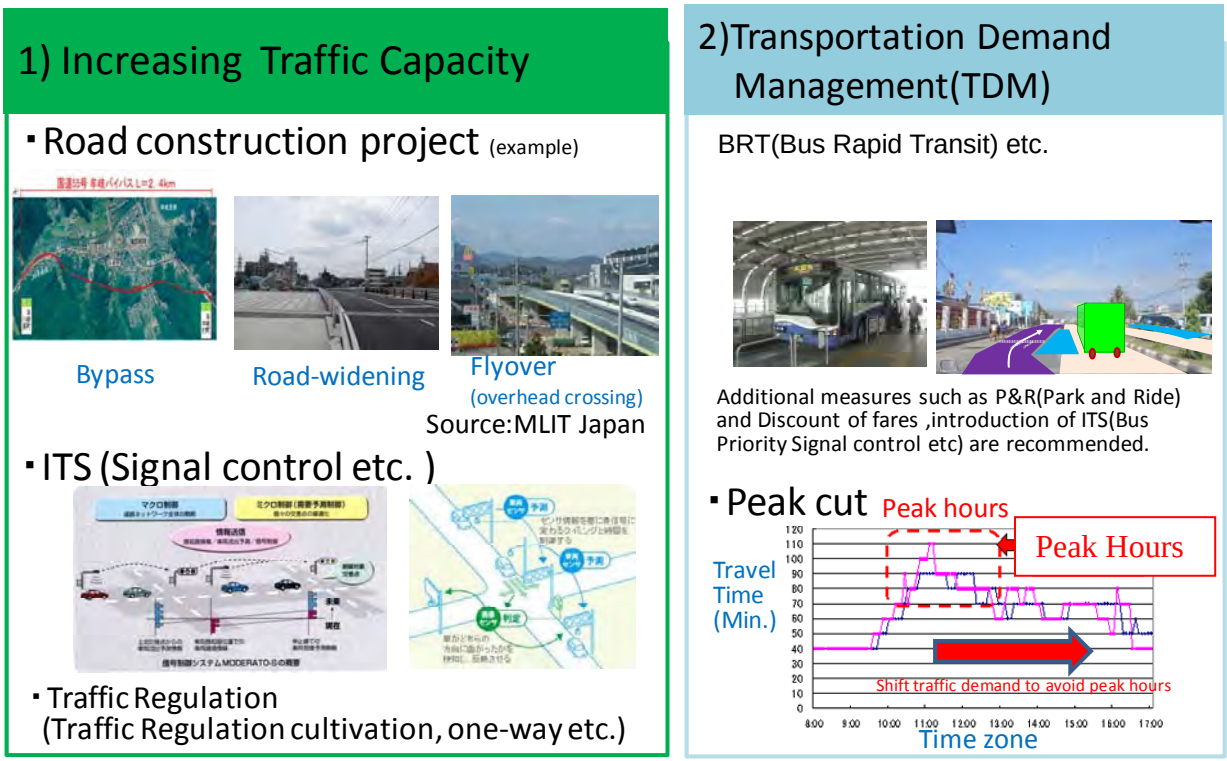
As countermeasures for the above mentioned issues, it is desirable to introduce the following ideas (also described in Figure 4.1.12):

(i) Increase of traffic capacity

- Implementation of road construction projects
  (bypass roads, ring roads, road-widening, improvement of intersections)
- Utilization of ITS (intelligent transportation systems, signal control)
- Development of off-street parking
- Traffic regulations

(ii) Traffic Demand Management (TDM)

- Introduction of mass transit (public transportation with exclusive lane like Bus Rapid Transit (BRT)
- Peak cut of demand (Encourage allowing flexible time work schedules, park and ride)
- Demand control by road pricing or regulation of license plate control
- Regulation for non- high occupancy vehicle (non-HOV)



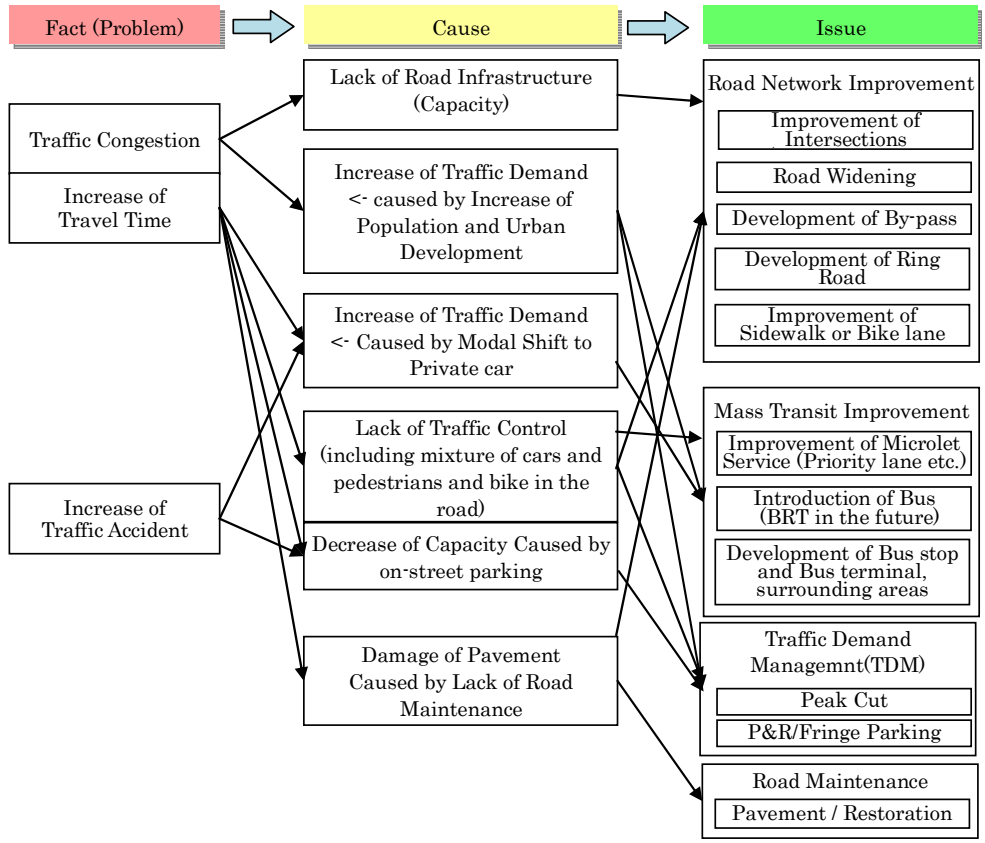
Source: JICA Project Team

Figure 4.1.12 Measures to Prepare for Future Traffic Demand Increase (Image)

(2) Problems and Issues

Future problems and issues on transportation sector in DMA are shown in Figure 4.1.13, which came from the result of demand and gap analysis. In DMA, not only the traffic congestion but the traffic accidents will be the transportation's problems caused by the increase of the traffic demand.

Road maintenance organization is also required because most causes of traffic jams and accidents are missing or damaged road pavements.



Source: JICA Project Team

Figure 4.1.13 Future Problems and Issues

(3) Development Issues in Transportation Field

The development issues for realizing countermeasures are summarized in Table 4.1.7.

Table 4.1.7 Development Issues for Realizing Countermeasures

Countermeasure	Issues for Realizing Countermeasures
Road construction project (Bypass roads, ring roads, road-widening)	➢ consensus building with local residents ➢ securing budget ➢ land acquisition ➢ consideration of the project scheme ➢ maintenance and management institution
ITS (signal control)	➢ development of communication infrastructure ➢ development of control center ➢ consideration of operation institution
Traffic Regulation	➢ consideration of traffic regulation in the whole area of DMA ➢ road widening for abolish one-way
Introduction of mass transit	➢ Ensure exclusive lanes (including consideration of traffic management and consensus building with road users) ➢ development of stations or bus terminals ➢ securing budget ➢ consideration of operation institution ➢ consideration of regulations for intruder vehicle to the exclusive lane
Peak Cut of Demand	➢ consideration of regulation or incentives to promote peak-shift for peak time users

Source: JICA Project Team

4.2 Seaport

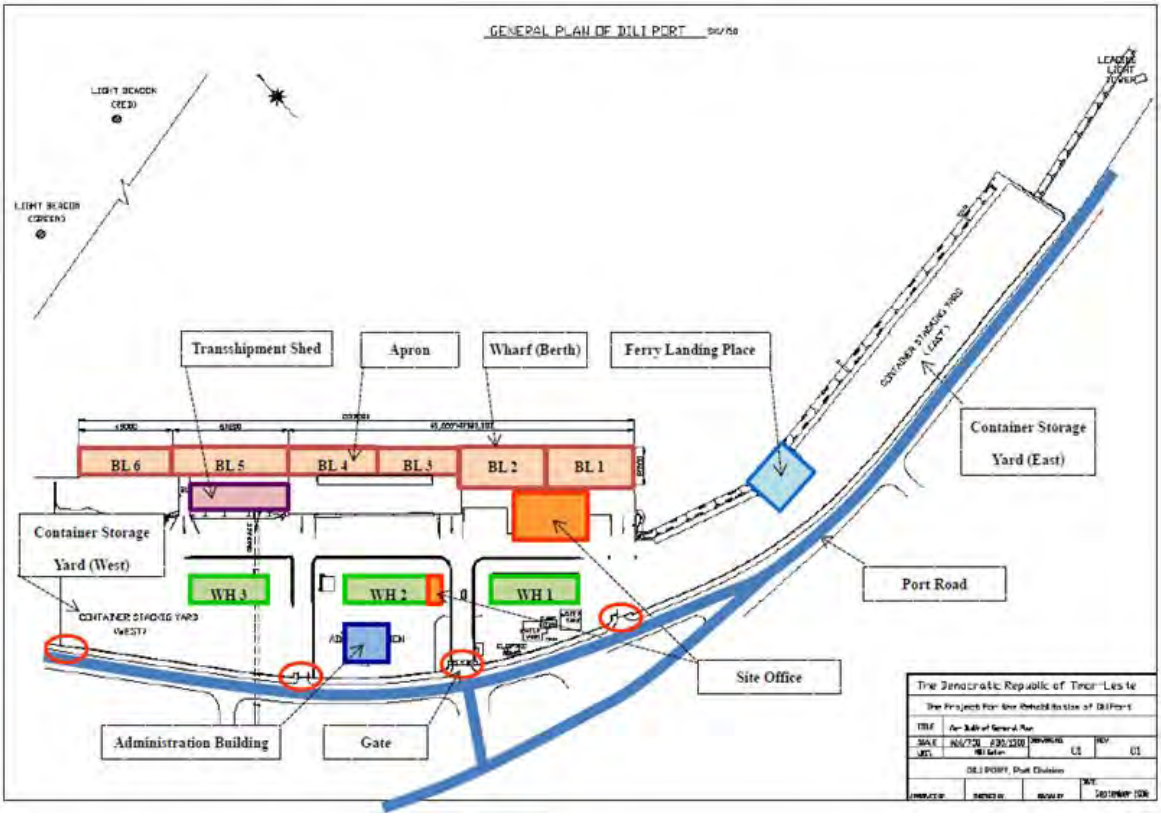
4.2.1 Review of Current Conditions

(1) Present Conditions of Port Facilities in Dili Port

1) Berth

The berth of Dili Port has a total length of 289.2 m and its depth ranges from 5.5 m to 7.5 m. A 180 m section of the berth (between BL 1 and BL 4 as shown in Figure 4.2.1) was rehabilitated in 2009 by JICA's grant aid. The remaining section of 109.2 m which was constructed in 1997 has suffered serious deterioration and needs to be repaired. Complete berth details are shown in Table 4.2.1.

Dili Port has two ferry routes: one connects with Oecusse (isolated enclave of Timor-Leste) in West Timor (Indonesia) and the other with Atauro located at Atauro Island on the opposite bank of Dili Port. There is no jetty for ferry boats but a slipway is used as a landing place for passengers and vehicles.



Source: JICA Project Team

Figure 4.2.1 Layout of Dili Port

Table 4.2.1 Berth Details

Berth Block Number		Length (m)	Width (m)	Depth (m)	Location	Description
Berth 289.2m	1	45.0	20.1	7.5	In front of passenger terminal	Construction in 1993 by Indonesia Rehabilitation in 2009 by Japan
	2	45.0	20.1		In front of passenger terminal	ditto
	3	45.0	12.0		In front of transit shed	ditto
	4	45.0	12.0		In front of transit shed	ditto
	5	60.2	12.1	5.5	Western part of pier	Construction in 1997 by Indonesia
	6	49.0	12.1		End of western part of pier	Construction in 1997 by Indonesia Improvement in 2002 by ADB
Ferry Landing Place					East of container yard	A slipway has been installed.

Source: Administração dos Portos de Timor-Leste (APORTIL)

2) Apron

The apron and backyard are used for cargo handling. General cargo and bulk cargo are unloaded from vessels directly and loaded onto trucks that exit via the port gate after the necessary documentation is completed. Container cargo is temporarily stacked in the container yard and carried out from the port to consignees after the prescribed procedure is completed.

Loading and unloading of cargo including container is mainly done by ship's crane, and cargo handling operation is carried out by private stevedoring companies.

The width of the apron is 20.1 m, 12 m, or 12.1 m depending on the section. As already mentioned, the total length of the apron is 298.2m.

3) Yard Area

Outdated layout of port facilities in Dili Port results in low operational efficiency. There is a slope between the backyard and storage yard which demands that drivers of cargo handling vehicles maintain a low speed to prevent their loads from shifting to one side. The port yard (except the warehouse and passenger terminal) is mainly used as a container stacking yard and marshaling yard, and is allocated at east/west sides of the yard. The east container yard is used for stacking of 20-ft containers and the west is for 40-ft. The area directly behind the berth is utilized for empty containers, tank-type containers and reefer containers. The complete list of yard usage is summarized in Table 4.2.2.

Table 4.2.2 List of Yard Usage

Yard		Area (m^2)
A	Container Storage Yard (20 ft)	11,000
B1	Container Storage Yard (Empty)	532
B2	Container Storage Yard (Empty, Reefer)	
C	Container Storage Yard (40 ft)	3,190
D1	ISO Tank	1,685
D2	Dangerous Cargo	
E1	Marshaling Yard	2,013
E2	Marshaling Yard	
E3	Marshaling Yard	
F	Vehicle Storage Yard	-
G1	Open Storage for Construction Materials	250
G2	Open Storage for Construction Materials	
Total		18,670

Source: APORTIL

APORTIL has a "Dry Port" at Tasitolu about 8 km west of Dili Port.

4) Storage Facility

The storage facilities consist of four warehouses. Warehouse No.1 (WH 1) is now used as offices for the customs service and for APORTIL, and Warehouse No.2 (WH 2) is used to store imported motorcycles. As the volume of imports has increased, part of WH 1 is currently being used for imported motorcycles. Warehouse No.3 (WH 3) is used for cargoes requiring emergency handling, but cargoes are not stored there regularly so it would not be correct to say that it is used efficiently. It would be difficult to expand the port area; therefore, to use the port land effectively and reduce congestion, it will be necessary to revise the port land utilization plan, including the removal of WH 3. Summary of storage facilities details is shown in Table 4.2.3.

Table 4.2.3 Storage Facilities

Facility Name	Specification	Number	Description
Warehouse No.1	45.5 m x 15.3 m = 696.2 m^2	1	
Warehouse No.2	45.5 m x 15.3 m = 696.2 m^2	1	
Warehouse No.3	38.0 m x 15.4 m = 585.2 m^2	1	
Transshipment Shed	50.0 m x 16.0 m = 800.0 m^2	1	Behind BL 5

Source: APORTIL

5) Passenger Terminal

Passenger facilities include ticket sales office, passenger terminal, and ferry landing, but the passenger terminal is not used at this time. Ferry passengers enter and leave through the east gate, go directly to the ferry landing, and then board the ferry by crossing an inclined ramp. Because the ferry landing is inside the container yard, passengers cross the container marshaling work area, endangering the passengers. In addition, the container work cannot be performed efficiently because it must be interrupted.

In response to the new ferry service, it is proposed that the ferry landing be moved to the west side. By doing so, work inside the container yard could be performed effectively, and passengers would be kept outside of this dangerous environment.

APORTIL operates two ferry services connecting the enclave of Oecusse and the remote island of Atauro. A ferry service to Oecusse is operated twice a week on Mondays and Thursdays and the one to Atauro is operated once a week on Saturday.

6) Gates

Two gates (Main Gate and West Gate 1) as well as berths are available and they are operational 24 hours a day, 363 days a year. However, the West Gate 1 is only used for carrying-out, and full containers are available only from 8:30 a.m. to 5:00 p.m., while empty containers are available all day.

7) Port Roads

The major road to Dili Port is Portugal Avenue that runs parallel to the seacoast and passes in front of the gate to the port, and which vehicles use to enter and leave the port. Another route to the port is via Presidente Nicolau Lobato Street, which runs from the west side of the port and converges with Portugal Avenue where it passes the East Gate. These two roads are used mainly by trucks entering and leaving Dili Port. They use these two roads to connect to arterial roads leading inland to distribute and collect cargoes throughout the country.

(2) Activities of Donors in the Port Sector

1) Japan

Before and after independence, Japan has been assisting with the development of infrastructure in various fields in cooperation with international donor agencies such as Asian Development Bank (ADB) and the World Bank.

In the field of ports and harbors, the following assistance projects were conducted at Dili Port and Oecusse Port.

- Grant Aid:「Navigation Aids and Fender Rehabilitation Project of Dili Port (2000)」based on the development study of「Urgent Rehabilitation Development Project of Dili Port (2000)」.
- Grant Aid:「Westside Container Yard Rehabilitation Project in Dili Port (2001)」
- Grant Aid:「Port Rehabilitation Project of Dili Port (2006 – 2009)」
- Grant Aid:「Oecusse Port Urgent Rehabilitation Project (2010 – 2012)」

A long-term port expert for port security and maintenance has been dispatched to Dili Port from November 2012 by JICA.

2) Germany

Germany is quite active in assisting Timor-Leste in the maritime sector. In 2007, it donated the ferry Berlin "NAKROMA" currently sailing between Dili and Oecusse as well as Dili and Atauro. Germany has been planning to donate another ferry through Kreditanstalt für Wiederaufbau (KfW) so that APORTIL can have at least one ferry boat available during the docking. Since this boat is designed to be berthed at a fixed berthing facility with a deep draft, a new deep-draft wharf needs to be developed. KfW has carried out conceptual designs of the ferry wharf, but the Government of Timor-Leste is responsible for its development.

The KfW and Ministry of Finance (MOF) signed a financing contract for this project in September 2013. Based on the contract, the Ministry of Transport and Communications (MOTC) put out the consulting works (detailed design, tender documents preparation, shipbuilding supervision) and shipbuilding to tender in the 2nd half of 2014. Shipbuilding will commence in 2015 and last for 12 months. Taking into account the time for commissioning, the ship delivery is expected at the end of 2016.

APORTIL is requesting an emergency fund for the new ferry wharf(USD 3 million for the least expensive berth alignment alternative)from Agencia de Desevolvimentto Nacional (ADN) but the prospects are unclear because its designs and cost estimates are not yet ready. Since KfW wishes to ensure the completion of the berthing facility before the ship delivery, it is planned to be executed with the assistance of JICA. This is quite a meaningful project which can address the two major problem areas of Dili Port: yard congestion and lack of safety.

Germany is also involved in the capacity development in the maritime sector. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) has made five million Euros available for this area. GIZ assisted the implementation of Port Facility Security Assessment (PFSA) and Port Facility Security Plan (PFSP) in 2013. GIZ's assistance includes administrative reforms of APORTIL (separation of regulatory functions), capacity building of government officials, and preparation for the ratification of maritime conventions.

3) USA

The United States Coast Guard (USCG) visited Dili Port in 2008 to carry out a review of security measures relating to the International Ship and Port Facility Security Code (ISPS Code). After meeting with officials and making site inspections, it identified problem areas relative to port security and concluded that security measures meeting the ISPS Code requirements were not in place in Dili Port. This report was made available to the government of Timor-Leste. The US government continues to be interested in accelerating the implementation of the ISPS Code in Timor-Leste.

4.2.2 Institutional and Regulatory Conditions (laws and regulation, organization)

In Dili Port, there are two organizations (DNTM and APORTIL) under the Ministry of Transport and Communication. The National Director of Maritime Transport (DNTM) has the authority to give permission and grant licenses. APORTIL is responsible for the management of Dili Port which is the only international trading port and any other matters concerning the port sector. The staff of APORTIL is comprised of 42 employees. However, the new port development at Tibar is administrated by ADN which is directly under the Prime Minister together with Major Project Secretariat (MPS) and International Finance Corporation (IFC).

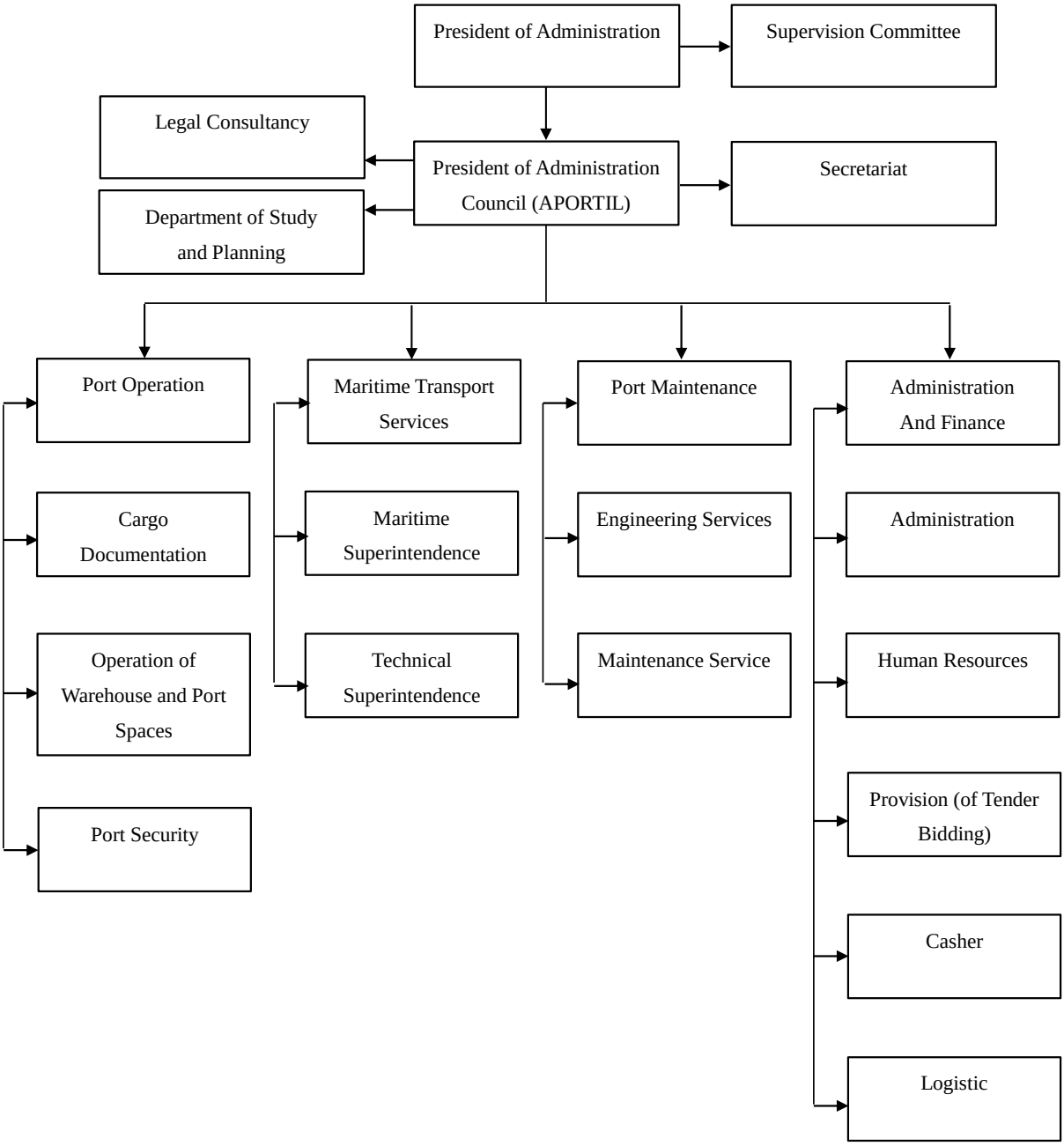
APORTIL was established by the Decree-Law No.3/2003 on 10 March. DNTM was established through the "Job Description and Regulation" which is an internal rule of APORTIL. The organizational structures of APORTIL and DNTM are shown in Figure 4.2.2 and Figure 4.2.3, rspectively.

According to the Decree-Law, the purpose of the establishment and nature of APORTIL are stipulated as follows:

- APORTIL is a public institute;
- Corporate entity/commercial entity;
- Administrative and financial autonomy; and
- Property of its own.

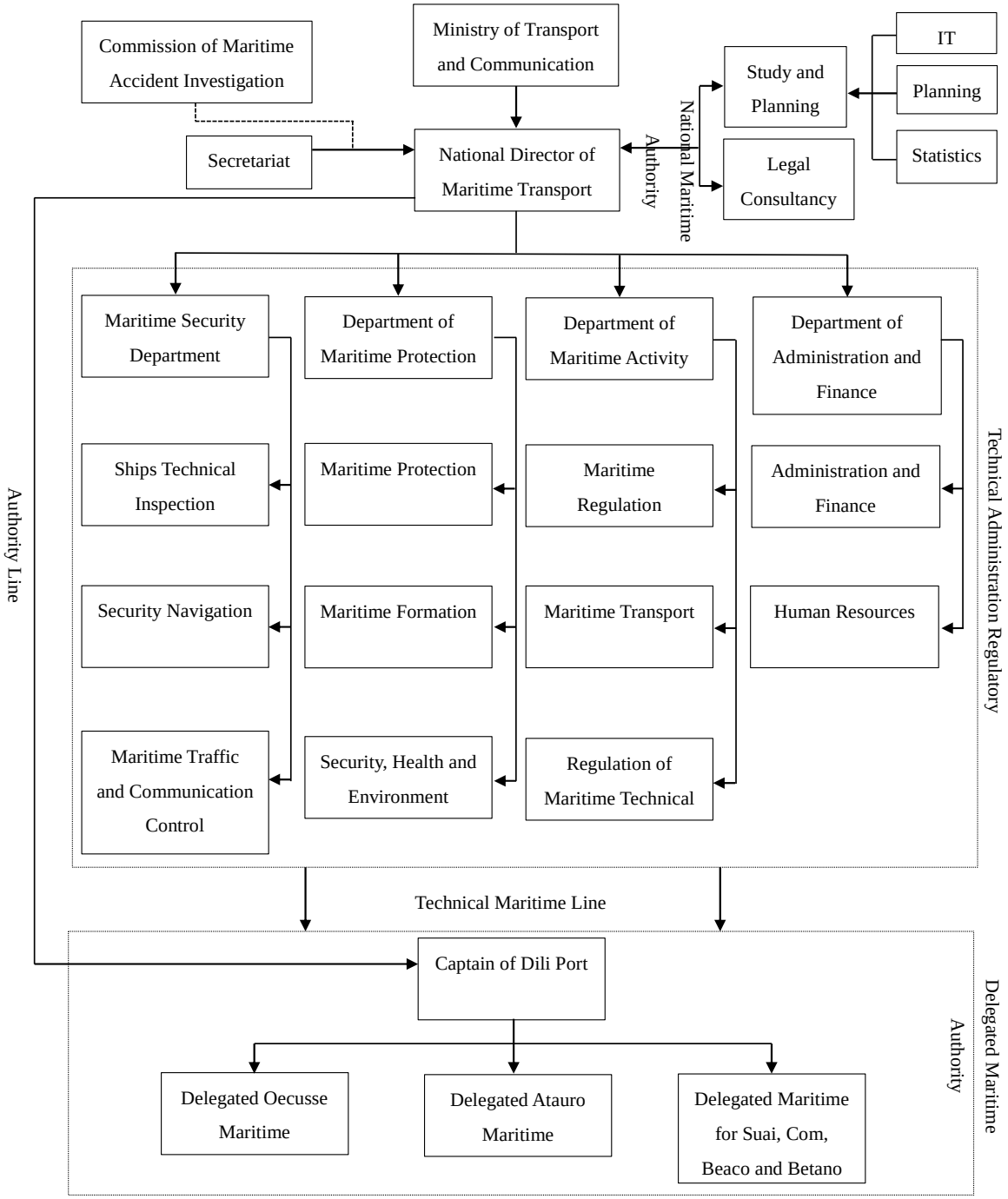
And the responsibilities of APORTIL are as follows:

- To manage, administer and develop ports;
- To prepare plans on port organization and extension of port area;
- To conduct surveys, plans, and projects on sea and land works in compliance with approved plans and programs;
- To build, acquire, maintain and monitor sea and land works, as well as the floating and land equipment of the ports; and
- To design and execute a strategic plan for commercial promotion of the ports.



Source: APORTIL

Figure 4.2.2 Organization of APORTIL



Source: APORTIL

Figure 4.2.3 Organization of DNTM

4.2.3 Development Issues and Directions

(1) Government Policy on Port Development

1) Timor-Leste Strategic Development Plan 2011-2030 (SDP)

The GoTL conducted the SDP in July 2011 at the request of donors to compile a medium- and long-term national development plan.

As to seaport development, new ports are positioned as national priority to support the growing economy and meet future industry and freight demands as indicated in Chapter 3 of the SDP (infrastructure development). The construction of Tibar New Port is scheduled to commence by 2015 and operation will start by 2020.

2) Program of the Fifth Constitutional Government 2012-2017 Legislature

The program of the fifth constitutional government 2012-2017 which includes governmental growth strategies for the next 5 years was formulated in August 2012.

Initiatives related to the port sector in this program are as follows:

- Construction of a new multi-purpose national port in Tibar with a capacity of one million (1,000,000) tons/year and the ability to cater for commercial cargo and passenger needs;
- Establishment of a logistics base for the petroleum sector in Suai, where a new port will provide an entry point for the materials and equipment, and include shipbuilding and repair facilities;
- Launching of a regional port construction program in order to build, repair, and expand facilities in Laga, Lautem, Atauro, Kairabela, Oecusse and Manatuto; and
- A more detailed study to determine maritime facilities to be built for the port of Hera which is permanently threatened by sedimentation.

3) Five-year Strategic Plan of APORTIL 2013 – 2017

APORTIL formulated its strategy for the next five years (2013-2017) which is compiled in terms of (1) development of infrastructure, (2) development of legal frameworks and actions supporting the maritime transportation and port, and (3) development of human resources specialized for maritime transportation and ports.

Among them, development of infrastructure consists of regional ports and the main ports (Dili Port and Tibar New Port) including respective goals, activities, target years and so on. Some of the activities are budgeted and have been already launched. According to the plan, Com Port and Atauro Port should be started prior to other regional ports, and rehabilitation works for Dili Port should be carried out from 2013 to 2014 while dredging should be implemented every two years.

(2) Tibar New Port Project

1) Outline of Development Concept

The GoTL is planning to create a new port at Tibar, 11 km west of Dili. This project was analyzed in the report "Public Private Partnership (PPP), Approaches to Port Development in Timor-Leste" published by IFC in 2011. The Government included the project in the SDP as one of the key infrastructure development projects. SDP contemplates the start of the construction works for the short term on 2015 and the opening of the new port for the medium term from 2016 to 2020. SDP identified the following shortcomings in the Dili Port as grounds for supporting the Tibar New Port Project:

- Rapid increase of container cargo (annual increase of 20% over the last six years);
- Lack of quay length resulting in a berthing backlog;
- Limited space and lack of room for expansion;
- Shallow draft (7.5 m); and
- Congested access roads.

MOF took up this project in the "Preliminary Project Appraisals for the Infrastructure Program" in June 2011. The goal of the Tibar New Port Project is to facilitate trade flows by alleviating the port capacity constraints. The project aims to create a multi-purpose terminal and expand the container cargo handling capacity from the current 42,000 TEU/year (2013). The program listed areas of engineering and environmental concerns including the following: need of breakwaters, maintenance of the channel depth, siltation, impacts of seismic events, and resettlement of residents. The Government plans to implement this project by a PPP scheme and hired IFC as transaction advisor at a cost of USD 600,000 in 2012. As the cost of this advisory service is quite high, the government applied for donor funding. The transaction advice can be considered as a form of technical assistance and capacity building for Timor-Leste.

2) Progress of Project

i) PPP Investor Conference

In order to attract private investors to infrastructure development projects, the Government, with the support of IFC, held a PPP investor conference in March 2013 in Dili. This conference was planned to invite private partners to participate in two major infrastructure projects: the development of Tibar New Port and upgrading of the international airport. Preliminary overviews for the projects were provided at the conference.

Basic development scenarios of Tibar Port are proposed as follows:

- Phase 1 (up to 2017): Two berths (630 m) with dredging and reclamation works (pavement of yard is 60% completed);
- Phase 2 (after 2018): pavement of yard is 100% completed;
- A layout plan was proposed after comparing several layout options; and
- Landlord port model was proposed for PPP.

ii) Transaction Structuring Report

The "Transaction Structuring Report" was released in July 2013 to obtain the Government's green light.

iii) Latest Progress

Four prequalified companies/groups were selected: MOTA-ENGIL (Portugal), Peninsular and Oriental Steam Navigation Company (UAE), International Container Terminal Service Inc. (Philippines), and Bollore Africa Logistics (France); and site surveys were conducted in June 2014.

iv) Schedule

- Proposed Bid Award: November 2014
- EIA for Construction: 2015
- Commencement of Construction: 2016
- Partial Opening and Start of Operation: 2018

(3) Issues and Directions on Port Sector

1) Dili Port

In line with the construction progress of Tibar New Port, all cargoes will be transferred to the new port gradually from 2018 and completely by 2020. On the other hand, passengers will continue to be served at Dili Port.

As a consequence, Dili Port will become a dedicated ferry port using new ferry facilities which will be constructed on the west side of BL 6.

In addition, the existing BL 1 and BL 4 will be utilized as an international cruise terminal. Tourism is one of the main development strategies mentioned in the SDP. Therefore, it is necessary to invite international cruise vessels to Timor-Leste.

There is a mooring basin for yachts on the east side of the existing Dili Port. The empty lot of the east container stacking area may be utilized as a yacht base.

Dili Port will become a ferry port and a waterfront park port in order to survive in the future.

Issues and constraints which shall be considered and/or clarified are as follows.

Ferry Port:

- Provision of ferry
- Construction of ferry terminal

Waterfront Park:

- Reflection of public opinion
- Roles of APORTIL
- Responsible organization for improvement, operation and maintenance

- Safety measures

2) Tibar New Port

Some questions concerning the cargo forecast still remain; however, Tibar New Port will be constructed as scheduled as a national project through the initiative of ADN and IFC.

The utilization of the newly developed Tasitolu "Dry Port" by APORTIL remains unclear. It could be used as an inland bonded CFS for LCL container cargoes.

Issues and constraints are:

- Role-sharing between public and private sectors;
- Role of APORTIL;
- Road and transportation issues;
- Relocation of government agencies; and
- Resettlement of residents.

3) Hera Port

The Hera naval port is planned to be developed under the "Port Hera Master Plan" of the administration's strategy.

Issues and constraints are:

- Consistency with the urban master plan; and
- Safety measures.

4.3 Airport

4.3.1 Review of Current Conditions

In Timor-Leste, there are eight airports/air strips, of which three are major airports namely the President Nicolau Lobato International Airport in Dili (PNLIA), Cakung Airport in Baucau and Suai Airport in Suai. Only PNLIA and Baucau/ Cakung aerodromes are designated as international aerodromes. All airports are not permitted for night operations. However, the Government (Civil Aviation Authority) may permit night operation for emergency purpose only. Figure 4.3.1 shows the locations of Timor-Leste's major airports.

Source: JICA Project Team

Figure 4.3.1 Location Map for Major Airports

PNLIA is the only international airport in Timor-Leste that services regular flight operation to/ from Denpasar Airport in Indonesia, Changi Airport in Singapore, and Darwin Airport in Australia. Operating airlines are currently five airlines such as SilkAir/Air Timor which are code sharing flight operated by Silk Air, Airnorth, Sriwijaya and Garuda Indonesia. The flight timetables in 2015 at PNLIA are shown in Table 4.3.1, Table 4.3.2, Table 4.3.3, and Table 4.3.4.

Table 4.3.1 Timetable of Silk Air/ Air Timor in 2015

Flight	Origin	Destination	Dep. Time	Arr. Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Aircraft type	Total Passenger
MI 296	Changi	Dili	0920	1415	-	✈	-	✈	-	✈	-	A319	128
MI 295	Dili	Changi	1525	1810	-	✈	-	✈	-	✈	-	A319	128

Source: Silk Air

Table 4.3.2 Timetable of Sriwijaya Airlines in 2015

Flight	Origin	Destination	Dep. Time	Arr. Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Aircraft type	Total Passenger
SJ270	Denpasar	Dili	0955	1250	✈	✈	✈	✈	✈	✈	✈	B737-500	130
SJ271	Dili	Denpasar	1330	1415	✈	✈	✈	✈	✈	✈	✈	B737-500	130

Source: Sriwijaya Airlines

Table 4.3.3 Timetable of Air North in 2015

Flight	Origin	Destination	Dep. Time	Arr. Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Aircraft type	Total Passenger
TL510	Darwin	Dili	0545	0635	✈		✈	✈				E170	72
TL511	Dili	Darwin	0715	0900			✈					E170	72
TL512	Darwin	Dili	0630	0720					✈	✈		E170	72
TL513	Dili	Darwin	0800	0955					✈	✈		E170	72
TL514	Darwin	Dili	0945	1040			✈					E170	72
TL515	Dili	Darwin	1115	1305	✈			✈				E170	72
TL515	Dili	Darwin	1125	1310			✈					E170	72
TL516	Darwin	Dili	0910	1000		✈						E170	72
TL517	Dili	Darwin	1045	1235		✈						E170	72
TL518	Darwin	Dili	1530	1620	✈						✈	E170	72
TL519	Dili	Darwin	1700	1855	✈						✈	E170	72

Source: Air North

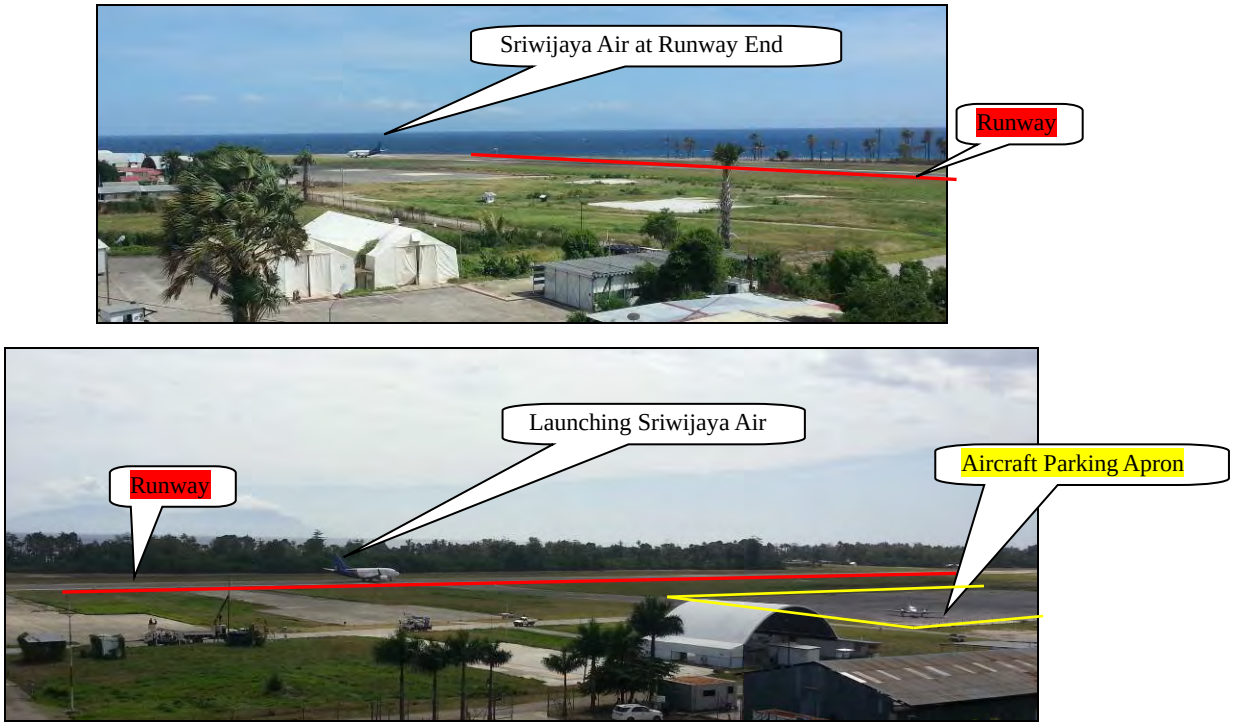
Table 4.3.4 Timetable of Garuda Indonesia in 2015

Flight	Origin	Destination	Dep. Time	Arr. Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Aircraft type	Total Passenger
GA7300	Denpasar	Dili	0930	1220	✈	✈	✈	✈	✈	✈	✈	CRJ1000	100
GA7310	Dili	Denpasar	1320	1410	✈	✈	✈	✈	✈	✈	✈	CRJ1000	100

Source: Garuda Indonesia
Note: Garuda Indonesia suspended the flight GA 7300 and GA 7310 from 2nd Sep suddenly.

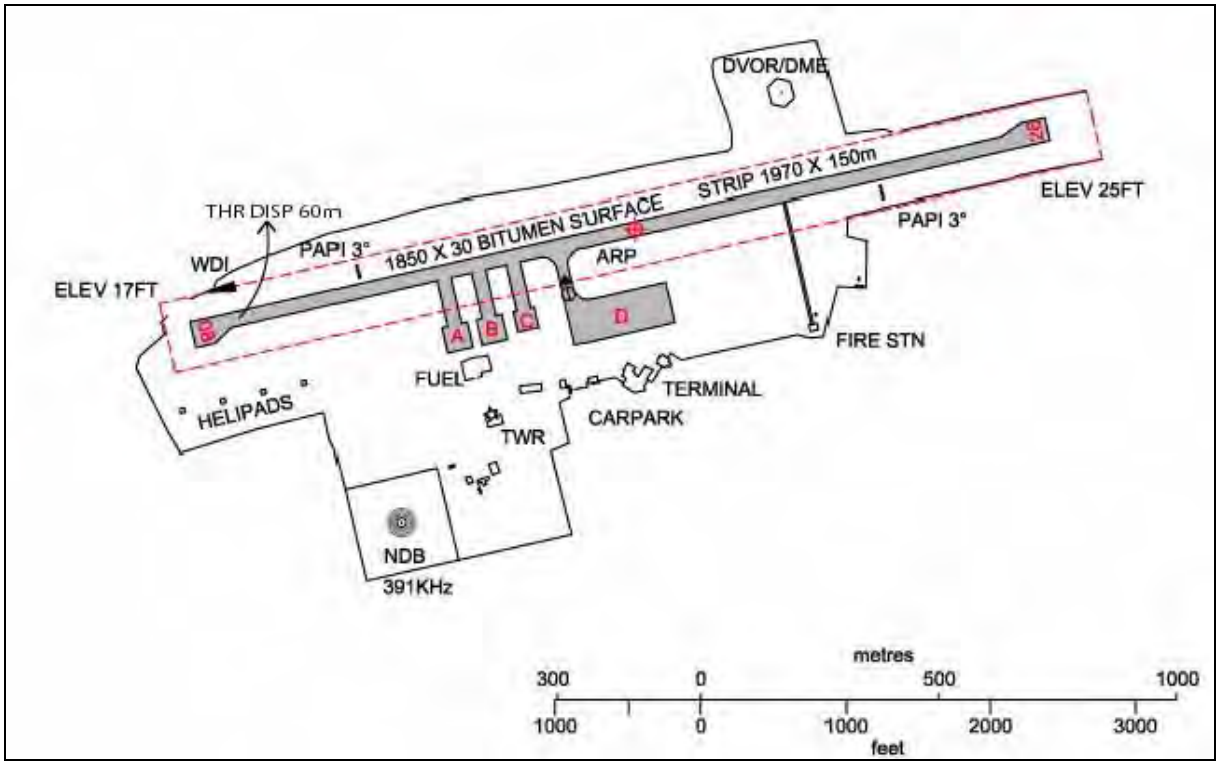
(1) President Nicolau Lobato International Airport in Dili (PNLIA)

PNLIA handles around 198,080 passengers and 172 tons cargo in 2014 for international air traffic in Timor-Leste. PNLIA is located in the west side of Dili City and situated at 8.0 m MSL (mean sea level) with one 1,850 meter runway, four exit taxiways, three separated passenger terminal buildings for departure, arrival, and VIP. Current facilities are in poor condition that the passenger building is narrow for proper passenger services and the runway length is only 1,850 m which is too short to enable large aircraft to reach key destinations without payload restrictions. Also, main airport facilities (shown in Table 4.3.5) do not meet international standards on airport/ aviation safety and security which are big issues. Figure 4.3.2 and Figure 4.3.3 shows PNLIA's actual view and lay-out plan, respectively.



Source: JICA Project Team

Figure 4.3.2 View of PNLIA Airside (Runway) from Control Tower



Source: Aeronautical Information Publication (AIP) Timor-Leste

Figure 4.3.3 Layout Plan of President Nicolau Lobato International Airport (PNLIA)

Table 4.3.5 Major Facilities of PNLIA

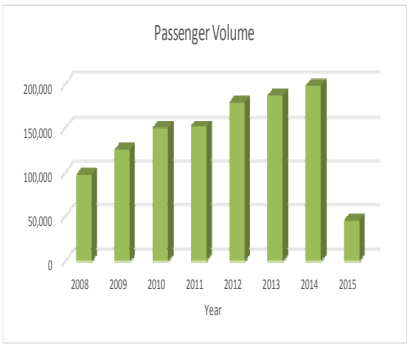
Item	Name	Description			
Principal Feature	Name	President Nicolau Lobato International Airport (Dili Airport)			
	Operation	International and domestic			
	Code	ICAO: WPDL IATA: DIL			
	Location	Latitude: 08º32'47.59"S			
		Longitude: 125º31'28.99"E			
	Access to airport	6.2 km west of Dili City, approx. 20 min. by vehicle			
	Reference ground elevation	8.0 m +MSL			
	Temperature	Average 33.8ºC			
	Operation time	12 hours (sunrise/ 06:00 to sunset/ 18:00)			
	Operator	ANATL			
Runway	No.	Dimension	Pavement surface	Slope	Strip Dimension
	08/26	1,850 m × 30 m	Flexible (Asphalt)	0.1 %	1,970 m × 150 m
Taxiway	width		Pavement surface		
	23 m		Flexible (Asphalt)	Asphalt overlaid on 2011	
Aircraft Apron	Location	Purpose	Pavement surface		
	A,B,C	Small aircraft	Rigid (Cement Concrete)		
	D	Main apron	Flexible (Asphalt)		
Approach and Runway 3Lighting	Green, Rwy08 THR lights displaced 60m, PAPI 3º Glide slope White, Red Rwy end lights				

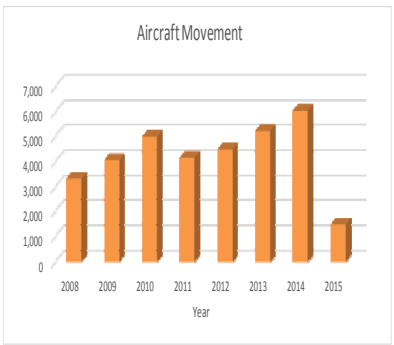
Note: THR; Threshold, PAPI; Precision Approach Path
Source: AIP Timor-Leste

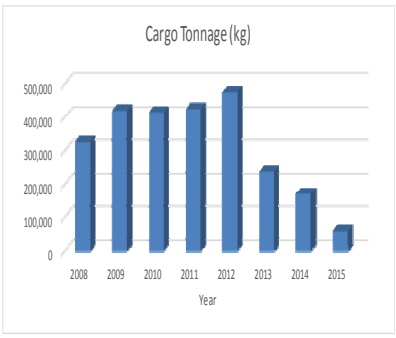
The aviation features of PNLIA from 2008 to 2013 constantly increased, as shown in below figures in Table 4.3.6. However, cargo tonnage decreased because Merpati Air stopped their operation in 2012.

Table 4.3.6 Aviation Feature of PNLIA (2008 to 2015)

	2008	2009	2010	2011	2012	2013	2014	2015
Passenger Volume	97,807	125,722	149,962	151,488	179,493	187,282	198,080	45,211
Aircraft Movement	3,328	4,056	4,980	4,150	4,474	5,208	6,056	1,474
Cargo Tonnage (kg)	326,410	421,372	415,653	426,029	476,709	239,318	172,390	60,126







Note: 2015 is preliminary figure until March.
Source: MoPWTC

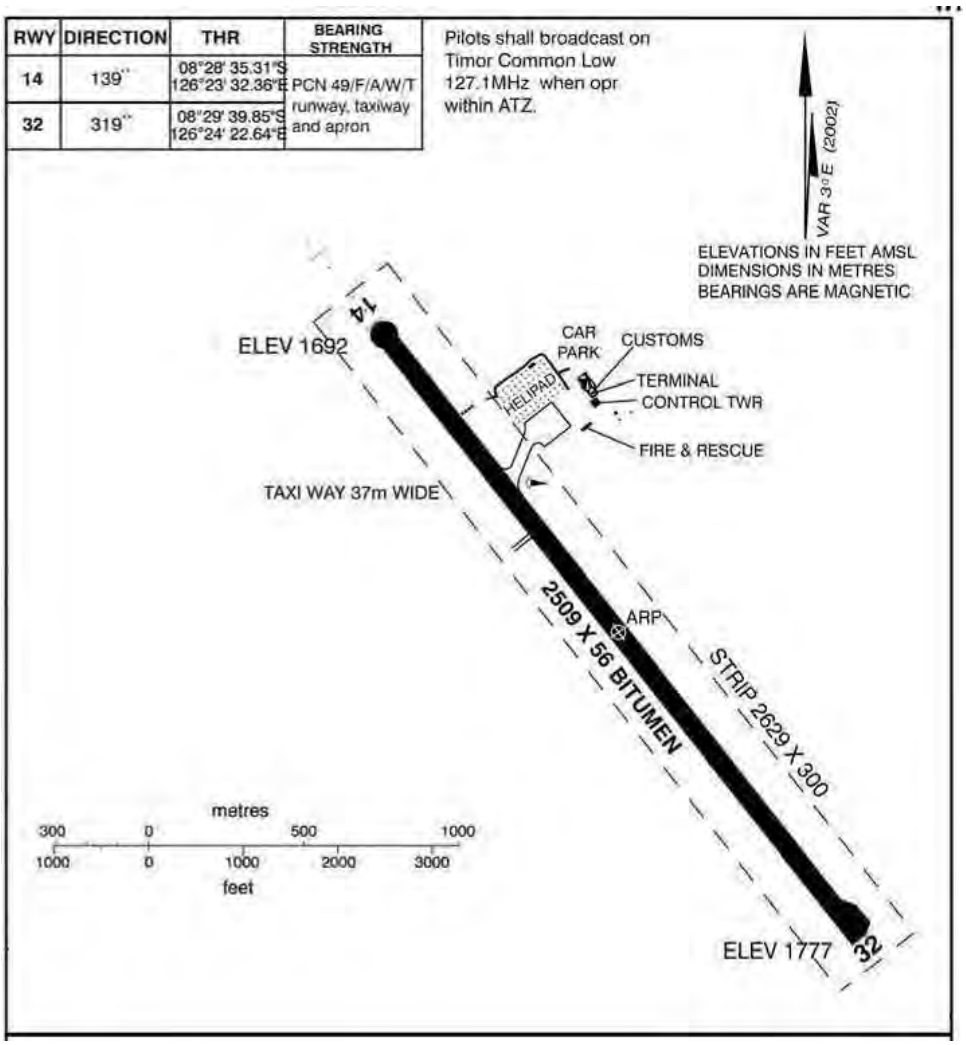
(2) Baucau Airport

Baucau Airport is an unattended airport located 6.5 km west of Baucau Town and has a 2,500 m long runway which is the longest runway in Timor Leste. Actually, Baucau Airport is presently stationed in Timor Leste Defense Force. Baucau Airport's principal features and layout plan are shown in Table 4.3.7 and Figure 4.3.4 respectively.

Table 4.3.7 Major Facilities of Baucau Airport

Item	Name	Description	
Principal Feature	Name	Baucau Airport	
	Operation	International and domestic	
	Code	ICAO: WPEC IATA: BHC	
	Location	Latitude: 08º29'07.7"S	
		Longitude: 126º23'57.6"E	
	Access to airport	6.5 km west of Baucaui City, approx. 20 min. by vehicle	
	Reference ground elevation	542.0 m +MSL	
Runway	No.14/32	Dimension: 2,509 m x 56 m	Pavement surface: Flexible (Asphalt)
Taxiway	Connecting T/W	Length: 37 m	Pavement surface: Flexible (Asphalt)
Apron		100m x 108 m	Pavement surface: Flexible (Asphalt)

Source: AIP Timor-Leste



Source: AIP Timor-Leste

Figure 4.3.4 Layout Plan of Baucau Airport

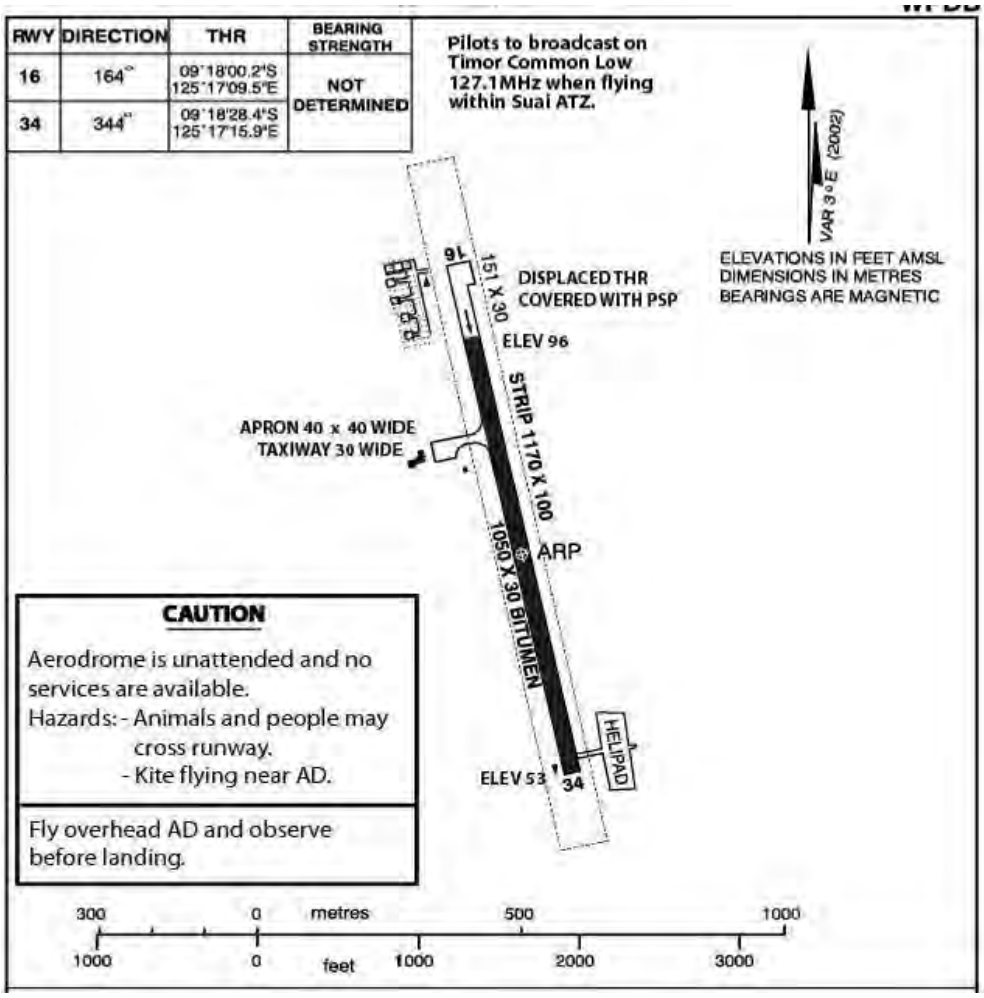
(3) Suai Airport

Suai Airport is also an unattended airport located 4 km east of Suai Town and has a 1,050 m long runway. Suai Airport's principal features and layout plan are shown in Table 4.3.8 and Figure 4.3.5 respectively.

Table 4.3.8 Major Facilities of Suai Airport

Item	Name	Description	
Principal Feature	Name	Suai Airport	
	Operation	Domestic	
	Code	ICAO: WPDP IATA: UAI	
	Location	Latitude: 09º18'14.3"S	
		Longitude: 125º17'12.7"E	
	Access to airport	4 km east of Suai City, approx. 10 min. by vehicle	
	Reference ground elevation	29.0 m +MSL	
Runway	No.14/32	Dimension: 1,050 m x 30 m	Pavement surface: Flexible (Asphalt)
Apron		Dimension: 40m x 40 m	Pavement surface: Flexible (Asphalt)
Taxiway	Nil		

Source: AIP Timor-Leste



Source: AIP Timor-Leste

Figure 4.3.5 Layout Plan of Suai Airport

(4) Donor Activity

The International Finance Corporation (IFC) revised PNLIA PPP project 2015. IFC studied the traffic forecast, runway development comparison, and landside including terminal building area. The comparison of the two options for the detailed IFC runway development plans are shown in Table 4.3.9, Figure 4.3.6, Figure 4.3.7, Figure 4.3.8, and Figure 4.3.9.

Table 4.3.9 Runway Development Options of IFC PNLIA Project

Option	Stage 1 (Initial Stage)	Stage 2 (Ultimate Stage)
1	Optimized land area expansion/ Runway 2,100m x 45m, 300m Width Runway strip	Extension to offshore/ Runway 2,500m x 45m, 300 Width Runway strip
2		Extension to cross River/ Runway 2,500m x 45m, 300m Width Runway strip

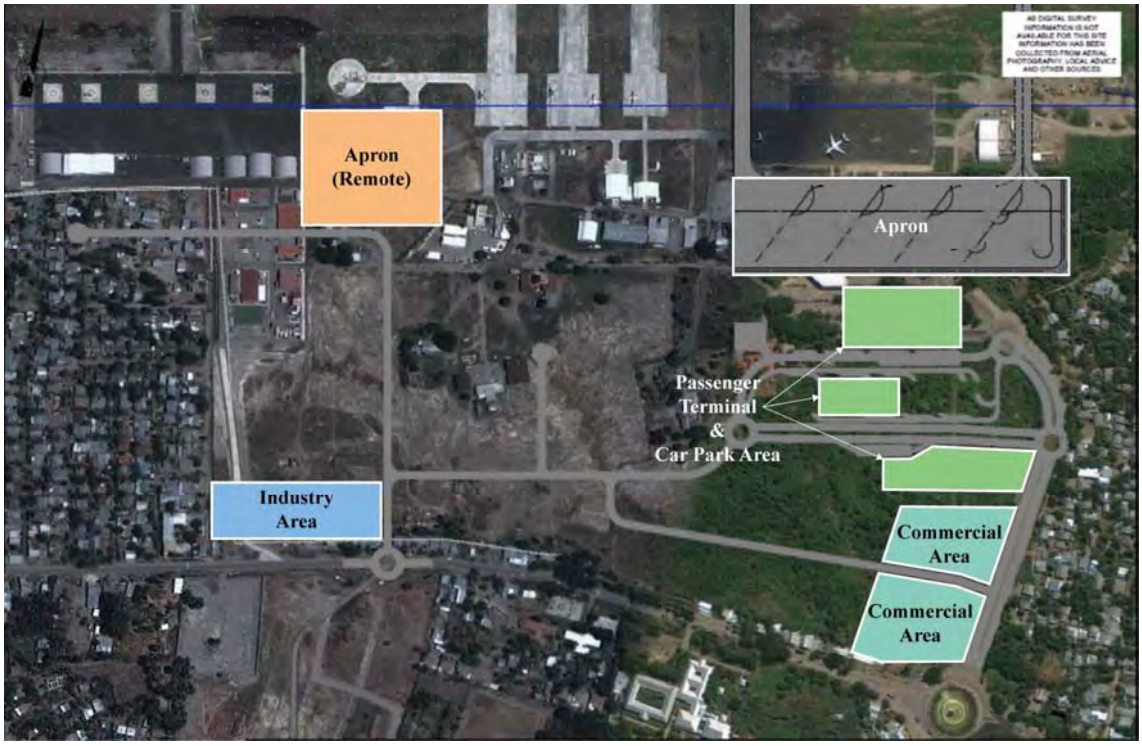
Source: MoPWTC

Source: MoPWTC

Figure 4.3.6 Stage 1 (Runway Expansion 2,100 x 45 Runway)

Source: MoPWTC

Figure 4.3.7 Stage 2 Option 1 (Offshore Side Extension)



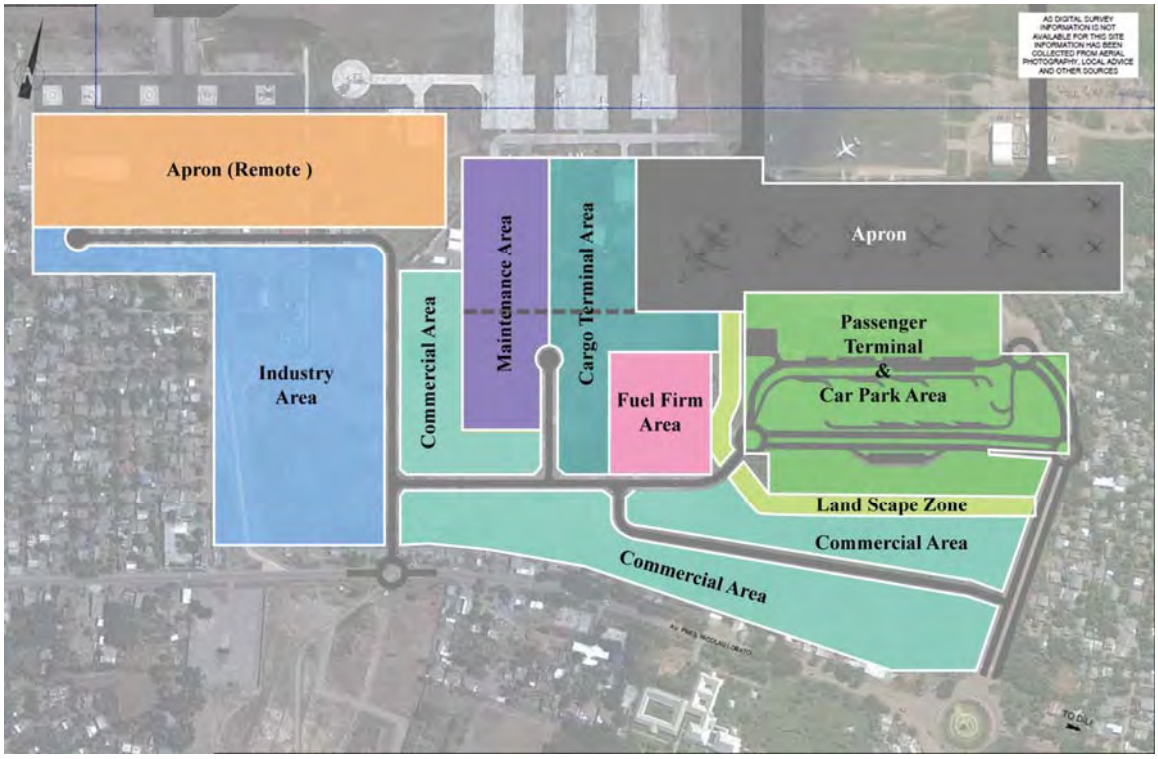
Source: IFC

Figure 4.3.8 Stage 1 Terminal Area Expansion

Source: MoPWTC

Figure 4.3.9 Stage 2 Option 2 (River Side Extension)

The terminal and surrounding facilities would be upgraded as shown in Figure 4.3.10 and Figure 4.3.11. Stage 1 of the terminal will cater to 250,000 passengers with additional terminal space added as demand increases.



Source: IFC

Figure 4.3.10 Stage 2 Terminal Area Expansion

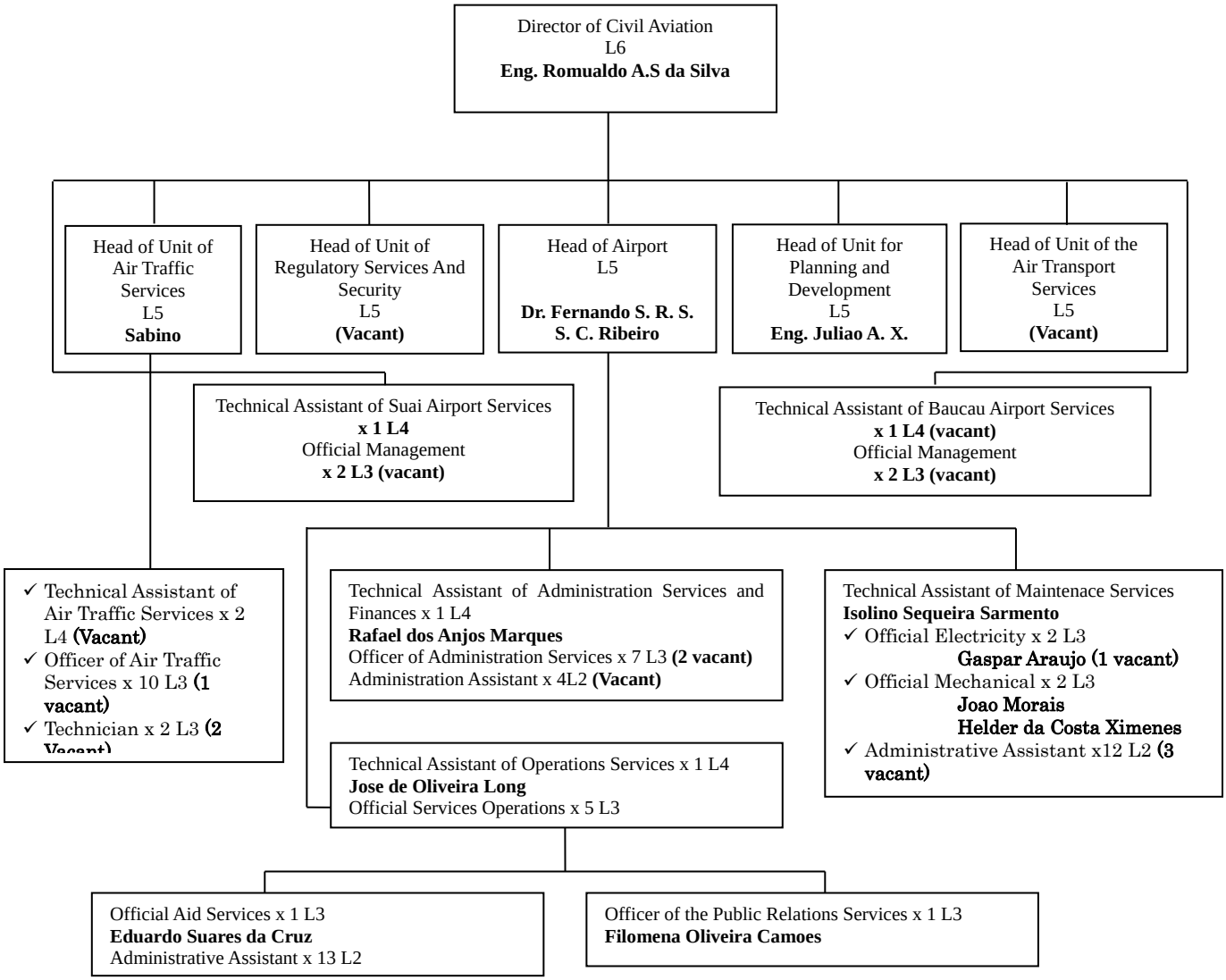
Source: MoPWTC

Figure 4.3.11 Stage 1 Terminal Area Expansion

MoPWTC is now evaluating the runway options under the relevant government organizations based on technical as well as environmental and social aspects. On the other hand, MoPWTC received some proposals for PNLIA airport development from China, Korea, and Australia. However, the most possible project as of the present is the IFC project.

4.3.2 Institutional and Regulatory Conditions

Established by Decree-Law 8/2005, the air transportation administration has two organizations under MoPWTC such as Civil Aviation Authority Timor-Leste (AACTL) and Air Navigation Administration Timor-Leste (ANATL). AACTL is in charge of supervising, regulating, monitoring, and inspecting the civil aviation sector while ANATL is the state company in charge of operating and managing national airports and air navigation infrastructure. However, actual operation is still with Civil Aviation Department under the MoPWTC, as shown in Figure 4.3.12.



Source: MoPWTC

Figure 4.3.12 Organization of Airport Sector (Civil Aviation Department)

4.3.3 Development Issues and Directions

Currently, the PNLIA development project is ongoing under IFC which was described before. Based on several meetings with airport sector officials and the IFC report, the existing airport has several problems of which items are summarized below:

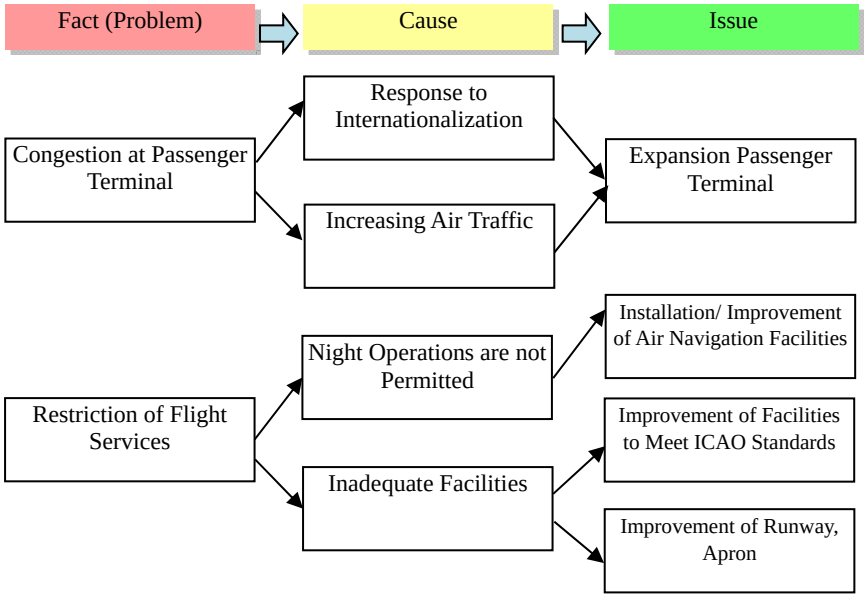
- Runway length and width is restricted for normal operation to current medium aircraft such as A310 and B737.

- No safety area in compliance with International Civil Aviation Organization (ICAO) standards
- Lack of airport lighting system/ only day flights
- Aircraft parking apron pavement has limited capacity
- Limited terminal building capacity and inadequate condition to respond to all operational and security requirement for passenger handling.

However, JPT analyzed the relation among fact, cause, and issue which are summarized in Figure 4.3.13. Current status of the airport sector is classified into two main facts, first is the congestion at the passenger terminal and second is the restriction of flight services.

The passenger terminal building was constructed during the Indonesian colonial period as a local domestic airport, so there are no prepared custom, immigration and quarantine (C.I.Q) facilities; and also passenger volume is increasing after the independence up to now. Therefore, the passenger terminal area is now quite narrow for proper passenger services.

The restriction on flight services has occurred due to the short runway length and lack of installed lighting system. Therefore, it is necessary to improve the airport facilities with priority for passenger terminal and runway facilities.



Source: JICA Project Team

Figure 4.3.13 Relation of Fact, Cause and Issue

The existing airport is located in the city center, so high accessibility to the airport is one advantage of city fascination. However, an airport sometimes may have negative impacts when social and environmental factors are considered. Recently, it seems that there are some complaints from nearby residential areas east of the airport regarding airport operation such as aircraft noise and pollution.

As a result of initial survey for the airport development in the Project, JPT finds that the Government does not have any relocation plan now. It is actually not easy to promote the relocation of the airport due to the country's steep geographical features. Therefore, it is necessary to pay attention for the implementation of the existing airport development project in this master plan.

CHAPTER 5 : CONDITIONS OF INFRASTRUCTURE

5.1 Disaster Risk Management

5.1.1 Review of Current Conditions

(1) Natural Disasters

Timor-Leste is affected by several kinds of natural hazards. These are frequent events such as tropical cyclones/storms, riverine floods, and landslides as well as rare events such as earthquakes and tsunami. The most prominent and frequent hazard types both in the country and in Dili are riverine floods, storms, and landslides according to DesInventar data. The more current major natural disasters in Timor-Leste and the consequent losses due to these major disasters in Dili are shown in Table 5.1.1. and Table 5.1.2, respectively.

Table 5.1.1 Major Natural Disasters in Timor-Leste (1980 – 2010)

Number of Disaster-Affected People			Number of Disaster-Killed People		
Disaster	Date	No. of People	Disaster	Date	No. of People
Storm	2006	8,730	Epidemic	2005	22
Flood	2001	2,580	Flood	2003	3
Flood	2007	947	Flood	2001	1
Flood	2003	600	Flood	2007	1
Flood	2003	450	Flood	2003	0
Epidemic	2005	336	Storm	2006	0
Flood	2007	0	Flood	2007	0
Drought	2007	0	Drought	2007	0

Source: Prevention Web (1980 – 2010)

Table 5.1.2 Major Losses Due to Natural Disaster Events in Dili

Natural Disaster Event	Houses Destroyed	Houses Damaged	Victims	Affected People
Floods	6	3,478	1,623	3,264
Strong Winds	3	86	99	267
Landslides	8	41	116	135

Source: "A Country Situation Report on Disaster Risk Assessment related Initiative"" by Asian Disaster Preparedness Center, data source DesInventar (1992 – 2013)

(2) Disaster Management of Timor-Leste

The GoTL issued the National Disaster Risk Management Plan (October 2005) which adopted all hazard approaches and dealt with the management of all types of natural disasters. This plan was prepared by the Ministry of Interior. However, it has now been transformed into a national policy by the National Disaster Management Directorate, the Ministry of Social Solidarity.

After the Asian tsunami on 26 December 2004, an Inter-Ministerial Commission for Prevention of Natural Disasters was established by the Prime Minister's Office, and the National Disaster Risk

Management Policy (March 2008) was issued to provide the platform for developing programs and plans in disaster risk management over the period of 2008 – 2012. The policy is in line with the Hyogo Framework for Action 2005 – 2015.

As of January 2015, it was said that the National Disaster Risk Management Policy for the next five years (2013 – 2017) had already been prepared, although it has not been issued yet.

The Ministry of Social Solidarity (MSS) has the mandate to coordinate preparation and response in relation to any emergency that may occur. Under the Minister's authority is the National Disaster Management Directorate (NDMD), which includes the Disaster Operation Center (DOC), the Departments of Preparedness and Formation, Prevention and Mitigation, Response and Recovery, and Disaster Management Committees at Districts, Sub-districts, and Sucos (villages) levels.

At district, sub-district and suco (village) levels Disaster Management Committees are to be established. The decentralized District Disaster Management Committees (DDMCs) are responsible for disaster prevention/mitigation, preparedness, response and recovery, and serve the functions of data collection, public awareness campaign, public information dissemination, food security, early warning dissemination and communication, rescue health, logistics and transportation, evacuation and recovery, and rehabilitation and reconstruction. The local governments are required to have heavy responsibilities and high implementation capacities.

Also the NDMD is an active participant of Adaptation to Climate Change (ACC) because the adaptation to the climate change is considered as a part of the Disaster Risk Reduction (DRR).

(3) Donor Activity

1) ADB

ADB has partnered with the Government of Timor-Leste to help make long-term improvement in living standards since 1999, three years before Timor-Leste gained independence and became a member of ADB. In the initial years, support concentrated on emergency infrastructure. Since 2006, ADB assistance has focused on rehabilitating infrastructure required for connectivity, and building the capacity to ensure that infrastructure is operated and maintained effectively. ADB's country partner strategy（CPS）2011-2015 for Timor-Leste is closely aligned with the Strategic Development Plan (SDP). ADB is helping the government to upgrade the national road network and water supply infrastructure.

As for future direction, ADB will increase support for roads, urban water supply, and other municipal services. Capacity and systems to operate and maintain new assets will be prioritized. Technical and vocational skills' training is an emerging priority, and involves partnerships with the private sector. Additional financing has been planned for roads in 2014; and in 2015, ADB supported rehabilitation and expansion of urban water supply in Dili and in district capitals. Support for a new port, which the government is developing as a public-private partnership, was also planned for 2015.

The ADB is to conduct the projects "Strengthening Water Sector Management and Service Delivery" and "Road Network Upgrading Sector Project", both of which require consideration of disaster/climate risks.

Technical assistance will strengthen capacity to develop and operate infrastructure.

2) UNDP

Since 1999, UNDP has been supporting the Timorese people move from post-conflict recovery towards sustainable development.

UNDP's Country Program Action Plan (2009-2013), developed in partnership with the GoTL, aims to build the foundation for lasting peace, stability and security in the country by fostering a culture of democratic governance, reducing poverty, managing environmental resources, and finding solutions for preventing and recovering from crisis.

UNDP provides technical advice and assistance to build strong and capable public institutions at national and sub-national levels in justice, parliament, human rights, anti-corruption, police, economics development, environmental management, and disaster risk management that bring development, peace, and justice to the population and reach out to the poor and vulnerable sectors of society.

UNDP has been supporting the MSS and the NDMD for DRM in developing the National Disaster Management Policy (2008),the next National Disaster Management Policy and also conducted a project entitled "Strengthening Disaster Risk Management" implemented between 2011 and 2013, of which the overall objectives is to develop disaster risk management capacity at the national and district levels and to undertake multi-hazard vulnerability and risk assessment to understand the disaster risk in Timor-Leste.

3) World Bank

Over the past decade, Timor-Leste has created the preconditions for successful development, educating, keeping healthy, and productively employing its young which are the biggest development challenges Timor-Leste will be facing in the next decade.

The GoTL conducted a participatory planning process to develop a Strategic Development Plan (SDP) for 2011-2030 that provides a clear direction for development, phased over two decades, but needs costing, sector-level planning, prioritization, and implementation support to be attainable. Achieving the government's development vision and CPS objectives requires continued efforts to strengthen Timor-Leste's institution and build implementation capacity.

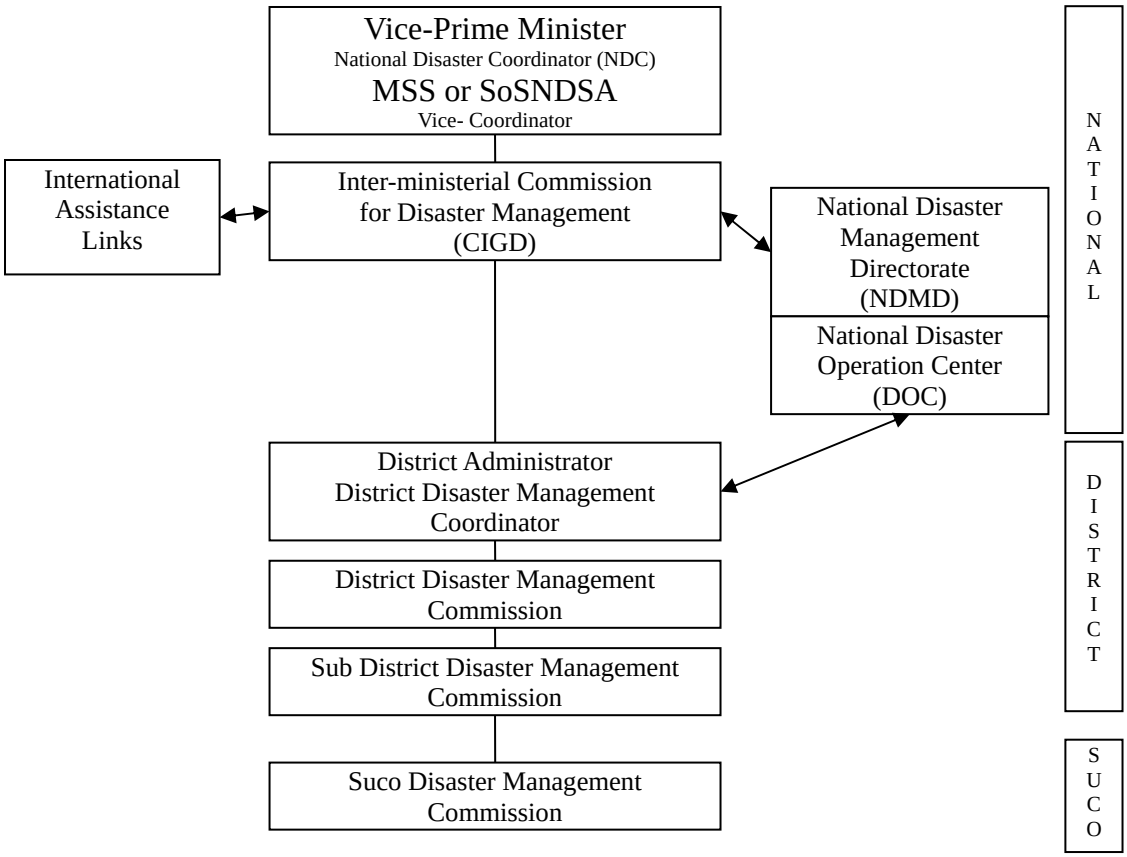
The Country Partnership Strategy (CPS) (2013-2-17) of WB Group is fully aligned with the government of Timor-Leste and sets out a focused program of lending, analytical and advisory work, trust funds, and covering the four pillars in SDP. The WB Group will help the government to (i) invest in the quality of health and education services and effectiveness of social protection programs; (ii) build core infrastructure to connect communities to services and markets and reduce transaction costs; and (iii) support the development of a non-oil economy that create jobs by improving the enabling environment for private sector investment and augmenting productivity and value-added of agriculture.

Regarding disaster risk management, during the CPS period, technical assistance will be carried out on managing disaster/climate risks on and around the Dili-Ainaro road corridor, with a view of improving disaster/climate resilience of the transport assets and of livelihood.

5.1.2 Institutional and Regulatory Conditions

(1) Disaster Risk Management Structure

Organizational structure for disaster risk management in Timor-Leste is shown in Figure 5.1.1.



Source: National Disaster Risk Management Policy (March 2008)

Figure 5.1.1 National Disaster Management Structure

An Inter-Ministerial Commission for Prevention of Natural Disaster was established by the Prime Minister's Office as a government response to the public fear of earthquakes/tsunamis after the Asian tsunami on 26 December 2004 (Despacho 01/PM/2005). The Inter-Ministerial Commission assigns the Vice-Prime Minister as the National Disaster Coordinator, the Minister of Social Solidarity as Vice-Disaster Coordinator and line ministries and agencies as members. The members of the Inter-Ministerial Commission for Disaster Risk Management (CIGD) are organized by the following ministers, ministries and agencies:

- Vice Minister (National Coordinator)
- Minister of Social Solidarity (Deputy- Coordinator)
- Ministry of Foreign Affairs and Cooperation
- Ministry of State Administration
- Minister of Finance
- Minister of Justice
- Minister of Health
- Minister of Public Works
- Minister of Commerce, Industry and Environment
- Ministry of Tourism
- Ministry of Natural Resources
- Ministry of Economy and Development
- Ministry of Agriculture and Fishery
- Secretary of State Public Works

- Secretary of State for Youth and Sport
- Secretary of State for Professional Training
- Secretary of State for Defense
- Secretary of State for the Promotion of Gender Equality
- Commander of F-FDTL
- Commander of PNTL
- Secretary General of Red Cross Timor-Leste (CVTL)

Note: the list of members of CIGD is based on the National Disaster Risk Management Policy (March 2008) and updated during the Study.

The CIGD will convene twice a year in non-disaster/emergency time. The NDMD acts as the secretariat of the CIGD. The major functions of CIGD, the NDMD, and The National Disaster Operation Center (DOC) explained in the National Disaster Risk Management Policy are shown in Table 5.1.3, Table 5.1.4, and Table 5.1.5 respectively.

1) Inter-Ministerial Commission for Disaster Risk Management (CIGD)

Table 5.1.3 Function of Inter-Ministerial Commission for Disaster Risk Management (CIGD)

	Function
(i)	Conducts an annual review of national disaster risk reduction policy and strategic development by the last sitting of parliament each calendar year;
(ii)	Provides an annual report to the Prime Minister on national disaster risk reduction by the 31st of December each year; this report will include recommendation on priorities for the next reporting year;
(iii)	Provides technical and policy advice and resource support to the National Disaster Coordinator (NDC) and the Joint National Disaster Operation Center (DOC) during response operations, if required;
(iv)	Assigns responsibilities related to disaster risk management to relevant departments and other bodies; and
(v)	Carry out any other disaster risk reduction related tasks as allocated by the Minister or Secretary of State responsible for disaster risk management.

Source: National Disaster Risk Management policy (March 2008)

2) National Disaster Management Directorate (NDMD)

Table 5.1.4 Function of National Disaster Management Directorate (NDMD)

	Function
(i)	Acts as Timor-Leste's center for disaster risk reduction activities and knowledge; collects information,; monitors overseas developments; and proposes development for incorporation into the national disaster risk reduction system;
(ii)	Develop strategies in disaster risk reduction including preparedness and response plans and procedures and assists in district planning;
(iii)	Administers and provides secretariat support to the CIGD;
(iv)	Establishes and sustains links to risk assessment and monitoring in the region, and interprets and provides warning and strategic planning in relation to developments that may affect Timor-Leste;
(v)	Acts as the contact point for initial reports of emergencies and disasters in conjunction with the DOC
(vi)	Coordinates disaster risk management including scheduling of regular meetings of actors and stakeholders
(vii)	Organizes and leads multi-sector damage and needs assessment teams during response when necessary;
(viii)	Develops and conducts public information and awareness programs in cooperation with other relevant agencies;
(ix)	Develops disaster risk reduction and emergency response training program in conjunction with relevant partners;
(x)	Maintains and develops the sources of baseline data for use in disaster preparedness and response activities;
(xi)	Maintains reviewing and developing the National Disaster Risk Management Policy (NDRMP) and advises on other sector and development policies, strategies and legislation related to disaster risk management; and
(xii)	Administers a national regional strategic stockpile of disaster response assets.

Source: National Disaster Risk Management policy (March 2008)

3) National Disaster Operation Center (DOC)

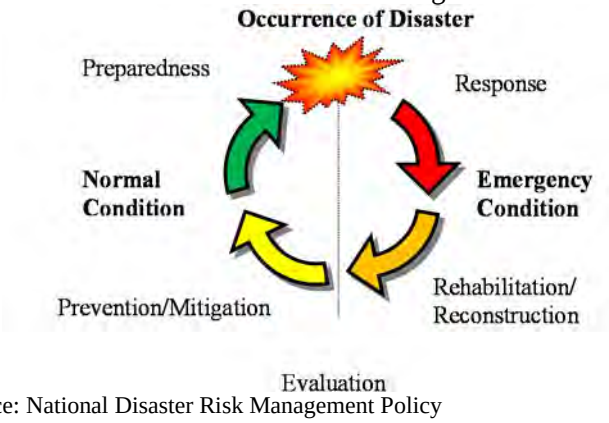
Table 5.1.5 Function of National Disaster Operation Center (DOC)

	Function
(i)	Directs and controls the population's survival recovery efforts and operations;
(ii)	Public information dissemination regarding emergencies;
(iii)	Early warning and notification;
(iv)	Damage assessment;
(v)	Evacuation, traffic control and security;
(vi)	Health and emergency medical care;
(vii)	Emergency food and shelter;
(viii)	Debris clearance; and
(ix)	Reconstruction of utilities.

Source: National Disaster Risk Management policy (March 2008)

(2) Disaster Management Cycle

The disaster management cycle is composed of prevention/mitigation, preparedness, response, rehabilitation, reconstruction, and evaluation. They are divided into the following three (3) stages: Pre-disaster, Disaster and Post-disaster showed as shown in Figure 5.1.2.



Source: National Disaster Risk Management Policy

Figure 5.1.2 Disaster Management Cycle

The Disaster Risk Management Policy has stressed the necessity of investment in preparedness with the most cost-effective and important measures for the disaster risk reduction.

5.1.3 Development Issues and Directions

(1) Present Situation for Preparedness

Preparedness explained in the National Disaster Risk Management Plan (October 2005) are as follows:

- Preparedness measures including warning, planning, public education, establishing stockpiles and development procedures for response and recovery.
- All actors or responders that will be involved in an emergency operation should be trained, equipped, and prepared to work together in a coordinated manner.
- These actors should prepare detailed support plans that outline the ways in which they will meet their operational responsibilities under the NDRMP. (NDMO October 2005)

The necessity for preparedness measures are explained and stressed, but still they have not conducted any yet. There is a big gap between the policy and the existing conditions.

1) *Hazard Map*

The NDMD explains that it has established the Disaster Management Information System (DMIS) and developed several GIS hazard maps on the web of the NDMD. These include hazard maps: tsunami, coastal erosion, earthquake (historical events), earthquake (MMI), earthquake (site condition), earthquake (recent events), and forest fire (susceptibility). However, these maps could not be utilized for the warning system at community levels because the NDMD has provided hazard maps only for national level but not that for district levels. More accurate or smaller-scale hazard maps would be required for districts and communities to prepare practical warning systems.

2) *Information of Meteorology*

Three days weather forecast data are provided daily from the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES) Thailand. However, the information and data are not properly utilized for weather forecasting because of lack of technical staff and capacities for meteorological events.

Severe weather warnings like cyclones and routine forecasts are available temporarily through the Australian Defense Force from the Australian Bureau of Meteorology Regional Forecasting Center in Darwin. However, the national warning system has not been developed yet. The DOC could not provide proper and timely information to the people in risk.

Timor-Leste is situated in the cyclone belt, in a “one cyclone per decade” zone, but affected annually by tropical storms. It is important to give warnings to communities in the path of tropical storms.

3) *Information on Earthquake and Tsunami*

Information on earthquakes is provided from Indonesia and RIMES Thailand. On tsunami information, before 2012 tsunami watch information for the Indian Ocean was available to Timor-Leste through the Japan Meteorological Agency in connection with the Pacific Tsunami Warning Center (PTWC). After 2012 however, a new system has been established. The present tsunami watch information is available to Timor-Leste through the following three agencies:

- Australian Bureau of Meteorology (BOM)
- Indian National Center for Ocean Information Services (INCOIS)
- Badan Meteorologi, Klimatologi, dan Geofisika (MBKG)

4) *Flood in the Study Area*

In Dili, there are four rivers passing through the urban area, namely: the Comoro, Maloa, Kuluhum and Santana rivers. In general, it is assessed that the rivers have a higher conveyance capacity than a 25-year return period flood except the Maloa River which seems to be flooded frequently. The Dili Sanitation & Final Drainage Master Plan by Sinclair Knight Merz (SKM) has proposed for improvement of the Maloa, Kuluhum and Santanarivers (SKM June 2012).

The river channels are not maintained properly and a lot of sand and gravel mining activities are observed along the river channels, especially along the Comoro River. Also, the river banks have deteriorated by scouring due to lack of proper maintenance works. In general, the river banks are protected by concrete or gabion walls, but the excessive sand/gravel mining activities affected river banks downstream the Comoro and other rivers. Optimum river management, control of sand/gravel mining, control of land use in flood plain and technical guidelines for river structures should be required.

The Maucau River in Tibar and Akanunu and Mota Kiik rivers are not improved yet and still in their natural states. The present condition of relatively high sediment yield in the basins needs both flood and sediment controls.

(2) Gaps and Issues

Disaster risk management (DRM) should be mainstreamed in the routine works and development sector programs of line ministries; and optimum preparedness measures for disaster risk reduction (DRR) should be required against frequent events as well as rare events such as a major earthquake (or tsunami) that can cause substantial damage to the country's fragile infrastructure and buildings as well as injury and fatality to people who may not be prepared.

Most prominent problems supposed to be solved are as follows:

- Improvement of the weak coordination among the line ministries and member agencies for mainstreaming of DRM in their sector programs;
- Improvement of the weak institutional and technical capacities of districts in order to carry out the districts' DRM responsibilities, especially for preparedness such as early warning, planning, and education;
- Improvement of monitoring equipment, facilities, and technological capacities in the area of hazard monitoring/assessment and also in the area of development of early warning system for floods, tropical storms, landslides, and earthquakes;
- There are no real time observation equipment (rainfall and river gauges) for early warning of floods, tropical storms, landslides, and also no earthquake monitoring facilities (seismograph and GPS);
- Improvement of the capacity of collection of hazard and disaster data and information that can be utilized for development planning and decision making, and also collection of historical time-series data for risk assessment and special distributed data for developing hazard maps;
- Enhancement of community participation in DRR and improvement of disaster resilient capacity of communities;
- Preparation of necessary laws and regulations of Timor-Leste for improvement of the current situation, including river management and control of sand/gravel mining along river channels from DRM aspects.

5.2 Water Supply

5.2.1 Review of Current Conditions

(1) Conditions of Water Resources in the Project Area

Surface water and groundwater are available for water supply and are sufficient to cover the demand of the present population in the project area. In the current situation, the lack of repair, maintenance, and development of water treatment plants, pumping stations and pipelines in water supply prevents the services from meeting the demand.

1) Surface Water

The huge fluctuation on the amount of surface water is observed between dry and rainy season. Based on the results of site visits during dry season, further development of water resource with current surface water may not be applicable. The situation of the surface water in dry season is presented in Figure 5.2.1.

Dry River (Bemos)

Small Flow at Intake (Benamauk)

Source: JICA Project Team

Figure 5.2.1 Situation of Surface Water in Dry Season

2) Groundwater

Half of the water for water supply comes from groundwater. According to the national hydrogeology map of Timor-Leste, the project area is on a susceptible aquifer based on the amount of rainfall and seawater level. On the point, the detailed investigation in terms of the subsidence and salinization is indispensable before the development of the groundwater in the project area.

(2) Existing Water Supply System in the Project Area

Water supply system has been developed in the project area. It is composed of 1) the governmental water supply system, 2) the system developed by each community, 3) water trucks, and 4) wells. The conditions of the systems are different among those found in the center of Dili, Hera, and Tibar. The condition of each area is presented below:

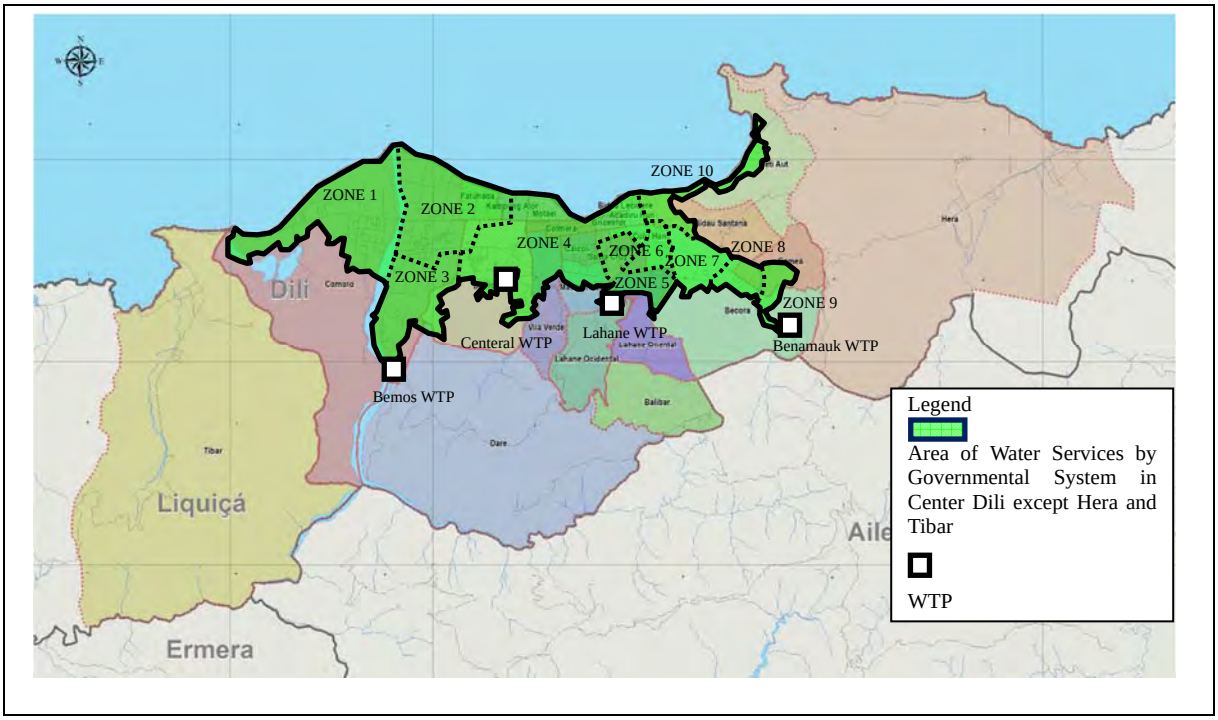
1) Center Dili

The governmental water supply system covers the area. Four water treatment plants (WTP) named Bemos WTP, Center WTP, Lahane WTP and Benamauk WTP are operating in the area. The distribution network receiving the water form WTPs covers the area. The area of the distribution network is composed of ten zones. The National Directorate Water Supply (DNSAS) is in charge of the construction, operation, and maintenance.

Instead of the governmental service, some of people living in the area have installed roof tanks on their houses to cover periods without the service. Others have ordered by water trucks and the others get water from shallow and deep wells.

In some communities on mountainous areas such as Dare, Becora, Lahane Oriental, Lahane Ocidental and Balibar, the communities developed small water supply systems using governmental budget. Although each community is responsible for O&M, no record of operation is available.

The location of WTPs and the zones of the distribution network by the governmental system are presented in Figure 5.2.2.



Source: JICA Project Team

Figure 5.2.2 Location of WTPs and Service Area by Governmental System

2) Hera (Dili)

Three boreholes with pump were developed by the government in Hera. One of them, however, has been broken and abandoned. Raw water has been served to people in the area, as there is no WTP available. The distribution system network in the area is not clear because pipelines are installed in the woods, banana fields, and grasslands. Road crossing points of connection pipelines with shallow installation cause leakage in the pipelines due to the burden of the cars and other transport. The situation affects the water pressure in the distribution system.

In other areas, people get water from delivery system by water trucks and small water supply system with intake, pipelines, and public taps developed by the community. People bringing water from taps to their houses were observed in the area.

3) Tibar (Liquicia)

Two boreholes with pumps were developed by the government in Tibar. All of them, however, are out of operation. One borehole with pump has been under the plan to be installed in the area. From the situation, no water supply system operation by the government in the area is available.

The community water supply system is available along a mountain path connecting Liquicia and Ermera. Its pipelines have been installed beside the mountain path and small reservoirs equipped with water taps were observed near colonies of houses.

Water delivery system by water trucks were also observed in the area. Almost all houses in the area have water tanks.

(3) Evaluation of Current Situation

The capability of the present water resources for water supply in the project area is evaluated in this section. As the standards and regulations on water supply system are under discussion, the following assumptions are applied to the evaluation.

1) Water Consumption per Capita (WCP)

0.150 m^3/day/capita is utilized in National Directorate Water Supply Services (DNSA) based on their practical study of current situation.

0.070 m^3/day/capita is the minimum requirement. The former parameter is for Center Dili and the latter parameter is for Hera and Tibar.

2) Population and Projected Demand

Population is based on the census in 2010. The population is presented in the Table 5.2.1.

Table 5.2.1 Population for Demand Evaluation

Name of Project Area	District	Population in 2010 Census	WCP (m^3/day/capita)	Demand (m^3/day)	Remark
Center Dili	Dili	213,321	0.150	32,000	Excluding Hera
Hera	Dili	7,376	0.070	520	
Tibar	Liquicia	3,096	0.070	220	
Project Area in total		223,793		32,740	

Source: Population and Housing Census 2010 and JPT

3) Capacity of Water Supply by Surface Water

On the evaluation of the surface water, amount of raw water provision in Dare without WTP and in Becora due to out of operation (Benamauk WTP) is included.

The fluctuation based on the dry and rainy season is presented as minimum and maximum, respectively. The capacity of water supply by surface water is presented in the Table 5.2.2.

Table 5.2.2 Capacity of Water Supply by Surface Water

WTP	District	Amount of Water Generation		Remark
		Minimum (m^3/day)	Maximum (m^3/day)	
Bemos	Dili	2,600	3,500	Excluding Hera
Central	Dili	2,600	6,600	
Lahane	Dili	1,000	2,600	
Benamauk	Dili	400	900	Out of Operation (Raw water supply)
-	Dili	1,900	1,900	No WTP (Raw water supply)
Project Area in total		8,500	15,500	

Source: Performance Survey of National Directorate of Water Supply (DNSA) and JPT

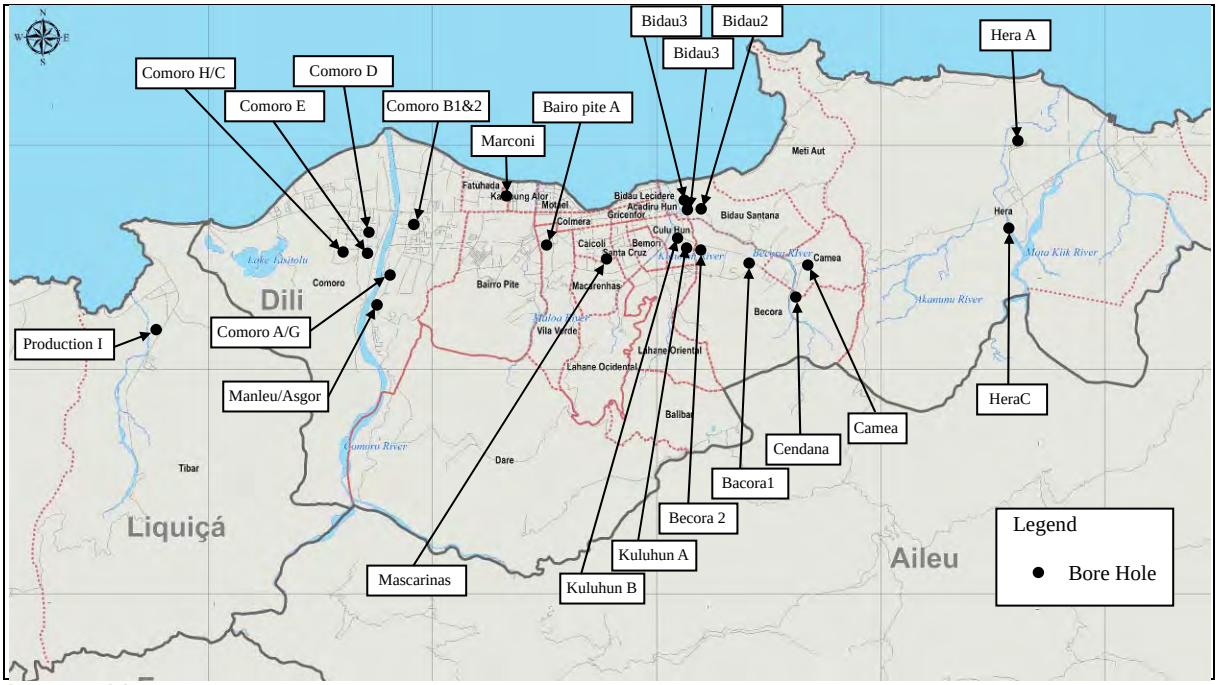
4) Capacity of Water Supply by Groundwater

Capacity of water supply by groundwater is estimated by the capacity of each pump. The capacity of water supply by groundwater is presented in the Table 5.2.3 and the location per area is presented in Figure 5.2.3.

Table 5.2.3 Capacity of Water Supply by Ground Water

Project Area	Name	Capacity (m^3/day)	Sub Total (m^3/day)	Total (m^3/day)
Center Dili	ComoroA	3,542	28,412	30,504
	ComoroB1	2,246		
	ComoroB2	207		
	ComoroC	1,469		
	ComoroD	1,901		
	ComoroE	281		
	KuluhunA	2,246		
	KuluhunB	2,246		
	Becora2	2,246		
	Becora Cipol	691		
	Terminal Becora	691		
	Bidau 2	1,469		
	Bidau 3	691		
	Bidau 4	19		
	Manleu/asgal	2,851		
	Mascarina	2,678		
	Marconi	1,469		
	Biro Bite A	1,469		
Hera	Hera A	115	192	
	Hera C	77		
Tibar	Production I	1,900	1,900	

Source: DNSA



Source: JICA Project Team

Figure 5.2.3 Location of Boreholes

5) Comparison of Current Demand and Capacity of the Developed Water Resource

In Center Dili, the potential water resource is capable to cover the current population in Center Dili with 0.12 of physical leakage and O&M usage. As the physical leakage is estimated to be0.556 based on the actual situation as shown the Table 5.2.4, diligent efforts to reduce leakage will be required.

In Hera, the water supply system has been partially developed and the population does not concentrate in the wide area. The figures of demand and capacity in the table shows the situation.

In Tibar, compared with the current population, a huge capacity well is under preparation to be operated for the future population.

The comparison of current demand and capacity of water resource is presented in the Table 5.2.4.

Table 5.2.4 Comparison of Current Demand and Capacity of Developed Water Resources

Project area		Demand (m^3/day)	Capacity (m^3/day)	Remark
Center Dili	Dry Season	32,000	36,000	In case, the service period is assumed with 12 hours per day, the ratio of physical leakage is estimated with 1 - 32,000 x 12/24 /36,000 = 0.556
	Rainy Season	32,000	44,000	
Hera		520	190	
Tibar		220	1,900	The pump is under preparation for operation.

Source: JICA Project Team

(4) Activities of Donors in the Water Supply Sector

Many donors have acted in the water supply sector of Timor-Leste. Listed are organizations concerned with the water supply projects in the project area.

1) Asian Development Bank (ADB)

ADB has financially and technically supported clean water supply in Timor-Leste improving the distribution system and strengthening the tariff management in Dili. Projects which are carried out through the support of ADB are presented below.

i) Technical Assistance to the Democratic Republic of Timor-Leste for Preparing the Urban Water Supply and Sanitation Project (Financed by Japan Special Fund),

ii) Democratic Republic of Timor-Leste: Strengthening Water Sector Management and Service Delivery, and

iii) Dili Urban Water Supply Improvement Project

Especially, ADB has just launched a project in March 2015 for the water supply in Center Dili. The project also includes the study of water resources in the catchment area of Center Dili. This urban development study should verify the result of the ADB study and reflect it in the urban development plan in terms of the potential water supply.

2) Australian Aid

Australian Aid has carried out projects for clean water supply in rural area of Timor-Leste and prepared a hydrogeology map of Timor-Leste. Technical advisors have been assigned to divisions of GoTL by Australian Aid to strengthen the organization such as DNSA and National Directorate for Water Quality Control (DNCQA).

Australian Aid financed the following projects to achieve strengthening of the organization and regulation in water sector and to maintain the water supply system in rural areas of Timor-Leste.

i) Support for Establishing Water Law

Australian Aid has assigned engineer technically to support for drafting the water law in DNCQA. The law is to control the existing usage and the development of surface and groundwater. The drafted law is under discussion in the government for approval in 2015.

ii) Evaluating Existing Boreholes and Studying Water Supply System in Rural Area

Australian Aid financed projects to improve the period of the water supply, the quality of the water, and the amount of water supplied in rural area. The projects includes the investigation of existing borehole in terms of its capacity and salinity risk, the evaluation of the existing water supply networks, and the plan of reconstructing the water supply system.

3) Japan International Cooperation Agency (JICA)

Since the time of control being under the United Nations (UN), JICA has supported the recovery, reconstruction, and enhancement of the water supply system in the region and mainly financed

to establish water treatment systems. The finance supported to install packaged water treatment systems, pump systems, and reservoirs in Bemos, Maloa, Lahane and Benamauk.

In these 3 years, JICA has assigned an expert on water supply to DNSA to improve the distribution system in Dili. The activity of the expert is to achieve 24 hours of water supply in the zone 9 shown in the Figure 5.2.2.

5.2.2 Institutional and Regulatory Conditions (including Donor Activity)

(1) Laws and Regulations

As of August, 2014, a new law and standard relating the water supply have been drafted and it have been under discussion in GOT for approval in 2015.

From the situation, although the law on water supply Ref no. 2004 No.4 stipulating policy on minimum requirement of water supply has been enforced, there is no law for water rights enforced in Timor-Leste. On the standard of water quality, the guidelines on water quality based on the WHO Guidelines for drinking water quality have been applied in current situation.

Water tariff has been established and enforced. In some wards of Dili sectioned by water supply project, the water meters are installed on the distribution network; the staff members of DNSA measure the figures and the financial section of DNSA issues the bills of the charge. On the collection of charges, the banks, which are committed for the collection, just issue the invoice to the customers as per the request of the financial department. In nearly all cases, customers have ignored the invoice. Although the director of the district administration has the right to order closing of the valve until payment, he has not ordered any to avoid the risk of riot by customers. From this point of view, the operation has not worked yet due to lack of people's understanding on the charges on public services.

(2) Organization

In 2013, the structure of GoTL has been reconstructed. After the reconstruction, the Ministry of Public Works (MOPW) mainly managed and controlled the water supply system in the project area. MOPW placed the National Directorate of Water Supply Services (DNSA) and National Directorate of Water Quality Control (DNCQA) under the General Directorate of Water Supply and Sanitation.

1) DNSA

DNSA is the department responsible for the construction of water supply facilities, operation and maintenance, and tariff control of the national water supply. The governmental water supply system in the project area is under the control of DNSA.

2) DNCQA

DNCQA is the department responsible on the water quality of water resources, water supply, and the condition of the groundwater. In the project area, DNCQA has checked the water quality of WTPs and boreholes such as water temperature, ph, turbidity, and residual chlorine. DNCQA has also checked the salinity of the groundwater near the seashore.

5.2.3 Development Issues and Directions

Establishment of the laws and regulations, master plan of water resource and water supply, reconstruction of distribution network, and information about public water supply to customers arethe typical development issues in the water supply sector. The situation for each issue is presented in following items and a chart on the development issues is presented in the Figure 5.2.4.

(1) Establishment of Laws and Regulations

Necessary laws and regulations concerning water rights and the development of water supply projects are under discussion in GoTL, according to DNSA and DNCQA. The water resources should be controlled by a unified organization for sustainable usage of the water resources under the laws and regulations.

(2) Master Plan of Water Resources and Water Supply

A master plan study on water resources and water supply needs to be carried out as soon as possible.

Any studies about the yield of surface water and groundwater have not been carried out. Although the national hydrogeology map of Timor-Leste have been published in 2012, the detailed study is required for the project area to decide the maximum potential of the water resources.

The master plan on water supply needs to be formulated from the viewpoint of water supply system development and its schedule to clarify the direction of the water supply in the project area for understanding of person concerning the development project.

In the project area, although the master plan on sewerage have been studied and approved by GoTL in 2012, certain difficulty is easily expected on its implementation without the master plan of the water supply system studying the provision of water consumption. From this point of view, the master plan of water supply is required because sewerage needs to be reviewed and revised, if necessary.

(3) Reconstruction of the Distribution Network

The location of the existing pipeline in the distribution network has not been clear due to no comprehensive registration of pipeline and illegal connections. DNSA have established the 10 zones to section the distribution area in this plan. The zones, however, have not been sectioned yet in the site and it causes disproportion of water pressure in the distribution network. It is one of the main cause of not meeting the water service period for 24 hours.

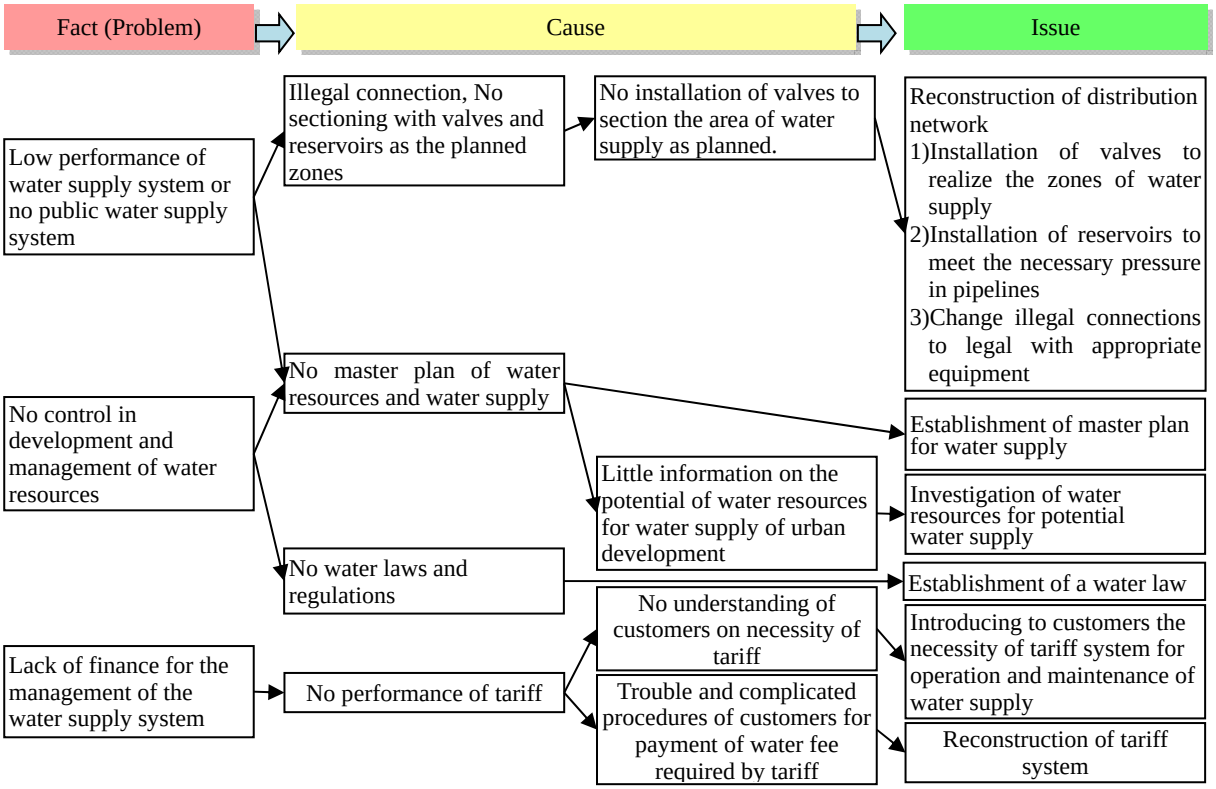
(4) Information of Public Water Supply to the Customer

Instruction to the customers is necessary to encourage customers' effort and to be able to mitigate certain issues on water supply.

Saving water and cost on maintaining water supply system and its quality need to be discussed among the customers. Understanding that saving water and cost by the customers will affect improvement of the service period and O&M works.

Although the instruction to the customers does not lead to drastic improvement, it is effective on the improvement of the performance and affordable to do with smaller budget compared with the construction/re-construction of the water supply system.

The issue will be included in the public consultation of Strategic Environmental Assessment (SEA) in the project as complementary agenda item.



Source: JICA Project Team

Figure 5.2.4 Chart on Development Issues

5.3 Sewerage/Drainage

5.3.1 Review of Current Conditions

(1) Approved Master Plan

In 2012, the Dili Sanitation & Drainage Master Plan (DSDMP) including sewerage and drainage, was approved by the Council of Ministers. Projects on sewerage and drainage have been implemented pursuant to the DSDMP as of August, 2014.

1) Sewerage (Wastewater)

Sewerage parts of DSDMP are mainly composed of three stages:

1) Stage 1 is for studying the DSDMP in terms of institutional arrangement, responsibilities and impact on sanitation operations and maintenance in Timor-Leste from 2011 to 2012;
2) Stage 2 is for the study of the responsibility of the governmental organization in terms of policy, regulation and services, the communication program among the governmental organization on the benefits of the sanitation facilities and the development of the Community Sewerage Treatment System (CSTS) and the implementation including plan and design of the decentralized wastewater treatment plants (the decentralized WWTP) from 2013 and 2017; and
3) Stage 3 is for the implementation of the additional eight decentralized WWTP, development of the pipeline network to connect the CSTS area and other residential,

industrial, and commercial areas, and the communication program that will be continuously implemented from 2018 to 2025.

On the activity after 2025, the DSDMP recommends the review of the plan for its modification based on the progress, achievement and issues occurring in the implementation, and to study for the unification of decentralized WWTPs by replacing some of these to pumping stations.

2) Drainage

Drainage parts of DSDMP are mainly composed of three stages:

1) Stage 1 is for studying by DSDMP from 2011 to 2012;
2) Stage 2 is for construction and improvement of drainage facilities in priority areas of Central Dili, West Dili, and East Dili in terms of the cleaning program for regular channels and drains, channel re-sloping, channel re-shaping, and construction of road side drains and curb inlets from 2013 to 2017; and
3) Stage 3 is for construction of three retarding basins, widening of two existing drainage channels, refurbishment of three upper catchment basins on the Maloa (2 basins) and Becora (1 basin) rivers, and expansion of the improved areas of drainage facilities similar to stage 2 from 2018 to 2025.

Certain issues on one retarding basin and 13 channels have been recommended to be studied after 2025 because the lack of information during the study for the DSDMP prevented to clear all issues.

Although the operation and management of drainage facilities by governmental organization was mentioned in the DSDMP, community participation is also mentioned on the following points:

1) Providing information to community for understanding of cause and effect on their behavior to the drainage system and its responsibility on cleaning the drainage facilities;

2) Workshops with community leaders for explaining and discussing the impact of installing private structures or farmland in the drainage channel to the drainage system;

3) Socialization and cooperation among the governmental organizations and communities;

4) Monitoring and reporting the condition of drainage channels and pipelines to the governmental organization by each community, and

5) Providing incentives and encouraging clean-ups through giving the community prizes for their effort on maintaining clean drainage facilities.

(2) Current Situation in Project Area

1) Sewerage (Wastewater)

Almost all facilities in the project area utilized pit, septic tank, or direct discharge to public water; and it is out of the control of the government. In some of the residential areas, wastewater flowing into small channels dug on the ground was observed.

Pipelines for wastewater have not been installed yet.

A WWTP has been operated in Tibar for some of the government facilities, hotels, hospitals, and companies. Wastewater is collected by the trucks from the facilities. As the collection of

wastewater is carried out based on the request, the inlet amount into the WWTP have certain fluctuations. The specifications of the WWTP and the inlet amount at any typical day are presented in Tables 5.3.1 and 5.3.2, respectively.

Table 5.3.1 Specifications of WWTP

Item	Specifications	Remark
Design Standard	Indonesian Standard	Aerobic/anaerobic pond + Chlorination
Capacity	170 m^3/day	
Biochemical Oxygen Demand (BOD)	300 mg/ml to 30 mg/ml	
Chemical Oxygen Demand (COD)	600 mg/ml to 60 mg/ml	
Suspended Solids (SS)	200 mg/ml to 50mg/ml	

Source: JICA Project Team

Table 5.3.2 Inlet Amount of Typical Day

No.	Name of Transferring Company	Inlet Amount (m^3)
1	ANTEATER	28
2	PDLTOLL	20
3	MTD	20
4	WASTE CONTROL	24
5	CALTECH	8
6	ALFMIMA	5
7	EDS	5
8	TESCORENTES	5
9	DIRAIRCOR	2
Total		117

Source: JICA Project Team

According to the DSDMP, the detailed design of the CSTS has been carried out on four locations: Fatuhada Community, Bairro Pite Clinic, Fatumeta Elementary School, and Morisse Badame. The four locations of the CSTS are presented in Figure 5.3.1.

Source: DSDMP

Figure 5.3.1 Four Locations of CSTS under Detailed Design

2) Drainage

Existing channels and pipelines are available and expected to function as drainage system in the main streets of the project area. The facilities have not met the requirement to rapidly drain rainwater due to 1) drastic shrinkage of section where roads will be constructed over the channels, 2) sedimentation of sand or mud in the channel, 3) dumping debris into channels and pipelines, and 4) collecting pits choked with soil and dirt that prevent discharge of rainwater from roads to channels. Screens for cleaning the channels are observed. The possibility that the screens become a weir due to stuck dirt and debris in the first flush of rain water needs to be considered.

Trenches dug on the road are the main structures of drainage in the branch road of the project area and it does not meet the required capacity. In almost all cases, trenches receive the wastewater from kitchens and laundry.

The current situation of drainage in the project area is presented in Figure 5.3.2.

Screen Installed in Channel

Choked Collection Pit

Trench Dug on Road

Debris and Soil in Channel

Source: JICA Project Team

Figure 5.3.2 Current Situation of Drainage

(3) Sewerage Projects in the Project Area

In the sewerage sector, specific projects have not been conducted in the project area by any donors after the approval of the DSDMP in 2012.

Pursuant to the DSDMP, the National Directorate of Basic Sanitation (DNSB) has implemented the detailed design of CTST by procuring a Portuguese consultant.

AusAid has supported the establishment of a national sanitation policy, regulation and standard which have been under discussion in GoTL.

5.3.2 Institutional and Regulatory Conditions (including Donor Activity)

In Timor-Leste, the laws, regulations, and standards for the management and control of sewerage system have not been established yet and the following drafts of laws, regulations, and standards have been under study in GoTL.

1) National Basic Sanitation Policy

The policy for sanitation has been studied by MOPW (MOI in 2012) and MOH supported by AusAID. The objectives and direction of sanitation in Timor-Leste are mentioned in the policy.

2) National Strategic Sanitation Plan

Priority areas for the development of sanitation and suitable resources in the sub-sector to achieve the objectives of the development are mentioned in the plan.

3) Specific Standards and Regulations for Plan, Design, and Operation of Sewerage System

Specific standards and regulations have been drafted, reviewed, and discussed by the GoTL.

(2) Organization

The following organizations are responsible for the control of the sewerage system in the project area.

1) National Directorate of Basic Sanitation (DNSB), MoPW

The organization is responsible for the sewerage and drainage systems in terms of plan, design, and management in Timor-Leste.

2) National Directorate for Water Quality and Control (DNCQA , MoPW

The organization is in charge of testing water quality and reviewing its results.

After the development of the sewerage system, the organization is expected to be responsible for testing the water quality of the inlet/outlet in wastewater treatment systems.

3) National Directorate for Road, Bridges, and Food Control, MoPW

The design and construction of rainwater collection facilities as part of the road such as trenches, pits, and pipelines are under the control of the organization.

4) District Administration

Cleaning and removing the debris and accumulated soil from the trenches is the responsibility of the organization.

5.3.3 Development Issues and Directions

(1) Sewerage (Wastewater)

1) Locations and Number of Decentralized WWTPs

In the DSDMP, decentralized WWTPs with Up flow Anaerobic Sludge Blanket (UASB) system were recommended from the viewpoint of operational cost and smaller required area for the system compared with other options. According to the recommendation of the DSDMP,

the decentralized WWTPs are stepwise constructed in the project area during the project period of the DSDMP (until 2025). After 2025, the number of decentralized WWTPs will be reduced by unifying their functions or replacing these WWTPs with pumping stations based on the recommendation.

Regarding the recommendation, the following two points need to be comprehensively discussed on the urban development plan.

1) The existence of WWTPs in certain locations in the center of Dili may have negative impact to the development of residential or commercial areas.

2) A WWTP is the facility for the treatment of wastewater discharged from residential, commercial, and industrial areas; therefore, its plan needs to be reviewed reflecting the direction of the urban development including the development of residential, commercial, and industrial areas studied in this MP as mentioned in the DSDMP.

2) Assumptions Utilized in the DSDMP

In the projection of the volume of wastewater and its pollutant load, certain assumptions were utilized in the DSDMP instead of the evaluation based on the survey result carried out in the project area.

In the study of the urban development plan, the necessity to review the assumptions needs to be discussed after the confirmation of the direction for the urban development.

3) Strengthening the DNSB

According to the document issued by National Directorate of Human Resources (DNRH) in MOPW, the number of staffs in the technical and administration division of the DNSB in 2014 is 25 members. The number is too small to complete the duty of the organization, as the organization is in charge of sanitation issues including the plan, design, and management of sewerage system in Timor-Leste.

Assigning new staffs and training them are urgently required for the implementation of any project. The organization, however, does not have the right to employ staffs and need to submit an application to MOF for new employees. According to our interview with the staffs, the review usually takes one year and that period may cause the delay of the project..

4) Establishment of Standards on Structural Aspect

Various types of sewerage facilities such as trenches, pipelines, latrines, pits, and septic tanks are observed in the project area and these cause difficulty in controlling and managing the sewerage system. It needs to be unified with standard structures to avoid complicating the study for adjusting plan or design type observed in the site.

The technical standards of sewerage structures have been discussed by GoTL as of August, 2014 based on the interview with DNSB. A campaign to disseminate the standards to the public, particularly on the area of construction works, will be recommended.

(2) Drainage

1) Sharing the Information of the Plan Among the Organizations

During the implementation of the drainage project, especially design and construction, its detailed information such as facility type, size, and location need to be shared among the organizations related to drainage management.

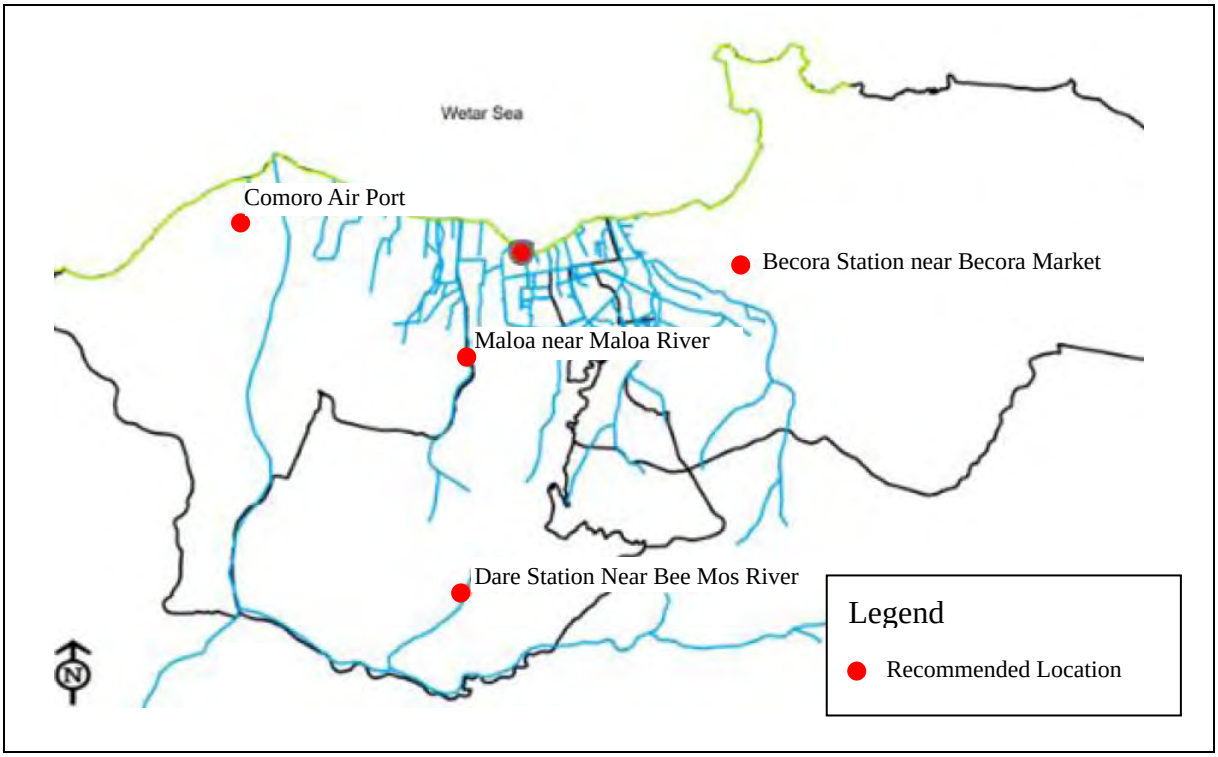
Currently, many structures related to drainage such as roadside channels and pipelines, rainwater collection pits, sewerage channels, and pipelines have been constructed in Dili by many organizations including DNSB. For the implementation of DSDMP, although DNSB need to get all information on the plan and construction works related to drainage facilities, DNSB faced difficulty on the issue and have not recognized certain construction works carried out in Dili.

2) Updating the Data of Rainfall for Study on the Capacity of the Drainage System

The existing study in DSDMP on the capacity of the drainage system is carried out based on the data of rainfall taken outside of Timor-Leste due to the lack of the necessary data.

DSDMP recommended installation of a rainfall measurement system at some locations to complement the data for the review of the study. The recommendation mentioned in DSDMP has not been carried out yet.

Since the project cost of the drainage system is not small, the review of the study for the confirmation of its validity based on the data of rainfall taken in the project area is necessary. The recommend locations to install the rainfall measurement system are presented in Figure 5.3.3.



Source: DSDMP

Figure 5.3.3 Recommended Locations of Rainfall Measurement Stations

3) Public Awareness for Cooperation on Management of Drainage System

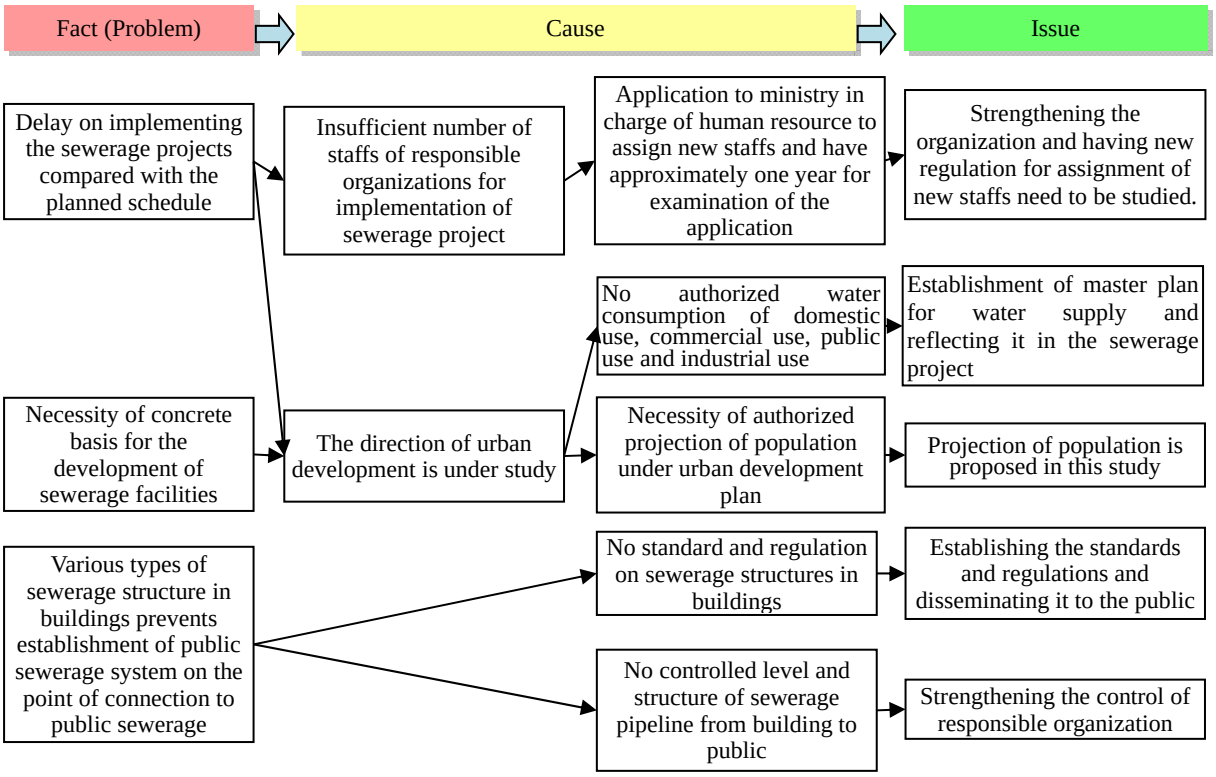
For the improvement of performance of the drainage system, the people's understanding of their role on the drainage system management and participation in keeping the system clean is indispensable.

As shown in the Figure 5.3.2, the remaining debris in drainage channels and choked collection pits are observed in the project area; and the situation seriously affects the smooth and quick discharge of rainwater from roads. Cooperation of people not to throw debris to the channels and not sweeping fallen leaves and dirt into the collection pit will improve the period length for discharging rainwater.

Public awareness on the role of drainage system and proper action to maintain its performance is necessary. DNSB is the suitable organization to take action on the issue.

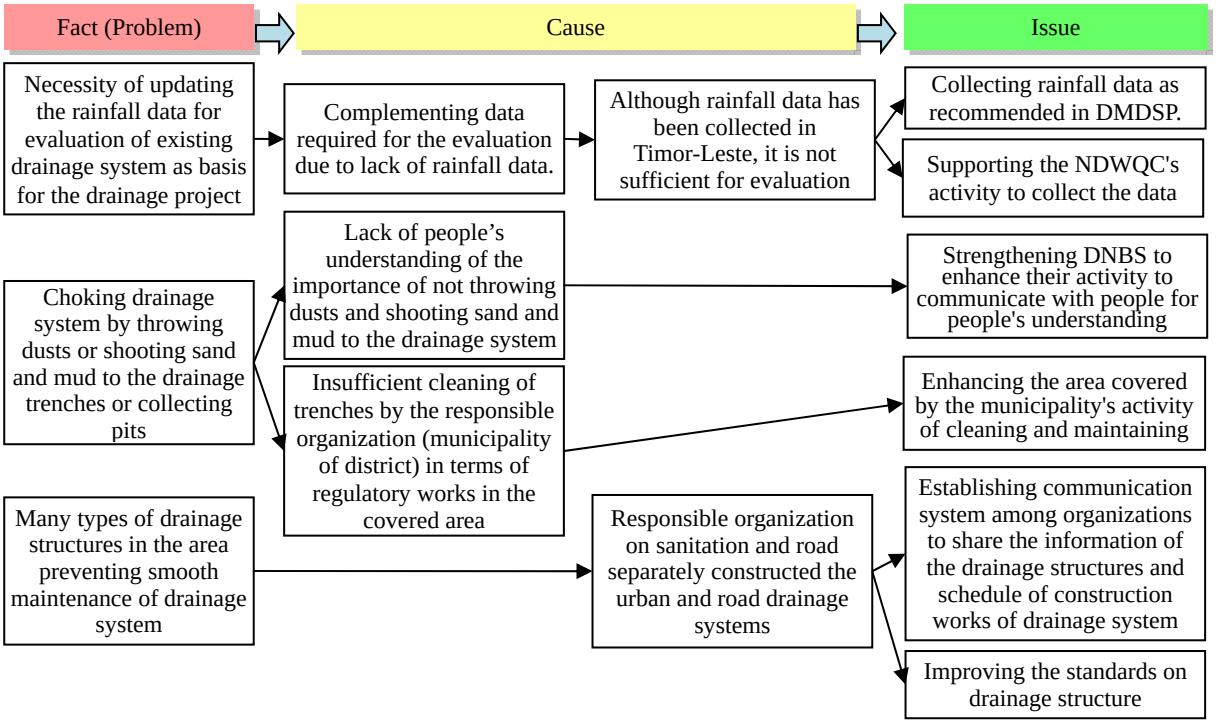
4) Strengthening DNSB and Establishment of the Standards on Structural Aspect

The same as the sewerage as shown in the item (1) iii) and iv) of Clause 5.3.3, the captioned issues should be considered in the drainage sector. Development on issues on sewerage and drainage are presented in Figure 5.3.4 and Figure 5.3.5, respectively.



Source: JICA Project Team

Figure 5.3.4 Chart of Development Issues (Sewerage)



Source: JICA Project Team

Figure 5.3.5 Chart of Development Issues (Drainage)

5.4 Solid Waste Management

5.4.1 Review of Current Conditions

(1) Donor Activity on SWM

GoTL has received a limited number of technical assistance on the solid waste sector from foreign institutions between 2001 and 2014.

In 2001, the study "Solid Waste - Measures to develop in Dili, East Timor" as part of the Water and Sanitation Rehabilitation Project was completed under the United Nations Development Programme. It provided recommendations for urban street cleaning, collection of waste, and the assessment and rehabilitation of the Tibar dumpsite. These recommendations have been partially implemented but need to be updated in the light of the significant changes the sector has undergone in the past 13 years.

The Asian Development Bank (ADB) funded a regional waste management assessment covering 14 developing member countries in the Pacific which included Timor-Leste. The study entitled "Solid Waste Management in the Pacific" was completed in 2011. In the case of Timor-Leste, the study resulted in the publication of four reports which provided an assessment of the solid waste management system of Dili and general evaluation of technologies used as well as financial and institutional arrangements.

Recently, ADB commissioned a study which was conducted within the period from May to September of 2014entitled "Study of the Dili Solid Waste Management Sector". It aimed the identification and development of preliminary improvement options for the solid waste management system of Dili. The study covered the various aspects of the system from generation through collection and transfer, recycling, and disposal. Waste characterization was undertaken, the results of which were used in the

projection of waste generation, recycling, residual, and disposal volume and the number of collection trucks needed by the system. The aspects of existing regulations and enforcement, institutional set-up, private participation, financing and cost recovery, and medical waste management were described and evaluated. Recommendations included options for improving waste storage, collection and disposal, and the assessment needed to develop a program to address the medical waste aspect. Capacity support programs on public participation, recycling strengthening, SWM regulations and training, medical waste, and institutional capacity were also proposed.

In chronological order, Table 5.4.1 presents the features of the donor assistance provided to Timor-Leste from 2001 until the commencement of this project.

Table 5.4.1 Summary of Donor Activity on Solid Waste Management in Dili

Donor	Project	Status
United Nations	Water and Sanitation Rehabilitation Project (TIM/00/008)	Completed (2001)
Asian Development Bank	Solid Waste Management in the Pacific (45051-001)	Completed (2011)
Asian Development Bank	Solid Waste Management Strategy and Urban Investment Plan (ADB SC-103479 TIM)	Completed (May – September 2014)

Source: JICA Project Team

(2) Dili Solid Waste Management Conditions

Solid waste management in Dili corresponds to a collect and dump system with intervening recovery and sale of aluminum cans and other metals.

1) Waste Generation and Characteristics

The bulk of the municipal solid waste (MSW) of Dili comes from residential areas, commercial establishments, and institutions. Based on the recently completed waste characterization study (WACS) commissioned by ADB, the composite per capita waste generation is 0.393 kg. This value, although indicative, is generally consistent with the rates established in similar developing Asian cities and municipalities. For this report, generation rate of 0.4 kg shall be used.

The WACS indicated a general composition range of 50% to 60% biodegradables and 40% to 50% aggregate for the recyclables, residuals, and other waste components. This is likewise comparable to the composition in the neighboring Asian cities. The food and garden waste comprise the bulk of the biodegradables. Plastics make up 12% to 16% of the waste while metals are distinctly low at less than 3%. The low presence of metals can be attributed to the observed practice of recovering aluminum cans and other metals at source for eventual sale to the local recycling facilities.

The projected waste generation of Dili from 2014 to 2030 is shown in Table 5.4.2. The base per capita generation rate of 0.4 kg was used with an assumed nominal annual increase of 1%. Given these considerations, the estimated waste generation of Dili would be about 108 tons per day in 2014 and would nearly double in 14 years by 2028.

Table 5.4.2 Waste Generation Projection of Dili (2014 to 2030)

Year	Population1	Per Capita Waste Generation (kg/day)	Projected Waste Generation (tons/day)
2014	270,323	0.40	108
2015	283,034	0.40	114
2016	296,109	0.41	121
2017	309,507	0.41	128
2018	323,181	0.42	135
2019	337,064	0.42	142
2020	351,137	0.42	149
2021	365,348	0.43	157
2022	379,648	0.43	164
2023	393,974	0.44	172
2024	408,280	0.44	180
2025	422,524	0.45	189
2026	436,691	0.45	197
2027	450,768	0.46	205
2028	464,734	0.46	214
2029	478,576	0.46	222
2030	492,251	0.47	231

Source: JICA Project Team

2) Waste Sweeping

Sweeping of litter along main roads and beaches is done by both the government and private sector. The swept waste is collected and brought to the nearby bins using wheelbarrows or their equivalent containers.

[1] Based on Case 3 of the Population Projection for Dili Urban Master Plan

3) Temporary Waste Storage

Prior to collection, waste is either temporarily stored in bins and containers of various sizes (as shown in Figure 5.4.1) or simply placed along side roads, vacant lots and even waterways. Based on available records, the District of Dili has established about 337 open concrete bins at various locations within the city. The volume of these bins is estimated to range from 1.5m^3 to 6 m^3. The concrete bins are complemented by 42 aging skips with an estimated storage capacity of 6 m^3. Between 2009 and 2010, the Dili District acquired and deployed 200 high density polyethylene (HDPE) bins to facilitate storage and collection. As reported by the district office staff, most of these bins have been damaged or destroyed.

Source: JICA Project Team

Figure 5.4.1 Containers used for Temporary Waste Storage of Dili Municipal Solid Waste

Commercial establishments use their own plastic containers or HDPE bins. Metal drums with a capacity of 115 liters have been deployed along the coastal road. The total number of privately owned bins is unknown.

The capacity of currently deployed bins and containers is deemed inadequate judging from the observed overflow of waste from these temporary storage locations.

4) Waste Collection

Current waste collection covers four of the six sub-districts of Dili. The sub-districts covered by the waste collection system are Cristo Rei, Dom Aleixo, Vera Cruz, and Nain Feto (as shown in Figure 5.4.2).

The bulk of waste collection is done by 30 privately-owned trucks which have been contracted on a 1-year basis with a break clause at six months. These trucks are required to perform three collection trips per day from Monday to Saturday and two trips on Sunday starting from 6:30 AM to completion. Timor Plaza has a single truck which makes three trips per day to the dumpsite.

Source: JICA Project Team

Figure 5.4.2 Map of Dili showing the four sub-districts covered by the collection system

The government has 15 collection vehicles which make one trip per day from Monday to Friday within the time period from 6:30 AM to 2:00 PM. Seven of these are conventional open trucks (Figure 5.4.3) while eight are used for loading the waste skips.

Loading of waste from non-fixed containers is done by simply lifting and tipping these bins into the collection trucks. Small waste piles and garbage outside of the containers and those placed at concrete storage are manually shoveled into tarpaulins to facilitate loading into the trucks. These processes are repeated at each of the collection points.

Once loaded, the waste-laden trucks are driven to the Tibar Dumpsite which is located 14 km from the center of the city and about 18 km from the Cristo Rei sub-district.

Daily waste collection service is provided along main roads and main commercial areas. The service varies from once to thrice a week in the rest of the collection area. There are sectors which could not avail of the collection service due to limited or difficult access.

Collectively, the potential collection trips per day could reach 108 with a likely average of 100. The average capacity of the waste collection trucks is 6 m^3. These figures translate to an average collection volume of 600 m^3/day. Assuming an in-truck density of 130 to 150 kg/m^3, the estimated waste collection per day would range from 80 to 90 tons.

Government truck Private hauler's truck

Source: JICA Project Team

Figure 5.4.3 Vehicles Used for Dili Waste Collection

Judging from the litter and waste piles along the road, beach area, vacant lots and waterways, as shown in Figure 5.4.4, the current collection system is deemed inadequate and inefficient. The total number of trips that can be made by the trucks exceed the estimated waste generation. This condition can be attributed the absence of performance-based provisions in the contract of the private waste haulers and access limitations in some areas.

Source: JICA Project Team

Figure 5.4.4 Photos of Uncollected Waste in Dili

5) Waste Reuse, Recycling, and Processing

Based on interviews, food waste generated in households and commercial establishments is used as feed to pets and domesticated animals. This practice effectively removes an unknown amount of this biodegradable material from the waste stream.

Waste recycling is done by the private sector. Four recycling facilities were identified and located at Aitarak Laran, Tasi-tolu, Rai-kotu in Dili and at Tibar (as shown in Figure 5.4.5).The latter facility is about 400 m northwest of the gate of the dumpsite. These facilities focus on the recovery of aluminum and other metals, baling, and eventual sale to buyers in Singapore and Malaysia. The metal fractions of the waste are bought by these facilities from roaming bin pickers of the city, from households that segregate these materials, and from those recovered by the waste pickers at the Tibar Dumpsite. The recovery process at the bins and from dumpsite exposes the pickers to health hazards, particularly at Tibar where waste is burned to recover the metal fractions.

Source: JICA Project Team

Figure 5.4.5 Recycling Facilities in Dili

Polyethylene terephthalate (PET) bottles, carton, paper and glass bottles are currently not collected and recycled in Dili. The preference for metals is because of the favorable prices of these materials.

A small capacity composting plant, operated by H3R Unipessoal, Lda is found within the Tibar Dumpsite area. It uses five rotating bins to process biodegradable materials from the dumpsite or those brought in by the collection trucks.

6) Waste Disposal

The Tibar Dumpsite, located nine aerial kilometers southwest of the center of Dili, serves as the main repository of the solid waste collected in Dili. The facility is accessible via the well paved, two-lane Liquica – Dili Highway. A 700-meter long paved road links the dumpsite to the main highway. Several clusters of residential units and a recycling facility are found along this road.

Entry to the site is marked by a concrete gate where incoming waste-laden vehicles are inspected and recorded. The area immediately north of the gate is partially fenced. The rest of the dumpsite is naturally bounded by steep uninhabited slopes.

Access to the main dumpsite is through an internal peripheral road. The roadway is in poor condition and reportedly unpassable during the rainy season.

The facility is open daily from 7:00 AM to 6:00 PM. It is manned by 11 employees of the Dili District Office which include eight monitoring personnel, two equipment operators and a supervisor who occupies a small office beside the gate. The facility is not guarded during night time. On-site equipment includes an excavator and a bulldozer. Facilities within the immediate vicinity include an incinerator, a wastewater treatment plant and a small capacity composting plant. Electricity is available at the gate area but not at the main dumpsite. The facility is not connected to any water supply system. Water used by the site personnel comes from a storage tank adjacent to the office.

As observed and based on interview with site personnel, incoming waste trucks are visually inspected. The facility does not have a weighbridge. Data on date and time of waste delivery, number of trips, collection area, name of driver and plate number are recorded in a monitoring form. Entry to and exit from the dumpsite is not restricted.

Reportedly operational since 1984, the dumpsite corresponds to a valley which pans and slopes westward to the residential areas and commercial establishments along the Liquica – Dili Highway. Elevation obtained varies from 60 m in the easternmost portion to about 30 m at its westernmost edge.

Unplanned placement of waste over the past three decades has artificially divided the disposal area into step-like sectors which are referred to in this report as lower, middle and upper reckoned from the west as shown in Figure 5.4.6. The approximate areas of these sectors are 5.8 ha, 2.7 ha, and 2.2 ha respectively for a total area of 10.7 ha. The active dump site occupies about 1.2 ha of the upper sector.

The middle and lower sectors as well as the edge of the dumpsite are currently used for stockpiling of recovered recyclable materials which include metals, plastic and glass bottles, tires, and carton. During the rainy season when access to the middle and upper sections becomes difficult, the lower section is utilized as the temporary disposal site.

The current active cell is characterized by piles of exposed waste, smoke, and on-going fires which have been set by waste pickers to facilitate the recovery of the metals as shown in Figure 5.4.7. The estimated 70 waste pickers, who include children and women, manually pick out the metal fraction of the waste and store them alongside the internal access road and in portions of the lower and middle sectors of the dumpsite. Picking is done without protective masks, gloves, and other safety apparel which expose them to the fire, heat, smoke, gases, and foul odor coming from burning and unburned waste. These unsanitary and dangerous conditions and direct contact with waste on a daily basis poses serious health and safety risks not only to the waste pickers but also to the waste collection driver and crew. Animals like cows and dogs are present at the dumpsite and feed on biodegradable components of the waste.

Commercial establishments and residential areas west and downwind of the dumpsite could also be affected by the smoke and smell from burning waste.

The leachate generated from the dumpsite, although not evident due to the dry conditions of the valley, could move down gradient and contaminate surface and groundwater systems in the populated areas west of the Liquica – Dili Highway.

7) Financing Aspects

The government provides funds for the operation and maintenance of the Dili waste management system from a budget allocated by the Ministry of Finance. A “user pays” system has yet to be implemented which should initially target the commercial establishments and government offices.

8) Medical Waste

Information regarding the amount of medical waste generated at the Hospital Nacional Guido Valadares and from an undetermined number of community health centers and clinics in Dili is not available. Secondary sources indicate that two incineration units are currently used to treat medical waste from these sources. These units are located within the hospital

compound and the Tibar Dumpsite. These reports need to be validated and confirmed through actual inspection

Source: JICA Project Team

Figure 5.4.6 Satellite Image of the Tibar Dumpsite

Source: JICA Project Team

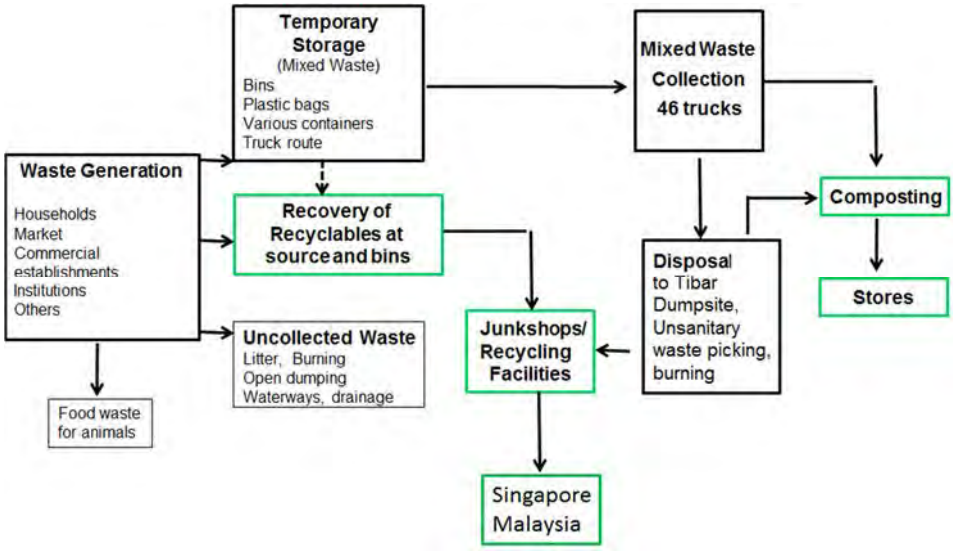
Figure 5.4.7 View of the Active Cell of Tibar Dumpsite

9) Solid Waste Management Practices

In general, segregation of waste at source is not practiced in Dili. Partial recovery of recyclables is focused on metals. Food waste is fed to the house pets and pigs. Burning of waste is practiced and done in some cases inside concrete bins. Littering and dumping in vacant lots and waterways are carried out likely due to limited information on proper waste management. Mixed waste is placed on bins and/or vicinity of designated collection points.

Figure 5.4.8 illustrates the indicative flow of waste in Dili. Currently available data is limited to the estimated waste generation and waste collection based on assumptions of the WACS

conducted by ADB, the assumed waste density and the number of truck trips. The quantities involved in components controlled by the private sector (green boxes) are not yet known. Together with the other components of the system, these need to be quantified or estimated through additional studies or surveys.



Source: JICA Project Team

Figure 5.4.8 Indicative Waste Flow in Dili, Timor-Leste

5.4.2 Institutional and Regulatory Conditions

(1) Existing Regulations

Currently, solid waste management in Dili is broadly guided by the Constitution of Timor-Leste, Decree Law 33/2008 and Decree Law 5/2011.

The 2002 Constitution of Timor-Leste provides the basic legal framework for solid waste management in the country. Through Section 61, it highlights the recognition by the State of the right to a healthy environment and the need to take action for its protection and use by future generations. This goal though has not yet been translated into the legislation of comprehensive laws directly pertaining to the solid waste sector.

Decree Law 33/2008 enumerates the particular prohibitions and penalties for the maintenance of hygiene and sanitation. Article 5 bans the placement of waste on waterways and its banks and right of way. Article 6 discourages littering and dumping of waste in street squares and public places, and prohibits burning of plastic and rubber. Article 9 prescribes the penalties appropriate for the violations of the provisions of Articles 5 and 6.

Within Dili, a local ordinance requires residents and commercial establishments to put out their waste at designated bins from 4:30 AM to 7:00 AM which corresponds to the time for the collection of waste. Persons caught in the act of placing waste outside this period shall be meted out with the appropriate penalties.

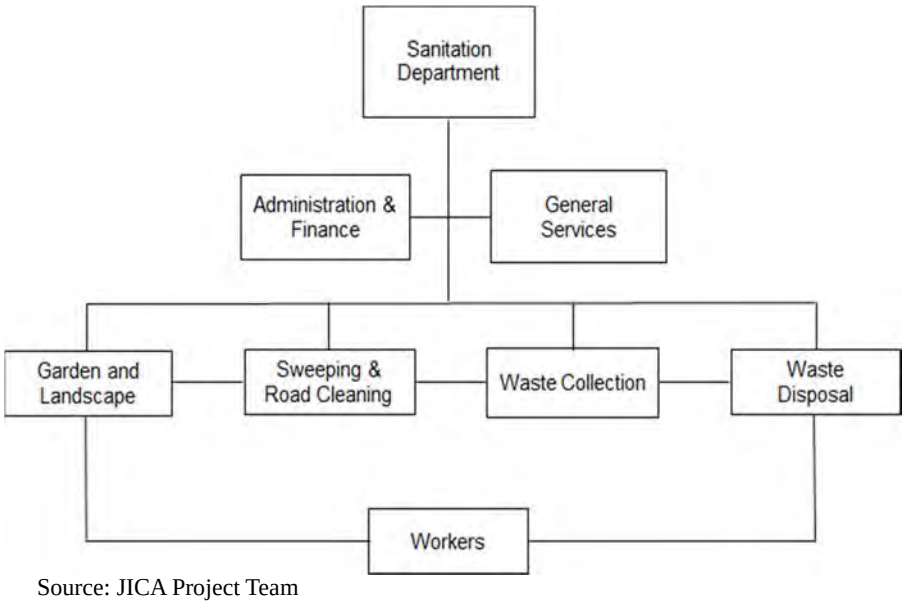
Decree Law 5/2011 on environmental licensing provides guidelines in the acquisition of permits and the conduct of monitoring for projects that could potentially generate negative impacts. Environmental impact assessments will be submitted to the Ministry of Industry, Commerce, and Environment for review and evaluation to secure the permits for the rehabilitation of the existing dumpsite and the establishment of future waste disposal or treatment facilities.

Overall, a comprehensive law that will cover all the aspects of solid waste management has yet to be legislated.

Solid waste management law in other countries contains provisions which require segregation at source, segregated waste collection, prohibits littering and open dumping, encourages establishment of recycling centers and backyard composting, conducts information and education campaign on proper solid waste management practices, requires the closure and rehabilitation of open dumps, and construction of sanitary landfills or waste treatment facilities. Timor Leste does not have this kind of law.

(2) Institutional Set-up

Solid waste management in Dili District is implemented under the Ministry of State Administration, specifically through the Sanitation Department as shown in Figure 5.4.9. The department is composed of 280 personnel who perform the interrelated functions of gardening and landscape maintenance, sweeping and road cleaning, and waste collection and disposal.



Source: JICA Project Team

Figure 5.4.9 Organizational Chart for Solid Waste Management in Dili District

Waste sweeping is performed by 124 personnel who are deployed in 18 sectors of the Dili District. Gardening and landscape maintenance is done by 15 people.

The bulk of waste collection is performed by 30 privately-owned trucks which have been contracted on a 6-month basis. Each truck makes three trips per day from Monday to Saturday and two trips on Sundays. The government utilizes 15 trucks to collect waste from Monday to Friday.

Waste collection is managed and monitored by eight personnel plus two operators of an excavator and a bulldozer.

Other government institutions that will be indirectly linked to solid waste management include the Ministry of Industry, Commerce, and Environment for environmental permits for waste management facilities, Ministry of Health for waste-related health issues and treatment of medical waste, Ministry of Public Works for the establishment of waste management facilities, and Ministry of Education for increasing awareness on environmental protection.

5.4.3 Development Issues and Directions

The current solid waste management of Dili corresponds to a collect and dump system. Improvement of the system needs to be considered and the following development issues need to be resolved:

(1) Absence of Comprehensive Law on Solid Waste Management

The only available law that directly affects solid waste is the Dili ordinance which requires the placement of waste for collection from 4:30 AM to 7:00 AM.

The country needs a comprehensive law which provides regulations and guidelines on the various aspects of management from generation through collection, diversion, treatment, and disposal including the educational, institutional and financing aspects. The law should include provisions which take into consideration current and emerging waste management technologies and practices.

(2) Need to Rehabilitate the Tibar Dumpsite and Develop an Environmentally Acceptable Disposal Facility

The core of any waste management system is an environmentally compliant disposal facility. The current status of the Tibar Dumpsite poses health and safety risks to waste pickers, the truck collection crew, and the inhabitants downwind and down gradient of the facility. This condition is not environmentally acceptable and must not be allowed to persist. On the short to medium term, the active cell should be properly closed and rehabilitated simultaneous to the development of engineered waste cells at the lower and middle sectors of the facility. Over the long term, a suitable facility which will accommodate increasing waste from a growing city must be identified and developed.

(3) Limited Awareness on Solid Waste Management and Environmental Protection

Based on currently available information, most of the waste generators are not aware of fundamental principles of the protection of the environment. Translated to the waste sector, this has resulted in littering, dumping of waste in waterways, burning of waste, mixed waste storage, collection, and disposal. Information and education campaign regarding proper solid waste management should be launched and implemented taking into consideration laws or decrees passed by the government to improve the system.

(4) Limited Institutional Capacity

The current capacity of the personnel and functional group involved in waste management must be upgraded parallel to the necessary improvements in waste collection, processing and disposal. Some of these improvements could include use of large capacity or compactor trucks to reduce the number of truck trips, acquisition and deployment of HDPE bins to improve temporary storage prior to collection, closure and rehabilitation of the active cell of Tibar dumpsite, and construction of sanitary landfill cells.

(5) Impact on the Waste Pickers at Tibar Dumpsite

The rehabilitation of the dumpsite and the establishment of engineered cells where unsanitary recovery of recyclables will not be allowed will affect the livelihood of the waste pickers. Measures to reduce this impact could be in the form of the establishment of a central or several modular recycling centers where sanitary recovery of the recyclables could be undertaken. Such recycling centers should be subjected to feasibility studies to ensure sustainable operations.

(6) Financing of Solid Waste Management Facilities and Operations

Currently, funding for the solid waste management system of Dili comes entirely from the government. In most countries, commercial establishments share the responsibility in financing collection through the regular payment of corresponding fees. If the proposed disposal facility will be funded and operated by the private sector, corresponding tipping fees will be imposed for cost recovery and sustained operations.

(7) Private Sector Participation and Government Monitoring

Private sector participation in waste collection and possibly in treatment and disposal must be properly monitored. As observed, the inefficient collection by the private sector can be attributed to the absence of performance based standards.

(8) Proven Technology on Waste Processing, Treatment, and Disposal

In the light of increasing waste generation and the environmental and social constraints of developing and operating new facilities in sites other than Tibar, the use of appropriate and proven technologies which suit the current conditions in Dili must be considered.

5.5 Power Supply

5.5.1 Review of Current Conditions

(1) Review of Current Conditions

1) Power Supply in Timor-Leste

In 2002, the number of customers for Electricity of Timor-Leste (EDTL) was 21,431 customers. However, it has increased up to 106,727 clients in 2013. Total electricity sales as well as the number of customers increased. This is because of the increase in number of customers and electricity consumption.

Table 5.5.1 Power Demand and Supply in Timor-Leste

Year	Produces Electricity (kWh)	Sell Electricity (kWh)
2005	63,384,615	35,871,301
2006	71,958,471	32,581,172
2007	91,788,978	36,119,579
2008	110,514,113	46,052,915
2009	131,700,316	67,594,239
2010	136,911,616	79,223,288
2011	147,027,949	73,939,964
2012	161,730,744	72,945,071

Source: Electricity of Timor-Leste (EDTL)

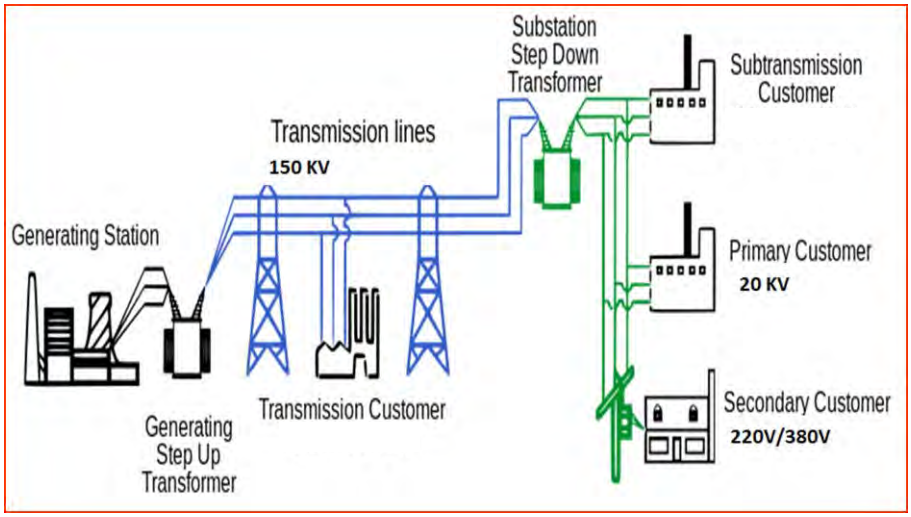
In 2010, the GoTL took a major decision to undergo a great power infrastructure development. The Hera and Betano power plants are the first biggest infrastructure projects in Timor-Leste which now supply electricity to the whole nation.

The Hera Power Plant is the first project in Hera-North coast of Timor-Leste about 30km from Dili. This project has started construction from December 2010. The first three engines of Hera Power Plant were commissioned in November 2011 and fully commissioned in March 2012. There are seven diesel generator sets (7 x 17.076MW) installed for a total capacity of about 120MW.

The Betano Power Plant is the second project located in Betano-South coast of Timor-Leste about 120km from Dili. Betano Power Plant construction started from June 2011 and was commissioned on March 2012. There are eight diesel generator sets (8 x 17.076MW) installed for a total capacity of about 136MW.

ETDL said the current full capacity of Timor-Leste requires approximately 65 MW, equivalent to 54% of the installed capacity of the Hera Power Plant. Betano Power Plant is being used as a backup power plant. Power supply in Timor-Leste is sufficient now.

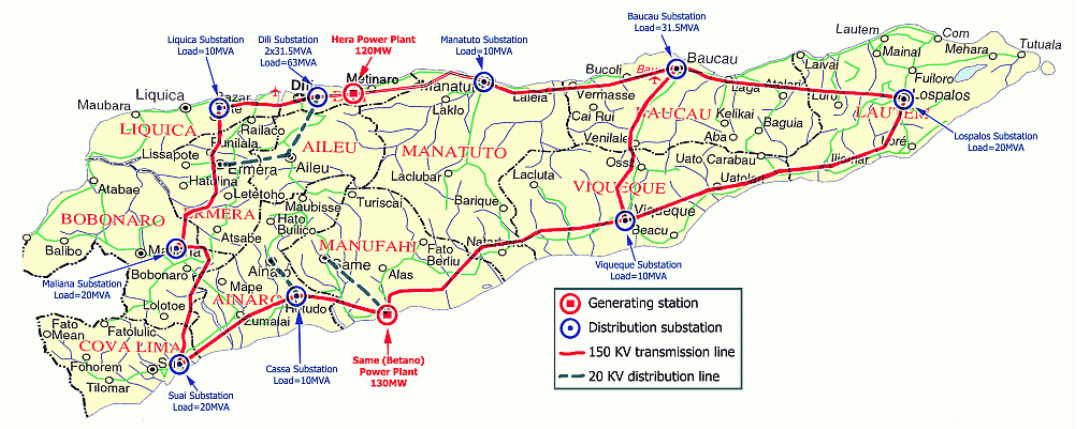
The diesel engine is the driving force of the alternator and the alternator generates a voltage of 15kV and step up to 150kV for the transmission line. Figure 5.5.1 shows the typical power diagram of Timor-Leste.



Source: Electricity of Timor-Leste (EDTL)

Figure 5.5.1 Typical Power Diagram in Timor-Leste

There is a 150 kV transmission line of 715 km forming a ring around Timor-Leste. The full grid was completed in 2012. There are nine substations to reduce the voltage in district capitals of Timor-Leste, which will allow connection to the existing lines of 20 kV distributions. Figure 5.5.2 and Table 5.5.2 below show the power plant and transmission network and list of substations in Timor-Leste, respectively.



Source: Electricity of Timor-Leste (EDTL)

Figure 5.5.2 Power Plant and National Transmission Network in Timor-Leste

Table 5.5.2 List of Substations

No.	Name of Substation	Capacity	Energized date	Note
1	Dili	63 MVA (2 x 31.5 MVA)	27.Nov.2011	Spared space for 31.5 MVA Trans.
2	MANATUTO	20 MVA (1 x 20 MVA)	27.Nov.2011	Spared space for 20 MVA Trans.
3	BACAU	31.5 MVA (1 x 31.5 MVA)	23.Dec.2011	Spared space for 31.5 MVA Trans.
4	LOSPALOS	10 MVA (1 x 10 MVA)	24.Dec.2011	Spared space for 10 MVA Trans.
5	VIQUEQUE	10 MVA (1 x 10 MVA)	30.Jun.2012	Spared space for 10 MVA Trans.
6	CASSA	10 MVA (1 x 10 MVA)	23.Nov.2012	Spared space for 10 MVA Trans.
7	SUAI	20 MVA (1 x 20 MVA)	Apr.2013	Spared space for 20 MVA Trans.
8	MALIANA	10 MVA (1 x 10 MVA)	04.Jul.2012	Spared space for 10 MVA Trans.
9	LIQUICA	20 MVA (1 x 20 MVA)	27.Nov.2011	Spared space for 20 MVA Trans.

Source: Electricity of Timor-Leste (EDTL)

Besides using diesel as power source, Timor-Leste's current electricity supply system is complemented by solar and hydropower as shown in Table 5.5.3 and Figure 5.5.3.

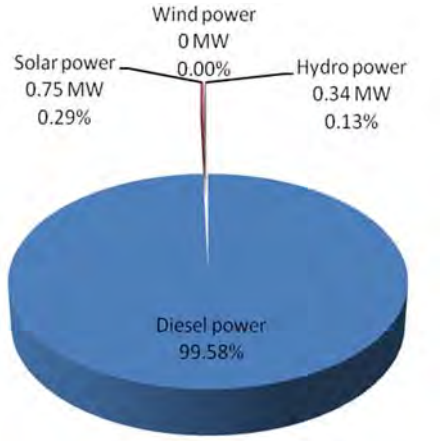
Table 5.5.3 Power Sources of Timor-Leste

No.	Type of Power Sources	Capacity (MW)	Percentage
1	Diesel	256	99.5%
2	Solar	0.75	0.29%
3	Wind	0	0%
4	Hydro	0.34	0.13%
	Total	**257.09**	**100%**

Source: Electricity of Timor-Leste (EDTL)

According to the table above, diesel power occupies up to 99.58% of the total generated capacity of the main network system. The rate of energy used by sources other than the diesel power is negligible.

For Oecusse District, due to the geographical location of this district located too far from the national grid system, power is supplied by local generators. There are seven generators, including four generators with total capacity of 1600kVA and the other three generators with total capacity of 225kVA located in the this district.



Source: Electricity of Timor-Leste (EDTL)

Figure 5.5.3 Percentage of Power Sources in Timor-Leste

2) Power Supply and Power Demand in Dili district

Table 5.5.4 shows the number of customers and percentage of Dili as well as Timor-Leste. The number of customers in Dili was recorded at 39,407 in August 2013. As shown in Table 5.5.4, the percentage of customers in Dili is up to 36.9% of the whole of Timor-Leste's customers. Moreover, it is the customers with large power consumption and large proportion of load.

Table 5.5.4 Balance of Customers

No.	District and Sub-district	Number of Customers	Percentage
1	**Dili**	**39,407**	**36.9 %**
2	Aileu	3,975	3.7 %
3	Ainaro	4,042	3.8 %
4	Same	2,364	2.2 %
5	Suai	6188	5.8 %
6	Maliana	10,757	10.1 %
7	Ermera	4,012	3.9 %
8	Manatuto	4,716	4.4 %
9	Baucau	12,575	11.8 %
10	Lospalos	7,610	7.1 %
11	Viqueque	5,109	4.8 %
12	Liquica	2,780	2.6 %
13	Oecusse	3,082	2.9 %
	Total	106,727	100 %

Source: Electricity of Timor-Leste (EDTL)

To provide power to Dili City, the Dili substation was installed with a capacity of 63MVA and a voltage of 150/20 KV. This substation has two transformers with 31.5MVA each and a spare space for future 31.5MVA transformer.

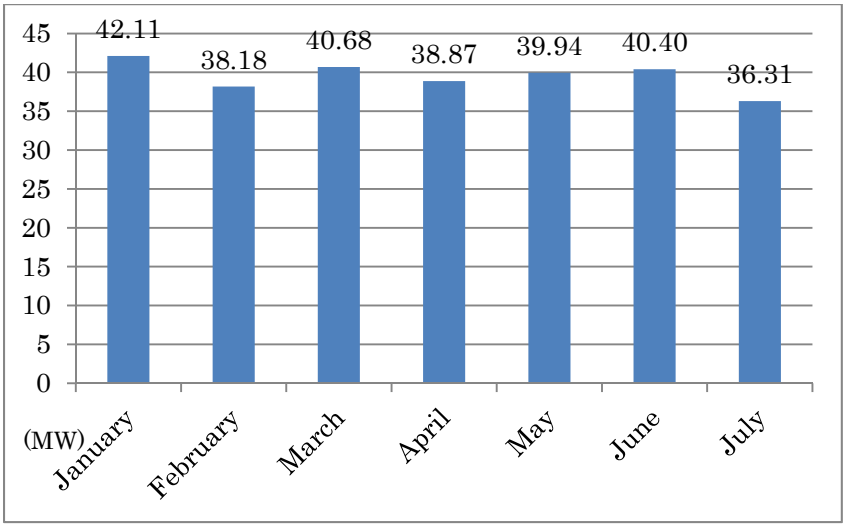
In addition, according to the Table 5.5.5, a network of 20kV distribution substations in Dili has 217 transformers, equivalent to 50,555 kVA installed capacity and transmission lines are approximately 204.92 km.

Table 5.5.5 Substations and 20kV Transmission Line in Dili

Feeder	Substations		Transmission lines	
	Total Transformers	Total Load (kVA)	Total Poles	Total Length (km)
1	25	4,925	1,364	75.02
2	69	10,240	1,226	67.43
3	32	12,095	251	13.80
4	38	8,965	292	16.06
5	24	7,890	275	15.12
6	29	6,440	318	17.49
Total	**217**	**50,555**	**3,726**	**204.92**

Source: Electricity of Timor-Leste (EDTL)

Currently, the total generating capacity of the two power plants (Hera 120MW and Betano 136MW) is 256MW. The total peak power demand of Timor-Leste is about 64.1MW, equivalent to 54% capacity of Hera Power Plant. All of power derived from Betano Power Plant are for spare. Meanwhile, the peak power demand of Dili in the last 7 months (from January 2014 to July 2014) is 42.11MWas shown in Figure 5.5.4.



Source: Electricity of Timor-Leste (EDTL)

Figure 5.5.4 Power Demand of Dili from January 2014 to July 2014

Besides getting the power from the national grid, Dili has a backup power source from the Comoro Power Plant with a capacity of 44 MW.

(2) Donor Activity

The power sector in Timor-Leste has many kinds of projects such as infrastructure management, rehabilitation, and development plan projects. Table 5.5.6 shows the projects related to this project.

Table 5.5.6 Power Sector Projects

No.	Project	Loan Amount (million)	Status	Implementing Agency	Donor
1	Technical Assistance for Democratic Republic of Timor-Leste: Infrastructure Management	USD 1.53	Ongoing (2012-2016)	Ministry of Public Works (MPW)	ADB
2	Power Sector Development Plan for Timor-Leste	USD 0.36	Completed (2002-2005)	Ministry of Transport, Communications and Public Works (MTCPW)	ADB, WB
3	Rehabilitation of Power Supply in the Democratic Republic of Timor-Leste	JPY 764.6	Completed(2003)	Ministry of Transport, Communications and Public Works (MTCPW)	JICA

ADB : Asian Development Bank
WB : World Bank
JICA : Japan International Cooperation Agency
MTCPW: Ministry of Transport, Communications and Public Works is former of Ministry of Public Works (MPW)
Source: JICA Project Team

1) Technical Assistance for the Democratic Republic of Timor-Leste: Infrastructure Management

The objective of ADB is to assist the Ministry of Public Works (MPW) prepare a long-term strategic plan that will set out results targeted for the road and transport, water and sanitation,

and power sectors, and how these targets will be achieved. The plan will emphasize capacity development. It will also help the MPW guide implementation and monitoring of the strategy.

2) Power Sector Development Plan for Timor-Leste

ADB's Technical Assistance was to develop a least-cost and technically optimum strategy for the development and expansion of the power networks throughout Timor-Leste, with the objectives of supporting the economic and social development of the country. Primary performance target was to develop a least-cost development strategy for the power sector to facilitate economic development and poverty reduction.

The scopes included:

(a) Preparing a detailed survey of the energy sector in Timor-Leste;

(b) Determining a least cost development strategy for the power sector;

(c) Preparing a 20-year demand growth model;

(d) Preparing a 20-year power system master plan study; and

(e) Preparing technical and economic feasibility study for prioritized investment requirements.

The Technical Assistance was to focus on affordability and sustainability of the proposed power system, and address poverty reduction, effective delivery of social services, and support commerce and trade.

3) Rehabilitation of Power Supply in the Democratic Republic of Timor-Leste

The project, by JICA's donor, aims at the construction of new generating facilities and the rehabilitation as well as development of the 20-kV Dili distribution network to secure a reliable and stable power supply which is highly ranked on the priority development list in Timor-Leste as part of the improvement of essential social infrastructure to improve the standard of living, to ensure the stable operation of social and public facilities and to vitalize industries in Dili, the center for social and economic activities in Timor-Leste, and also in other areas.

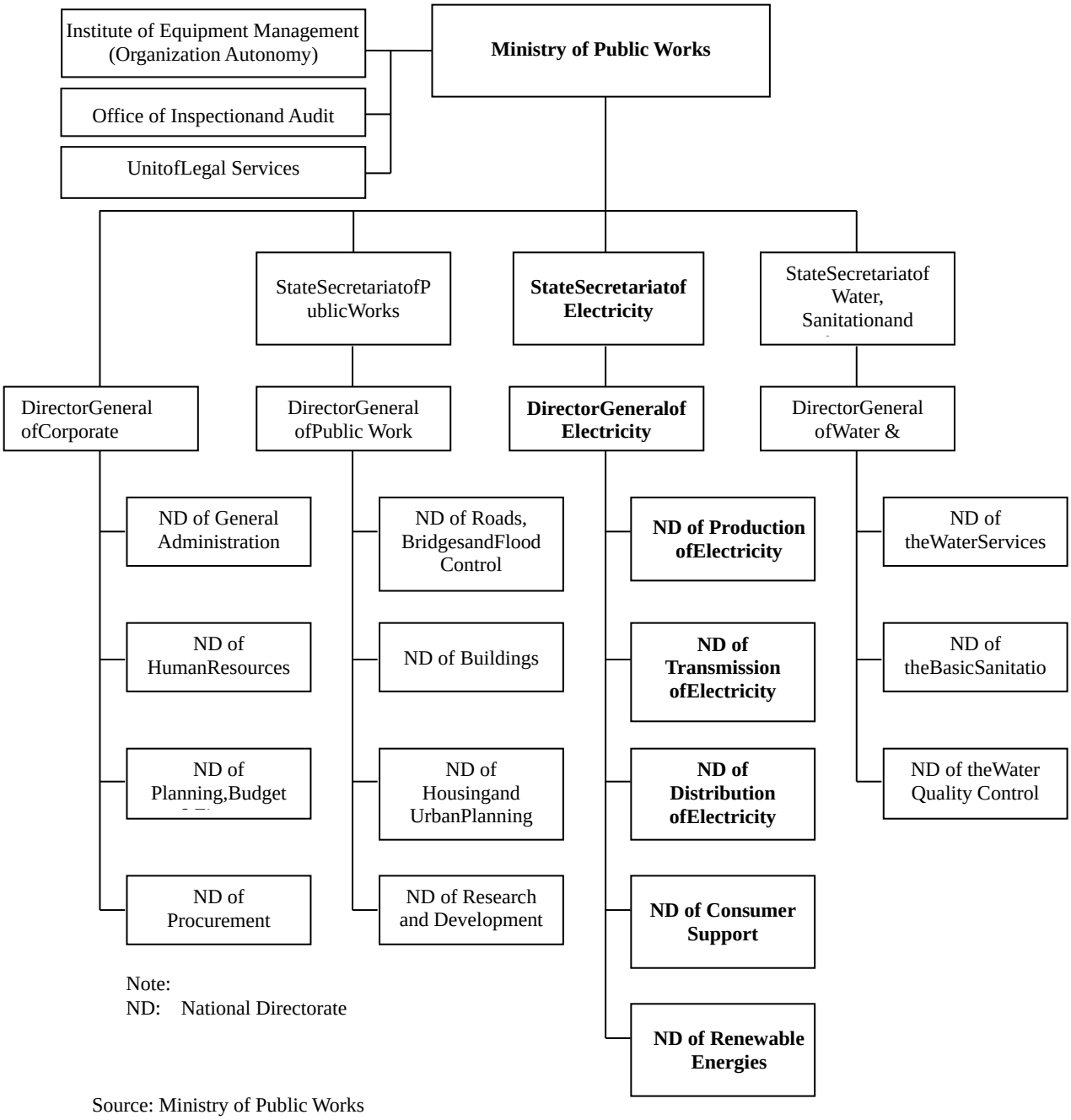
The successful implementation of this project is expected to secure a stable supply of power as an essential component of the social infrastructure in Dili and also to improve the reliability of the power supply system. The actual components of the project are the installation of a new generator unit at the existing Comoro Power Plant and the improvement of the existing 20-kV Dili distribution network.

5.5.2 Institutional and Regulatory Conditions

(1) Institutions and Regulatory

The Ministry of Public Works (MoPW) is covering various infrastructure sectors from road, bridge, urban planning, to water and power. MoPW has three secretaries of state: a) State Secretariat of Public Works; b) State Secretariat of Water, Sanitation and Urbanization; and c) State Secretariat of Electricity. Power sector administration is under the Director General of Electricity (Director General of EDTL).

The organizational structure of MoPW is shown in Figure 5.5.5 below.



Source: Ministry of Public Works

Figure 5.5.5 Organizational Structure of the Ministry of Public Works (MoPW)

In 2003, the Constitutional Government of Timor-Leste issued Decree Law No. 13/2003 with the objective of organizing and regulating the National Electricity System (SNE). This legislation led to the creation of the Electricity of Timor-Leste (EDTL) as the nation's electricity supplier. The main objectives of EDTL are:

- Construction and development of infrastructure in the country; and
- Provide, at affordable prices, businesses and the general population, a wide range of services with quality electricity supply.

The principles that govern EDTL under Article 2 of Decree-Law No. 13/2003:

Ensure the satisfaction of basic electricity supply needs of populations and public and private entities in various sectors of activity through the creation of conditions conducive to the development of such services as follows:

- The existence and availability of the provision of universal service under conditions of adequate quality and affordable prices to all users;
- The economic and financial viability of the provision of universal service;
- To users, in identical circumstances, equal treatment in access to and use of supply of electricity;
- The use of energy sources more suitable for the production of electricity;
- The promotion of rationality and efficiency of the resources available, from production to transmission, distribution and consumption in order to contribute to the progressive improvement of technical and economic conditions of operation;
- Domestic and foreign private investment is attracted to the SNE for creating stable, equitable, transparent, and favorable conditions for investment.

Currently, EDTL is divided into 5 departments: a) National Director of Production of Electricity; b) National Director of Transmission of Electricity; c) National Director of Distribution of Electricity; d) National Director of Consumer Support; and e) National Director of Renewable Energies.

(2) Tariff System

In August 2001, the responsibility for the administration of EDTL was transferred to East Timor Transitional Administration (ETTA); and after independence in May 2002, to the Government of Timor-Leste. The UNTAET Tariff Directive giving EDTL the right to charge consumers for electricity services in Dili and including provisions for tariff setting, billing and collection, connection and disconnection. Since then, the tariff system has changed over the four periods as follows:

1) 2002-2003 Period

In the beginning, the tariff system has followed Directive No. UNTAET/DIR/2002/7, which specify electricity services, fees and charges, and collection of fees and charges. All rates were 249 cents/kWh, which included domestic, residential, commercial, and government. And the domestic and residential are subsidized by 25kWh = USD1.

2) 2003-2005 Period

In 2003, Ministerial Diploma No. 1/MTCOP/2003 by Ministry of Transport, Communications and Public Works (MTCPW) issued the new tariffs. The decree provides that all consumers must have an adequate kilowatt-hour (kWh) meter installed, obligates EDTL to organize an adequate metering and billing system in the country, establishes disconnection rights for cases of nonpayment and delayed payment, and specifies procedures for legalization of informal connections. The following tariffs were set as:

- Domestic and social sector consumers: 16 cents/kWh; and
- Commercial consumers and Government agencies: 20 cents/kWh.

For consumers who are not metered and are located outside the Dili system, the decree establishes a system of flat rate charges based on duration of daily service and amperage of

connection. The flat rates vary from USD 3.00 per month for low-income consumers with a 2A connection and 6-hour daily provision of power, to USD 25.00per month for connection above 4A and 24-hour access to power.

3) 2006-2010 Period

Ministerial Diploma No. 01/MPF-MRNMPE/2007 set the tariffs as:

- Domestic and social sector consumers: 12 cents/kWh; and
- Commercial consumers and government agencies: 20 cents/kWh.

4) 2010-2014 Period

Progressive tariff has been applied in Government Resolution No. 33/2010 "Revision of Tariff for Power Supply" as follows:

- Domestic consumers:
    - 5 cents/kWh with consumption from 0kWh to 20kWh per month.
    - 12 cents/kWh with consumption of over 20kWh per month.
- Social sector consumers:
    - 12 cents/kWh for all consumption.
- Commercial consumers:
    - 15 cents/kWh with consumption from 0kWh to 1,000kWh per month.
    - 20 cents/kWh with consumption from 1,001kWh to 3,600kWh per month.
    - 24 cents/kWh with consumption of over 3,600kWh per month.
- Government agencies:
    - 24 cents/kWh for all consumption.

The synthesis process of changing retail electricity tariff from 2002 to 2014 is shown in Table 5.5.7.

Table 5.5.7 Retail Electricity Tariff Structure

Type of Customer	**2002 - 2003** (Rate per kWh)	**2003 - 2005** (Rate per kWh)	**2006 - 2010** (Rate per kWh)	**2011-2014**	
				Rate per kWh	Consumption (kWh/month)
Domestic/Residence	249 cents Subsidy (25kWh = USD1)	16 cents	12 cents	5 cents 12 cents	0kWh – 20kWh > 20kWh
Social		16 cents	12 cents	12 cents	0kWh – 20kWh > 20kWh
Commercial	249 cents	20 cents	20 cents	15 cents 20 cents 24 cents	0kWh – 1,000kWh > 1,000kWh and ≤ 3,600kWh > 3,600kWh
Government	249 cents	20 cents	20 cents	24 cents	N/A

Source: Electricity of Timor-Leste (EDTL)

With Table 5.5.7, we can notice that the electricity tariff was very expensive in the period of 2002-2003. This was due to Timor-Leste being just recently formed; almost all of power plants were destroyed leading to high production cost.

In the 2003-2005 and 2006-2010 periods, electricity tariff have fallen significantly because electrical systems were already being recovered. However, with a flat tariff, it does not encourage the citizen and companies implementing power-saving issue, leading to reduced burden for the government.

Beginning in 2011, the new electricity tariff has been applied in a progressive form; this has to meet with the general trend of the world, encouraging people to save electricity and still ensure the revenue of EDTL.

5.5.3 Development Issues and Directions

The objective of power sector is to ensure the synchronization between power supply development and power grid to provide the best quality, reliability, efficiency of power, and it has to meet the needs for socio-economic development. Based on the study of the current conditions, the development issues and constraints should be implemented as follows:

(1) Improvement of Distribution Network and Primary Substations

In recent years, the Government of Timor-Leste undertook the development of power plant and national transmission lines. However, distribution network for medium voltage and low voltage are unimproved. Generally, voltage fluctuations in low-voltage networks far exceed the levels of electrical appliances. This represents an additional burden for customers who thus bear the costs associated with electrical failure caused by low supply voltages and poor performance of electrical appliances.

In addition, power overhead lines should be underground to keep the urban landscape of Dili such as historic preservation areas and the center of Dili. Underground overhead lines are not only keeping the urban landscape of the city but also ensure safety of power supply and minimizing failures due to lightning and rain storms.

Furthermore, the steel poles of the power distribution network have degraded. It became rusted andcould not withstand the weight of the overhead line leading to failed installation of more lines to develop the grid. The steel poles should be replaced with concrete poles. Concrete pole has advantages such as low prices and high tensile strength which is popularly installed worldwide.

Currently, the primary substation for DMA is the Dili substation with capacity of 63MVA (equivalent to 53.5MW). Meanwhile, the peak power demand is 42.1MW by 2013; it shows that Dili substation will be overloaded in recent times. To ensure sufficient power supply to the DMA, Dili substation should increase its capacity for the short term and a new primary substation should be installed for the long term.

With the reasons stated above, the improvement in distribution network and primary substation are necessary.

Objectives

- Improve distribution power to improve the quality of electricity;
- Put the existing overhead line in historic preservation areas and the center of Dili underground; and
- Ensure power supply capability for DMA.

Effects

- Ensured improved power supply to the load; and
- Kept the urban landscape of Dili.

Development Items

- Increase of transformers and low-voltage lines in Dili;
- Replace the old steel poles with concrete poles to improve the better capable of force;
- Put the existing overhead lines in the main route's underground; and
- Upgrade Dili substation and install the new primary substation.

(2) Using Renewable Energy

Although national grid is the main power supply for Dili, but to mitigate climate change and save the national budget on the oil supply running generators, as well as savings cost for every people electricity charge, renewable energy needs to be considered. Renewable energy includes: hydropower, wind power, biomass energy. and solar power.

Hydropower is generated by using water flow to spin turbines. The power station should be installed near the river to divert water to a higher elevation and use the falling water to turn a turbine that drives a generator. So, Dili is not suiable forhydropower.

Wind power is suitable for places with high wind density and empty terrain.Dili will be a modern city with high building so it would not be suiable for this energy source.

Biomass energy is produced by plant or animal waste materials and it is not suiable with Dili City.

Solar power uses heat from the sun to generate electricity. Solar power may be applied to a single load or a load without using power supply continuity. In Dili, street lighting and hot water heater for household should be mentioned. Street lighting system has been installed in the main streets of Dili. This system can use solar energy. This is a viable solution because it does not only save energy but is also a sustainable solution for an urban civilization. In addition, the hot water heater is one of the main components of electricity consumption in households, restaurants, and hotels. Therefore, the use of hot water heaters with solar energy is required. With the above reasons, solar energy is the most suitable in Dili.

Objectives

- Use solar energy for street lighting; and
- Use solar energy for hot water heater.

Effects

- Using renewable energy to reduce electricity bills paid by residents as well as reducing the burden on the Government's investment in power sector; and
- Ensure sustainable development of urban civilization.

Development Items

- Solar energy street lighting will be installed in the new or renovated roads; and
- Government propaganda and encourage Dili citizens to use solar water heater by subsidizing the production unit.

5.6 Telecommunication

5.6.1 Review of Current Conditions

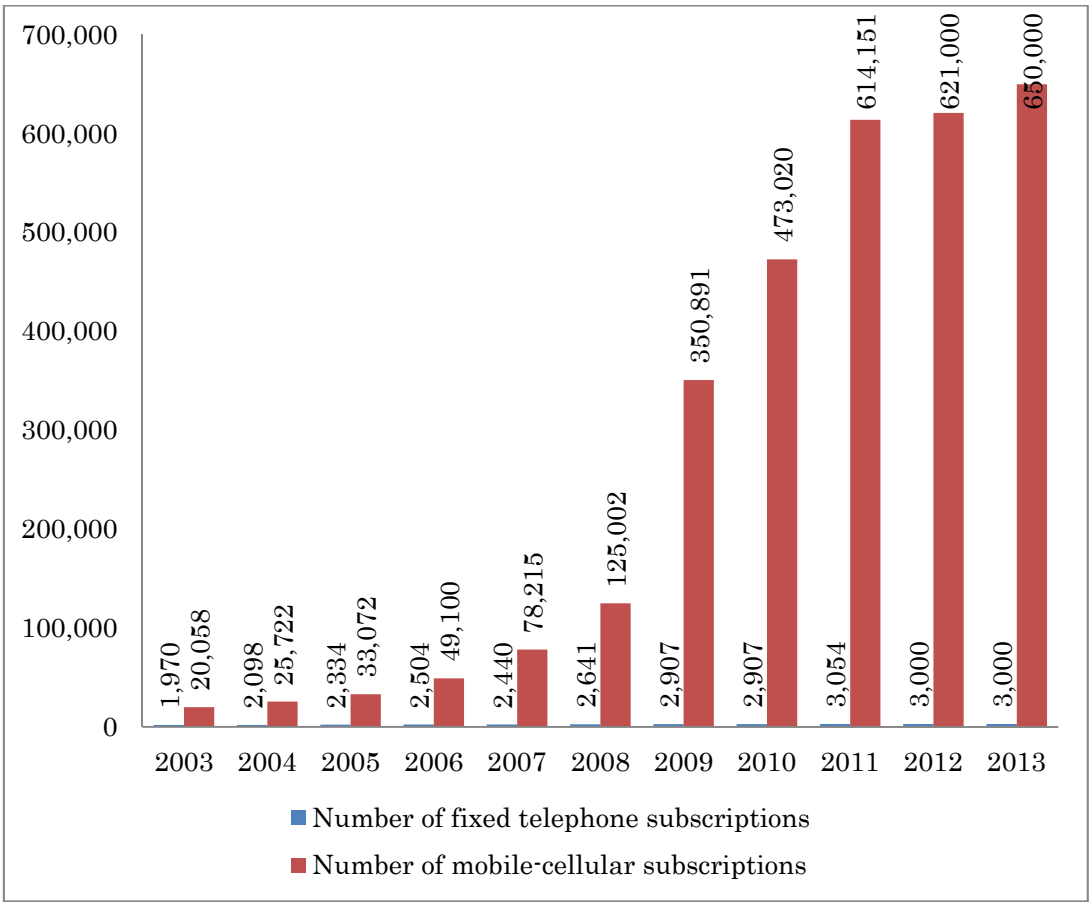
(1) Review of Current Conditions

1) Fixed Telephone Subscriptions and Mobile-Cellular Subscriptions

Voice telecommunications in Timor-Leste is largely mobile. Although their use is not as widespread as its neighboring countries, mobile phones are no longer exclusive to the wealthy, and many, even the poorest citizens, have access to it. As of the end of 2013, there are 650,000 mobile-cellular subscriptions. This number of mobile-cellular subscriptions equates to nearly 55% of the current population.

In contrast, the number of fixed phones is insignificant, and has only risen marginally since the Timorese independence. At the end of 2013, there were about 3,000 fixed telephone subscriptions, accounting to less than 1% of the population. These are used mainly in governmental, corporate, and NGO offices in Dili, as well as in some private homes.

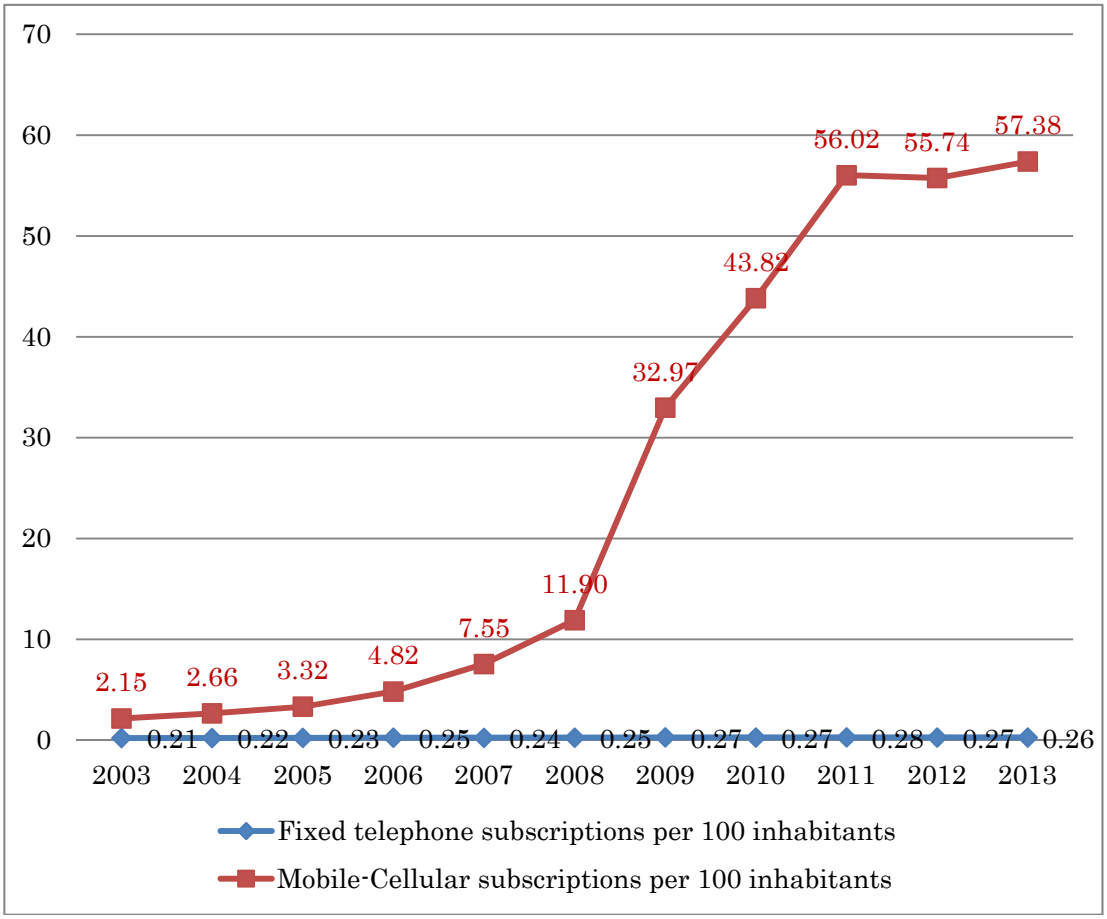
Figure 5.6.1 shows the comparison chart between fixed telephone and mobile-cellular subscriptions.



Source: JICA Project Team based on ITU (International Telecommunication Union) statistics data

Figure 5.6.1 Comparison Chart Between Fixed Telephone and Mobile-Cellular Subscriptions

Figure 5.6.2 shows a clear contrast between the fixed telephone and mobile-cellular penetration ratio per 100 inhabitants. From 2003 to 2013, the fixed telephone penetration ratio was kept around 0.25 per 100 inhabitants. But the mobile-cellular penetration increased from 2.15 to 57.38 per 100 inhabitants in the same period, which leads to the conclusion that most telephone users in Timor-Leste use mobile.



Source: JICA Project Team based on ITU (International Telecommunication Union) statistics

Figure 5.6.2 Proportion of Fixed Telephone and Mobile-Cellular Subscriptions in Timor-Leste

2) Broadband Subscriptions and Network Information

In 2009, there was a rapid growth of fixed broadband subscriptions, with a bandwidth of over 256 kbps, up by660% compared with 2008. But in general, the percentage of individuals using the internet is as low as 1.1%. Table 5.6.1 shows the fixed broadband subscriptions and percentage of individuals using the internet from 2003 to 2013.

Table 5.6.1 Fixed Broadband Subscriptions and Percentage of Individuals Using the Internet

Items	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Fixed Broadband Subscriptions	9	13	22	29	50	71	471	500	550	600	700
Fixed Broadband Subscriptions per 100 Inhabitants	0	0	0	0	0	0.01	0.04	0.05	0.05	0.05	0.06
Percentage of Individuals Using the Internet	0	0	0.10	0.12	0.14	0.16	0.19	0.21	0.90	0.91	1.10

Source: JICA Project Team based on ITU (International Telecommunication Union) statistics

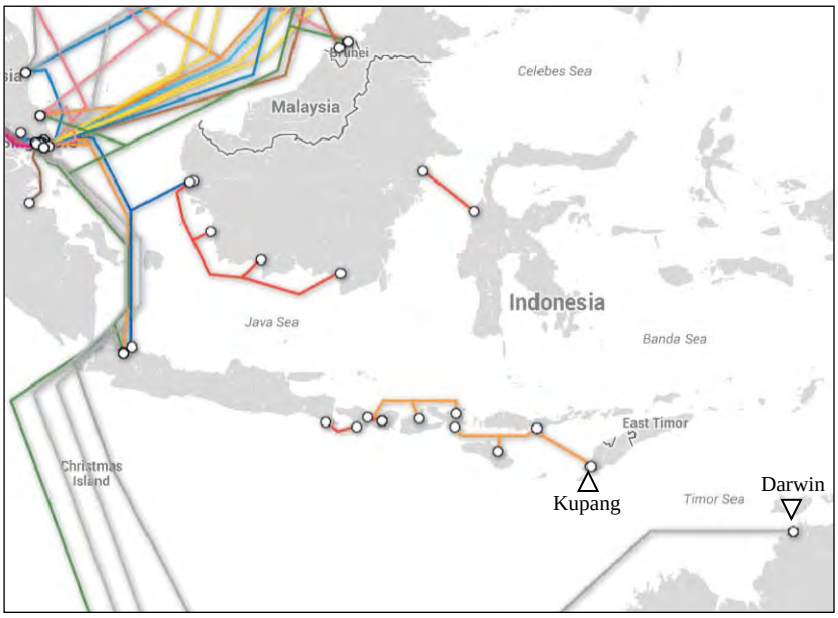
Regarding internet services, fixed connections are only provided by Timor Telecom. The fixed connections are ADSL and Permanent Access. Mobile connections are provided by all of three operators as Timor Telecom, Telemor and Telkomcel shown in Table 5.6.2.

Table 5.6.2 List of Operators in Timor-Leste

No.	Category	Operator
1	Fixed Internet subscription (ADSL/Permanent Access)	Timor Telecom
2	Internet subscription (Mobile Data/Internet/3G)	Timor Telecom Telemor (Viettel Timor Leste) Telkomcel (Telekomunikasi Indonesia International)

Source: JICA Project Team

Currently, international connectivity is provided only through satellite links and there is no submarine fiber links connected to Timor-Leste. Therefore, internet speed is slow with higher costs. Timor-Leste is far from any submarine fiber links serving the Pacific or Southeast Asian regions. In the future, terrestrial local cable links can be terminated relatively closer, in Kupang, Indonesia (about 300 km) and Darwin Australia (about 750 km) as shown in Figure 5.6.3



Source: Submarine Cable Map (a free resource from Tele Geography)

Figure 5.6.3 Map of Current Submarine Cable around Timor-Leste

3) Broadcast

i) Radio

Radio is the most widespread form of mass media in Timor-Leste. It is used in urban as well as rural environments, despite the poor electricity supply. Nearly half the population has a radio receiver at home, most of them powered by batteries. There are 1 AM radio station by Radio and Television of Timor-Leste (RTTL) and 37 FM radio stations by others, including 13 stations located in Dili.

Faced with the challenge of commercial sustainability, the number of radio stations is decreasing. Of the 15 stations set up during the transitional government period, only six were

active in 2006. Community radios also face a range of challenges. Many are dependent on development donor funding, and have not integrated well into their communities.

ii) Television

Timor-Leste has the state-owned Radio and Television of Timor-Leste (RTTL), which has the television division known as Television of Timor-Leste (TVTL) broadcasting programs in Tetun, Portuguese, and Indonesian. In May 2007, TVTL became available via satellite using a transponder leased from Telkom Indonesia. In September 2008, TVTL began carrying programmers from Rede Globo in Brazil.

Beside the state-owned RTTL, Timor-Leste also has a privately-owned television channel STL TV by STL Corporation. STL TV aired on 2009 and this is the first private and commercial channel in Timor-Leste.

(2) Donor Activity

In 2012, the GoTL has announced that it has awarded the country's two new telecommunication licenses to Vietnam's Viettel Global Investment (with the operator name Telemor) and PT Telekomunikasi Indonesia International (with the operator name Telkomcel), with the aim of introducing competition to the Timor-Leste markets. The projects are as listed below.

1) Vietnam's Viettel Global Investment

As of June 2014, Vietnam's Viettel Global Investment, which offers mobile communication services under brand Telemor, invested in infrastructure and distribution network with 160 stations with 2G, 160 stations with 3G, 1600 km of fiber optic cable, covering 96% of the population; 2,500 points of sales agents; with 400,000 customers out of 1.2 million people. The total revenue of the company by the end of the June 2014 is USD17 million, an estimated profit of over USD4 million. The total investment is around USD 13 million. (Source: www.ictnews.vn)

2) PT Telekomunikasi Indonesia International (Telkomcel)

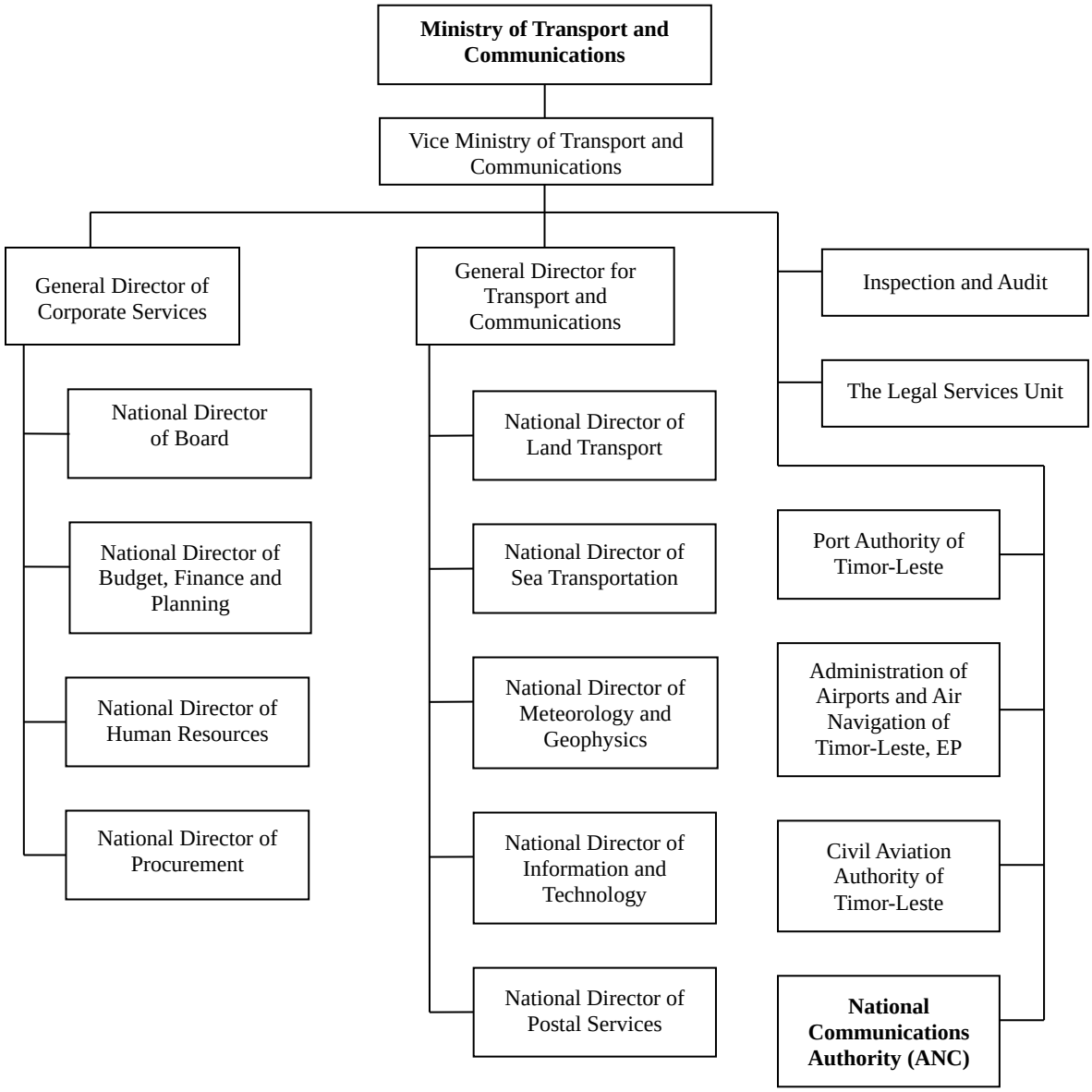
PT Telekomunikasi Indonesia International (Telin), which offers mobile communication services under the brand Telkomcel, spent up to USD50 million to build the relevant infrastructures. Majority of the funds are for establishment of the necessary infrastructures, from base transceiver stations (BTS) to setting up customer service call centers. They had set up 30 BTS in Dili and increased the number of BTS to 110 units to cover 95% of Timor-Leste. (Source: the Jakarta Post)

5.6.2 Institutional and Regulatory Conditions

In 2003, the Communications Regulatory Authority (ARCOM) was established to regulate, monitor, and represent the telecommunications sector. However, the Board of Directors of ARCOM is expected to be appointed within 90 days from the effective date has not been made. ARCOM continues to operate as a department of the government. Since ARCOM was financially dependent on the government, it has prevented ARCOM's operation become independent. At that time, there is only one operator (Timor Telecom), so these restrictions do not affect much. But the problem is that telecom users do not know that they can complain to the agency about the quality of service issues. With its limited resources, ARCOM had not guaranteed the set tasks.

Because of the above reasons, under the Telecommunications Decree-law No. 15/2012 of 28 March 2012, the National Communications Authority (ANC) replaces ARCOM. The ANC will take on greater responsibilities, including: overseeing registration of service providers; granting radio spectrum licenses; monitoring compliance with legislation, regulations, and licenses; regulating interconnection, competition, and consumer protection; resolving disputes among and between operators and service providers; and allocating, assigning, and supervising the use of radio spectrum and numbering, among other responsibilities.

Timor-Leste has begun preparations for the new regulator, including its design, funding, and staffing. The ANC will be funded mainly from license and other fees from telecommunications service providers. It will be accountable for its budget and required to report annually to the Council of Ministers on its activities and finances. Appointments to the ANC's board (made by the Minister upon approval of the Council of Ministers) should ensure ANC's independence from political influence in executing its statutory powers and responsibilities as shown in the Figure 5.6.4.



Source: Ministry of Transport and Communications

Figure 5.6.4 Organizational Structure of the Ministry of Transport and Communications (MOTC)

The national telecommunications policy offers further guidance to encourage competition, consumer protection, and infrastructure sharing.

The law also includes universal service goals, that is, to provide voice-service access to all citizens of Timor-Leste, and to provide broadband internet access to all district capitals in the near term. To achieve this, the government plans to establish the Telecom Fund of Timor-Leste (TFTL), which will be financed from levies, donor funding, and government grants. The TFTL will be administered by the new regulatory body and used to subsidize the extension of coverage to areas that would not otherwise be served because such coverage would not be economically viable for the providers.

The new legislation has a number of salient features:

Registration of service providers: Once registered, service providers will be required to report regularly on their activities and finances. The ANC has the power to amend, suspend, or revoke registrations in case of non-compliance.

Competition: The ANC will periodically review the telecommunications market to ensure its competitiveness. Any anticompetitive contract, informal agreement, or conduct is prohibited. Mergers and acquisitions will be controlled to prevent the concentration of significant market power in one or a few entities, unless user benefits exceed the negative impact.

Price regulation: Prices (wholesale and retail) will be subject to regulation only in case of a significant market player. Prices will be principally based on international benchmarks, but may also consider costs. No ex-ante retail mobile price regulation will be allowed for two years after the introduction of services.

Interconnection, cell site sharing and access: Service providers should negotiate and agree on interconnection, cell-site sharing, and access to facilities. The ANC may require providers to respond to reasonable requests for access.

Furthermore, if international fiber-optic cables are installed, capacity shall be provided to others on non-discriminative and cost-oriented prices.

Dispute resolution: The dispute resolution process is designed to promote speed, quality and effectiveness in the case of competition, interconnection, or other disputes between operators.

Consumer protection: Service providers establish provide complaint and dispute resolution procedures. They should also establish and maintain emergency services, operator assistance services, and customer call center services. Introduction of a mobile number portability requirement will be reviewed in 18 months.

Fees: Beginning in 2013, all service providers will pay a regulatory fee, a percentage of gross revenues capped at 2 per cent. Mobile service providers will pay a minimum fee of USD 200,000 per annum. There will be no license application numbering fees. Operators can use state-owned land for free for five years and at a nominal fee afterwards. New entrants will not pay radio spectrum fees for the GSM and 3G spectrum.

Universal access programmed and levies: Two years after liberalization, ANC will propose a universal access program for voice and internet. Levies on operators to create the fund will be no more than 1% of gross revenues.

Radio spectrum: The government will publish allocations and usage details; licenses are valid for 15 years.

Contraventions and administrative penalties: ANC can impose penalties of up to USD 2 million for most violations.

5.6.3 Development Issues and Directions

Based on the study of the current conditions, the development issues and constraints should be implemented as follows:

(1) Upgrading the Fiber Trunk Network in Dili

Upgrading the fiber trunk network for the metro trunk communications and local access network is essential since it will lead to speed up internet connection and also indirectly reduce internet prices. And the undersea cables should be installed to get the high speed internet connection atlower price.

Objectives

- Upgrading international connections by submarine fiber cable for high speed internet connection with lower price; and
- Improving connectivity for users.

Effects

- Increase in the number of internet users; and
- Enhanced convenience in the use of the internet.

Development Items

- The government should assist operators to install the undersea cable bandwidth capacity;
- Upgrade the trunk communications network and accessibility; and
- Upgrade the networking equipment.

(2) Common Infrastructure and Bunch of Existing Overhead Line Cables

At present, cable laying works under the road are conducted by every operator based on their own marking strategy. It affects road traffic and increase the workload of officers in the road sections such as when a road is dug up several times to install cables of different operators.

Besides, the telecommunication overhead line installation is in a mess and disrupts the aesthetics of the city. Therefore, it is necessary to rearrange the overhead line.

A common underground duct for cables to be shared amongst operators is recommended. The common underground duct buried under the ground accommodates indispensable primary infrastructure that includes communication and power cables. The Government should charge common underground duct users a fee to operate and maintain the common underground duct.

Objectives

- Avoiding uncoordinated infrastructure deployment by operators; and
- Rearranging the overhead telecommunications cable.

Effects

- Coordinated land use;
- Improvement of urban landscape;
- Reduction of road construction; and
- Reduction of operators' burden for construction and maintenance works.

Development Items

- Common underground ducts along the main roads and new urban area or industrial zone; and
- Firstly, arrange the telecommunications overhead line in the main route; secondly arrange the remaining overhead line in whole city.

(3) Upgrade Government Network

The fiber optic network is exclusively developed for theuse of government offices in order to share information and data, to promote effective administrative management as well as to provide prompt administrative services to citizens. This network will connect government offices, its site offices, ministries, and agencies.

Objectives

- Upgrading the government network by the private fiber optic network; and
- Share information between government offices, its site offices, ministries, and agencies.

Effects

- Prompt and effective implementation of administrative management; and
- Prompt administrative services to citizens.

Development Items

- Upgrading the government network to a dedicated fiber optic network.

(4) Upgrade Government Data Center with Cyber Security

At the national government level, Dili should set up their local government data center. The data center is a centralized repository, either physical or virtual, for the storage, management, and dissemination of data and information. For efficient data exchange between the local government data center and Dili, the dedicated government network can be utilized effectively to centralize the governmental information in the data center.

In addition, cyber attacks of fraudulent access and distributed denial of service (DDoS) have hit and damaged the intranet system of companies and government offices and concurrently might have caused a leak of confidential information or an organization’s defamation. Cyber attack protection does not only serve to block an attack from outside of the intranet, but also includes countermeasures which are premised on intrusion into the intranet.

Objectives

- Centralizing data and information; and
- Protecting data and information against cyber attacks.

Effects

- Ensuring the security of government information and data; and
- Efficient implementation of administrative management.

Development Items

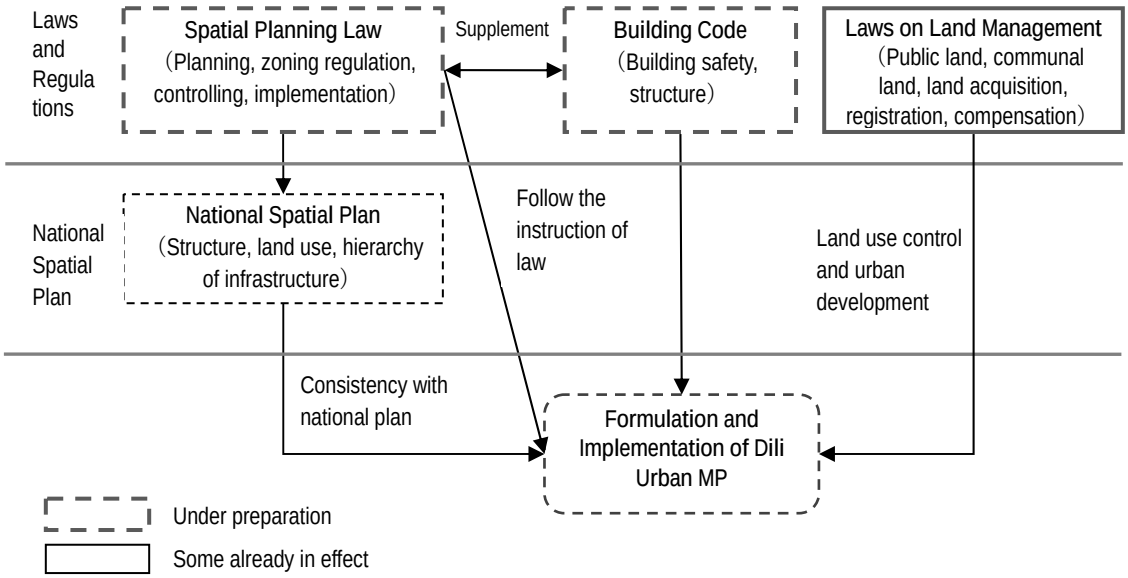
- Setup the Dili data center.

CHAPTER 6 : URBAN MANAGEMENT CONDITIONS

6.1 Land Use Control and Development Control (Institutional)

6.1.1 Legal Framework for Spatial Management

Spatial management is administered by laws and regulations concerning spatial and land management, most of which are still under preparation including the Spatial Planning Law and National Spatial Plan. Figure 6.1.1 shows the legal framework of spatial management to be established in Timor-Leste.



Source: JICA Project Team, based on interviews with government officials

Figure 6.1.1 Legal Framework of Spatial Management

6.1.2 Outline of Laws and Regulations for Spatial Management

The Spatial Planning Law, Housing and Settlements Law, and National Spatial Plan are considered as the foundation of urban management in Timor-Leste, and are under preparation by a Portuguese consultant, under the supervision of the National Directorate of Housing and Urban Planning, Ministry of Planning and Strategic Investment. Some of the land management-related laws have been established by the Ministry of Justice. The outlines of laws and regulations are described below.

(1) Spatial Planning Law

The Spatial Planning Law aims to govern spatial planning and urbanization. Draft law was presented in July 2014 and revised in November 2014. The composition of the draft law (as of July 2015) is summarized in Table 6.1.1 below.

Table 6.1.1 Composition of Spatial Draft Planning Law

Chapter	Articles
CHAPTER I Objectives, Goals, and Principles	Article 1 Objectives Article 2 Settings Article 3 Purposes and General Principles Article 4 Private Ownership of Land Article 5 Identification and Weighting of Public Interests
CHAPTER II Spatial Planning System	Article 6 Public Intervention on Land through Spatial Planning Tools Article 7 Balancing Public and Private Interests Article 8 National Level Article 9 National Spatial Plan Article 10 Sectoral Plan Article 11 District Level Article 12 District Level Spatial Planning Tools Article 13 Master Plan Article 14 Land Use Plan Article 15 Coordination and Articulation Guidelines Article 16 Relationship between Spatial Planning Tools Article 17 Juridical Links
CHAPTER III Design and Dynamics of Plans	Article 18 Drafting Article 19 Monitoring Article 20 Conciliation Article 21 Environmental Report Article 22 Public Discussion Article 23 Approval Article 24 Advertising Article 25 Amendment and Revision Article 26 Suspension Article 27 Assessment
CHAPTER IV Provisional Measures	Article 28 Preventive Measures Article 29 Jurisdiction Article 30 Material, Spatial and Temporal Limits Article 31 Provisional Measures Article 32 Publishing
CHAPTER V Implementation of the Land Use Plan	Article 33 General Principles Article 34 Implementation Program Article 35 Field of Intervention Article 36 Means of Intervention Article 37 Preemptive Rights Article 38 Expropriation Article 39 Re-installments Article 40 Execution Granting
CHAPTER VI Final and Transitory Provisions	Article 41 Direct Application Article 42 Adaption Article 43 Administrative Decentralization Article 44 Particular Cases Article 45 Entry into Force

Source: Spatial Planning Law, Final Proposal, November 2014, Intersismet, Quaternaire

(2) Housing and Settlements Law

The Housing and Settlements Law aims to provide instructions on housing development including social housing and housing for civil servants, and its management. The composition of the law as proposed is shown below.

Chapter I – Objectives, Goals, and General Principles: Scope, objectives, and general principles
Chapter II - National Housing Plan: Diagnosis of housing needs, provision of state interventions, particularly through the National Housing Plan, and the provision of municipal social and public servants housing, provision of other public actions to promote housing, programming and financing means of forecast actions
Chapter III – **Urban Rehabilitation**: Identification and delineation of disordered and degraded urban areas, to rearrange and provide with infrastructures, through detailed plans and implementation programs
Chapter IV – Housing Policy Tools: Including the necessary means, regime of expropriation for public utility and right of preference
C**hapter V - Social Housing:** Regime of access and modes of provision in the social rent rule
Chapter VI - Housing for Public Servants and Agents: Regime of access and modes of delivery
Chapter VII - Housing Cooperatives: Constitution, provision of land, credit funding and tax regime
Chapter VIII - Support to Construction: Providing materials, training, technical support, model projects, and funding through microcredit
Chapter IX – Financial Incentives from the State: Technical support, access to program contracts, tax benefits
Chapter X – Resettlement: In situations of natural disaster or rising out from the implementation of public infrastructures, urban projects or otherwise
Chapter XI – Penalties Provisions
Chapter XII - Final and Transitional Provisions

Source: Spatial Planning Timor-Leste, Final Proposal, November 2014, Intersismet, Quaternaire

(3) National Spatial Plan

The National Spatial Plan will be used as an instrument for spatial development through establishing policy options relevant to organizations of territory of Timor-Leste, and constitutes the reference frame to be considered in the production of other instruments operating within the national planning system and land management (referred from the Spatial Planning of Timor-Leste, Final Proposal, November 2014, Intersismet, Quaternaire).

Objectives of the National Spatial Plan are summarized below.

i. To establish itself as the key instrument for sustainable development as basis of social, spatial and economic development of East Timor, promoting integration in sectors such as housing, transport, energy and industry, improving systems and urban and rural development, at the national and local level, also taking into account the environmental dimension;
ii. To present a set of policies and guidelines of territorial scope addressed to all sectors of development in order to prevent eventual conflicts of land use in the implementation of major national development policies;
iii. To establish a model of spatial structuring of the whole territory of East Timor, as well as the foundations of structuring of its urban system;
iv. To guide the territorial policies at lower scales - regional, provincial, urban and local, pointing to preferred areas for special activities such as industry, housing, and economic areas or areas of environmental conservation;
v. To submit the plan with adequate information on land use at a reference scale of 1:100,000, containing guidelines for the implementation of the Strategic Development Program in relevant areas; and
vi. To define a set of more detailed standards of urban management supporting regional planning at the regional, district, urban and local scale.

Source: Spatial Planning Timor-Leste, Final Proposal, November 2014, Intersismet, Quaternaire

(4) Laws Concerning Land Management

Several land management-related laws concerning public land and abandoned properties are already in effect as shown below.

- **Decree Law No.1/2003** has the purpose to regulate the judicial regime of immobile goods, defining the statute of state patrimony and abandoned properties and set out the outline for management of these goods.
- **Decree Law No.19/2004** regulates the administration of immobile goods of the State, establishing specified rules about leasing of state properties and attributions for the state organs and services.
- **Decree Law No.12/2005** sets out the leasing among particular matters and delivering the rules regarding the types of contract.

In addition, laws on financing of land management, land acquisition and compensation, land registration, and communal land management are under preparation with support of international donors.

6.1.3 Relationship of Legal Framework and Dili Urban Master Plan

(1) Relationship between Spatial Planning Law and Dili Urban Master Plan

Even though the Dili Urban Master Plan should be prepared to satisfy the requirements in the Spatial Planning Law, since the Spatial Planning Law is still under preparation, it is necessary to secure consistency of the Dili Urban Master Plan with the Spatial Planning Law. In addition, the legal justification for the Dili Urban Master Plan has to be secured by the law for approval and implementation of the plan. Important points of the Spatial Planning Law to be considered for the Dili Urban Master Plan formulation are summarized in Table 6.1.2 below.

Table 6.1.2 Relationship between Spatial Planning Law and Dili Urban MP

Points to be Considered	Explanation	Relationship with Dili Urban MP
Types of areas based on administration, natural condition and function	• Geography: urban area, rural area, metropolitan area, others • Function: e.g., agropolitan area, industry area, maritime area, tourism area	The Dili Urban Area has to be defined (urban area? Metropolitan area? Capital Area?)
Types and contents of the plan for each area or functional area	• Administrative character (boundary, national, regional) and geographical function (urban, rural). • Hierarchy, structure, and relation of types of plans (general plan, detailed plan) have to be clearly mentioned. • Objective and contents of each plan have to be clearly defined (planning or urban development project).	Some plans are not "plans", these are considered as urban development projects. It is necessary to clarify the objective of each plan; and the Dili Urban MP proposal has to be consistent with the objective.
Land use zoning category and zoning regulation	• Land use zone category (how many zones, what kind of zones) has to be clearly established together with zoning regulation. • Map and zoning regulation are always shown together.	Land use plan proposed in the Dili Urban MP has to be consistent with zone category in the Spatial Planning Law.
Plan formulation procedure including approval process	• Decentralization Law has to be referred to, particularly the authority of national government and local government have to be consistent with the Spatial Planning Law. • Who should authorize and what type of legal documents are required?	Support for the Dili Urban MP approval is included in the JICA Project. Responsible agency for approval and approval process have to be clearly defined in the law.
Implementation (Urban development project)	• One of main problems of implementation of urban development is that there is no legal justification of the implementation scheme and organization. • Urban development scheme such as new town development, urban re-development, and land re-adjustment, should be introduced.	Urban development project in the action plan together with its implementation scheme has to be proposed in line with the implementation scheme of the law.
Control (permission)	• Permission mechanism in line with the spatial planning law should be defined. ➢ Land development permit ➢ Building permit (zoning regulation)	How the Dili Urban MP will be used for land development permission and building has to be clarified?

Source: JICA Project Team

Issues of the draft Spatial Planning Law, in regard to the formulation of the Dili Urban Master Plan are summarized below.

- Definition of urban area or metropolitan area is not clearly mentioned. Since the Dili Urban Master Plan covers two municipalities: Dili Municipality and Liquica Municipality, the master plan area should be defined in the law.
- Relationship among concerned plans (master plan, detailed plan) is not clearly mentioned. Legal justification of the Dili Urban Master Plan and other plans has to be clearly defined.
- Land use control is not covered. One of important aspects of spatial planning is the land use control including land development permit and building permit. Permit mechanism, in line with zoning plan and zoning regulation, should be covered in the law.
- Approval process including "who approve" is not clearly mentioned. Since the local government does not exist, and the master plan covers two districts, it is important to show the process and approval agency.

(2) Relationship between National Spatial Planning and Dili Urban Master Plan

The National Spatial Plan (NSP) will show the basic structure, land use, hierarchy of urban areas, and hierarchy of infrastructure; thus, the structure plan, land use plan, and infrastructure development strategy to be proposed in the Dili Urban Master Plan have to be consistent with the structure and hierarchy at the national level. Important points to be considered for the preparation of the Dili Urban Master Plan in relation to the National Spatial Plan are summarized in Table 6.1.3 below.

Table 6.1.3 Relationship between National Spatial Plan and Dili Urban MP

Items and Points to be Considered	Explanation	Relationship with JICA MP
Structure Plan	• Plan of settlement system: regional system and urban internal system. • Plan of infrastructure network system: transportation, energy, telecommunication, solid waste and sanitation, water resources.	• Function (economic and political center) of the Dili Urban Area has to be clearly defined in the National Spatial Plan. • Consistency between NSP and Dili MP has to be secured in terms of function of infrastructure (road, sea port, and airport).
Spatial Pattern	Allocation of conservation area and settlement area. • Environment preservation, social activity, cultural activity, economic activity, security and defense • Strategic area	• Consistency between NSP and Dili MP has to be secured: protected area and development area.
Hierarchy of Urban Area	Metropolitan, urban area, rural area and their functions and significant to the national spatial development.	Hierarchy of the Dili Urban Area has to be defined.
Hierarchy of Infrastructure	Primary function, secondary function, supporting function, etc.	Function of infrastructure (port, airport, road) proposed has to be consistent with NSP.

Source: JICA Project Team

Since the draft National Spatial Plan has not been provided, it is necessary to examine the position of the Dili Urban Master Plan in the national spatial planning structure prior to its finalization.

(3) Relationship between Land Management and the Dili Urban Master Plan

Land management-related laws will have impact during implementation of the Dili Urban Master Plan. Issues for land management for implementation of the master plan are summarized below.

- **Land use control:** Implementation of zoning plan/zoning code will limit the use of private land such as limit the activity of land and volume of building. Laws on land management should mention the limiting use of private property for efficient spatial management.
- **Urban development project**: Implementation of urban development project requires land acquisition. To follow the Constitution which mentions the use of private property for public purpose can take place with fair compensation, detailed rules on land acquisition have to be mentioned in the laws on land management.

6.1.4 Practice of Land Use Control

Since there is no regulation for construction permit, land control is implemented based on the Indonesian system with an integration of Timor-Leste.

The necessary documents for the application include certificate of land ownership issued by the National Directorate of Land, Property and Cadastre (DNTP) of the Ministry of Justice (MoJ), a location map of the building, architectural drawings set (scale 1: 100-50), structural calculation documents, water supply, electricity, building materials, and a letter of authorization of the Suco chief. In addition, there is also a case to submit a recommendation document of the Ministry of Commerce, Industry, and Environment (MCIE) and report on environmental and social impact. It should be noted that, at present, the fee of application at the office and other offices is free.

Because there is no land use zoning and building regulation, evaluation is done on a case-by-case basis by the applicant project. For example, if there is a building proposal such as a large-scale shop in a residential area, the owner can be advised to provide enough parking space for the proposed building, but it is not legally enforceable. For building regulations, the Directorate of Building (DNE) has continued to request to prepare the building code for Timor Leste since 2012, its approval is not done yet and thus, construction is carried out in compliance with the building code of Indonesia so far.

To realize the land use plan and other action plans to be proposed in this master plan, it is necessary to enact laws and regulations on land use control especially on the zoning code.

6.2 Land Use Control and Development Control (Organizational)

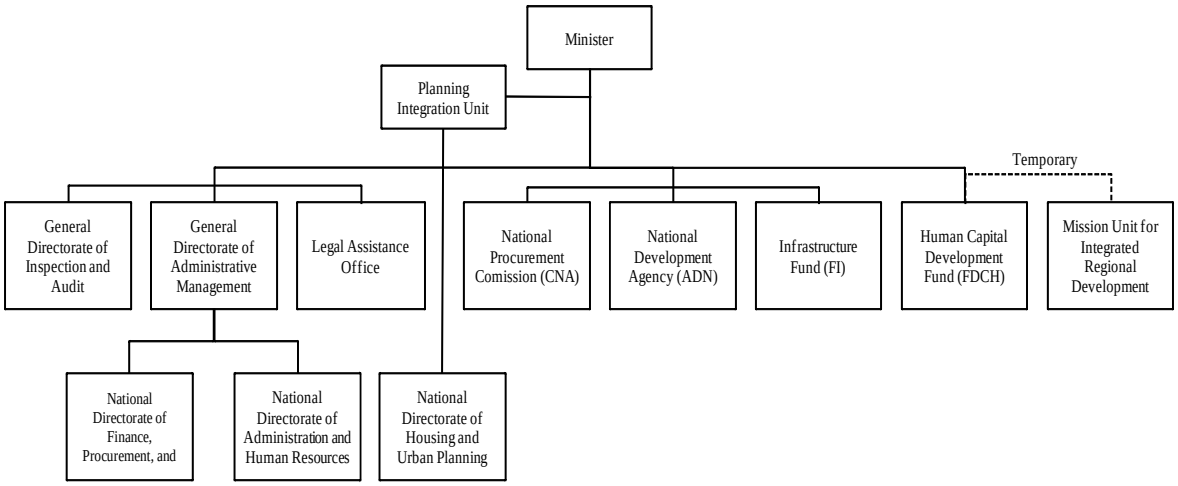
6.2.1 Organizations Concerning Spatial Management

Since spatial management means the “management of state territory” covering from urban area to rural area, from build-up area to agriculture and forest area, many organizations are involved, among which the National Directorate of Housing and Urban Planning of the Ministry of Planning and Strategic Investment is responsible for spatial management in terms of plan formulation and land use control. Other organizations include the Ministry of Public Works, Transportations and Communications, Ministry of Justice, Ministry of State Administration, Ministry of Agriculture and Fisheries, and Ministry of Tourism.

(1) Ministry of Planning and Strategic Investment (MPSI)

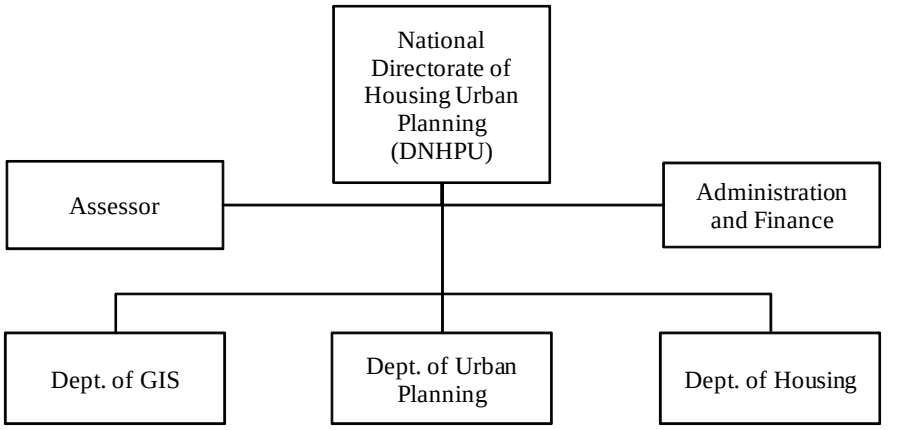
The National Directorate of Housing and Planning (DNHPU) performs urban development planning and various coordination works with related organizations, which was established based on the MoPW Establishment Law No. 7, 2012 and operated based on Decree Law No.6/2015. At first DNHPU was established under the Ministry of Public Works in 2012 and transferred to newly established Ministry of Planning and Strategic Investment in March 2015. DNHPU is the counterpart of the JICA Project and started with 11 staff. Main activities are to manage and establish Spatial Planning Law and Housing and Accommodation Law, and formulation of National Spatial Plan and Dili Urban Master

Plan. DHNPU has three departments: i) Department of Geographic Information System (GIS), ii) Department of Urban Planning, and iii) Department of Housing.



Source: Ministry of Planning and Strategic Investment

Figure 6.2.1 Organizational Structure of the Ministry of Planning and Strategic Investment

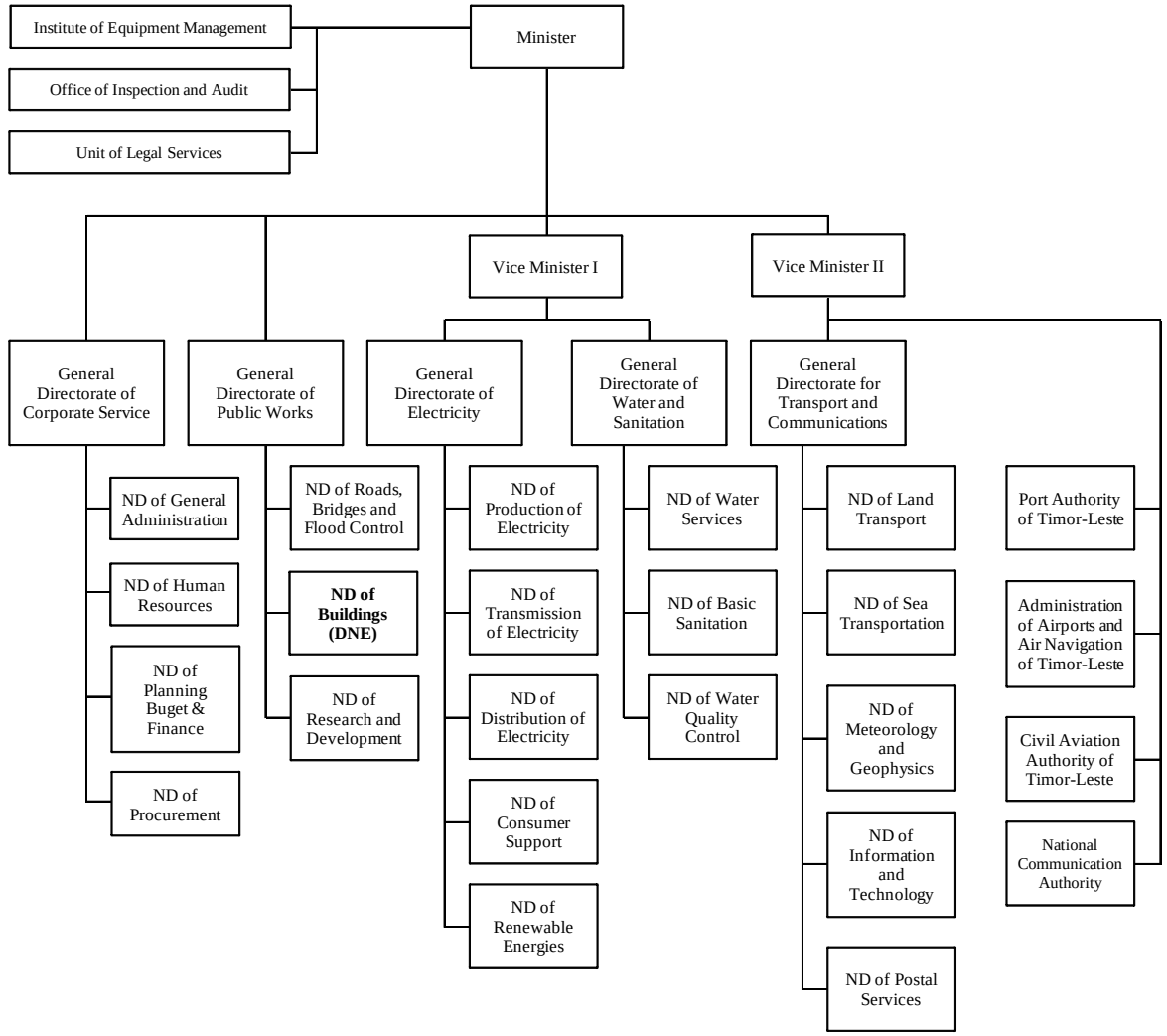


Source: DNHPU, Ministry of Planning and Strategic Investment

Figure 6.2.2 Organizational Structure of DNHPU

(2) Ministry of Public Works, Transport and Communications (MoPWTC)

The Ministry of Public Works, Transport and Communications (MoPWTC) is composed of five general directorates covering public works, electricity, water and sanitation, and transport and communication in addition to the general directorate of cooperative works. Organization of the MoPWTC is shown in Figure 6.2.3 below.



Source: Ministry of Public Works, Transport and Communications

Figure 6.2.3 Organizational Structure of the Ministry of Public Works, Transport and Communications

1) Directorate of Building (DNE)

The Directorate of Building belongs to the General Directorate of Public Works, MoPWTC and is responsible for building construction permission in the country. With the headquarters in Dili, they work as counter desk of building permits application for the Dili Municipality.

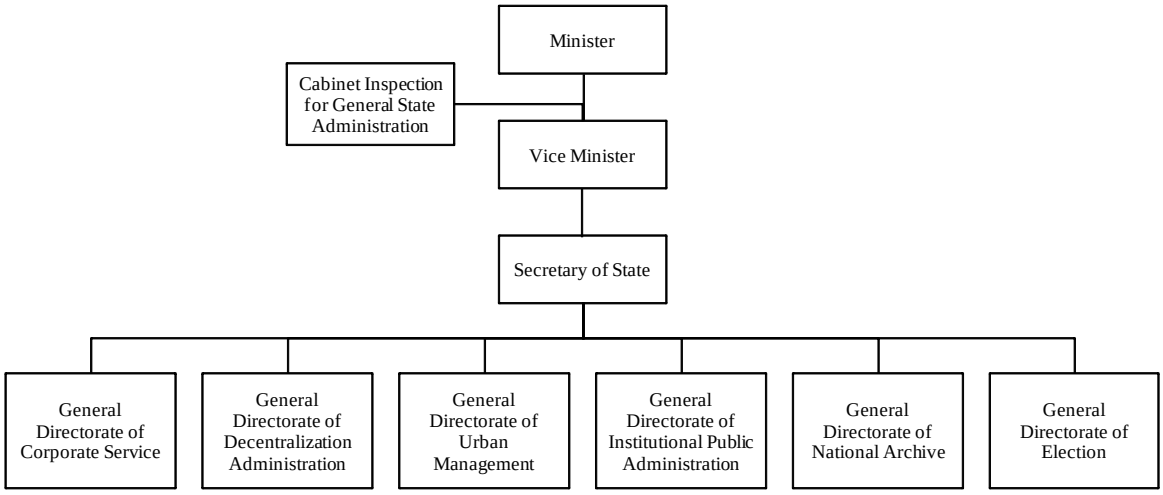
2) Other Directorates of MoPWTC

In addition to above directorates including road, bridges, and flood control, electricity, water supply and sanitation, transportation, and telecommunication are the responsibility of MoPWTC.

(3) Ministry of State Administration

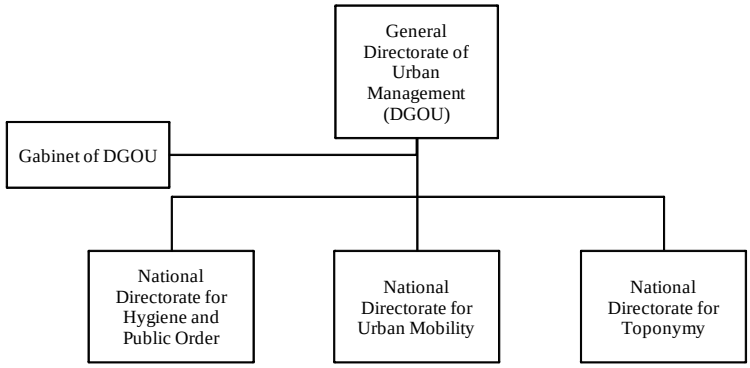
The Ministry of State Administration (MOSA) is responsible for decentralization, local and rural development, also responsible for promoting hygiene and urban organizations. To implement the ministry's mandate on promoting hygiene and urban organization, the ministry established the Directorate General for Urban Management (DGOU) in July 2015. DGOU is responsible for ensuring the general guidance of decentralized services of MOSA in the creation and management of collection and treatment of urban solid waste, maintenance of hygiene and cleanliness of public spaces, the creation and conservation of urban gardens and parks, the development and implementation of urban mobility plans and the creation and management of a register of streets on the main population centers.

DGOU has three departments: i) National Directorate for Hygiene and Public Order, ii) National Directorate for Toponymy, and iii) National Directorate for Urban Mobility. The National Directorate for Urban Mobility is responsible for urban parking, traffic, and signaling management. The directorate has also programs such as urban land use planning, zoning, and city master planning for some municipality. However, the Government Decree No. 12/2015 does not mention the three programs in detail. DGOU plays a role in coordination among MPSI and municipalities for urban land use planning, zoning, and city master planning.



Source: Ministry of State Administration

Figure 6.2.4 Organizational Structure of the Ministry of State Administration



Source: Ministry of State Administration

Figure 6.2.5 Organizational Structure of the Directorate General for Urban Management

(4) Other Organizations

Other organizations related to spatial management are summarized in Table 6.2.1 below.

Table 6.2.1 Organizations Related to Spatial Management

Organizations	Responsibility	Linkage with Dili Urban MP
Ministry of Justice	National Directorate of Land, Property and Cadastre is responsible for land management including map preparation, land dispute, and management of public land. Establishment of laws on land management is also the responsibility of this directorate.	Land use control (development and construction permission) and urban development project
Ministry of Agriculture and Fisheries	Responsible for agriculture development and management of forestry and conservation area.	• Management of agriculture, forestry area including conversion of agriculture/forestry area to build up area • Designation of development area and conservation area
Ministry of Tourism	Ministry of Tourism is responsible for tourism and cultural promotion including designating tourism zone and managing protected area for tourism development. Management of city parks is also the responsibility of this ministry	• Conserving cultural heritage (designating conservation zone) • Urban facility management

Source: JPT, prepared from interviews with concerned agencies

6.2.2 Organizational Capacity of National Directorate of Housing and Urban Planning (DNHPU)

Although the counterpart (C/P) of the DNHPU has a responsibility to formulate the urban plan through the coordination and integration works with other related organizations by law, the C/P has no experience and very limited know-how for the job at the stage of plan formulation, decision-making and implementation of the urban plan. Capacity development goal of DNHPU is to strengthen the organization to be able to formulate an urban plan properly.

(1) Issues to be Solved in the Project Period

Because there are no divisions and sections under the National Directorate, it is difficult to deliver the service as an organization. There is a need to establish necessary divisions under the National Directorate and assign a manager for each division. In addition, it is necessary to prepare job descriptions for each division, especially for the jobs required in the plan formulation stage. At the same time, the concerned C/P members and WG members should continue discussions to construct an appropriate organizational structure for the implementation of the urban plan.

Through clarifying demarcation of roles among the concerned ministries and organizations, the roles and jobs of DNHPU should be clearly identified. It is also necessary to clarify the roles and jobs among DNHPU, DNE, and the municipalities regarding development and building permits, to realize the land use plan to be proposed in this project.

(2) Activities for Solving the Above Issues

- Promotion of the meetings of the working group and discussions among all six working groups.
- Promotion of discussions and coordination meetings with related departments and organizations including the DNE, National Directorate of Roads, Bridges and Flood Control (DNEPCC), MoJ, and MoSA

- Coordination with concerned organizations to be proposed in the project of the National Spatial Plan and Housing Policy.
- Coordination with the National Development Agency (ADN).
- Coordination with Dili and Liquica municipalities, which will manage the Dili Urban Master Plan in the future.
- Briefing of organizational system for the city planning in the local governments during the training in Japan.

6.3 Human Resources Management

6.3.1 Ongoing Human Resources Development Program

The National Directorate of Human Development (DNRH) of the MoPWTC is responsible for performing human resource development of each department in the MoPWTC, along with implementing the human resource development program 2014, which is shown in Table 6.31 below. Since DNHPU wass under the Ministry of Public Works by February 2015, DNHPU has followed the program prepared by DNRH.

Table 6.3.1 Ongoing Human Training Program of MoPW 2014

No.	Training Title	Responsible Organization (Division)
1	Formation and Mind Your Own Business (MYOB)	National Directorate of Planning, Budgeting and Finance (DNPOF)
2	Training of Financial Management Area	DNPOF
3	Training of State Asset Management	National Directorate of General Administration (DNAG)
4	Portuguese Language Training	National Directorate of Human Resource/ Ministry of Public Works (DNRH/MoPW)
5	English Language Training	DNRH/MoPW
6	Master Degree of Study in Management specializing in Project and Structural Design	DNRH/MoPW
7	Bachelor Degree in Civil Architectural Engineering	DNRH/MoPW
8	Realization of Comparative Study	DNRH/MoPW
9	Gender Training for the Members of GTGN at the National and District Level	DNRH/MoPW
10	Training of Geographic Information System (GIS)	National Directorate of Housing and Urban Planning (DNHPU)
11	Formation of Technical Staff in the Use of Laboratory Equipment	National Directorate of Research Development (DNPD)
12	Technical Training in the Area of Survey and Monitoring of Proven Construction	National Directorate of Roads, Bridges and Flood Control (DNEPCC)
13	Formation for Operation and Maintenance of High-voltage Line	National Directorate of Distribution of Electricity (DNDEE)
14	Formation for Electrical and Mechanical Simulator	National Directorate of Production of Electricity (DNPE)
15	Training of Staffs on Potable Water	National Directorate of Water Services (DNSA), and National Directorate of Basic Sanitation (DNSB)
16	Training of Staffs on Water Resources and Hydrology	National Directorate of Water Quality Control (DNCQA)
17	Training and Capacity Building on Hydrology	DNCQA
18	Training of Operators of Heavy Equipment and Technical Workshop	Institution of Equip Management (IGE)

Source: National Directorate of Human Resources (DNRH), MoPW as of July 2014

Most of the above training programs have been implemented as scheduled. The GIS training shown in number 10 in the above table is a request from DNHPU, which is already implemented as planned.

6.3.2 Capacity Evaluation Analysis

DNHPU is a new organization, and regulation to administer the organization is in its preparatory stages. A questionnaire survey was made and attempted to evaluate the capacity of individuals of DNHPU, which includes general ability to perform work (educational background, work experience, language, computer skill, etc.), knowledge, experience, interests related to urban planning and development sector, for example, urban sprawl, land use planning and zoning, traffic surveys, and GIS. The following is an outline of the results of questionnaire survey for the 12 newly employed staffs.

Of the 12 persons consisting of seven males and five females, the mean age is 28.5 years old. Among the university graduates, nine are graduates from universities in Indonesia. The main educational fields include urban development, regional development, architecture, and civil engineering. Indonesian language can be understood well at the same level as their native language of Tetun. Most of them can do basic computer operation.

- Because most of them have stayed or visited some major cities in Indonesia, they are familiar with urbanization issues and the Spatial Planning Law of Indonesia. They have a concrete image of the difference between Dili and the cities in Indonesia.
- They have academic knowledge but knowledge remains in a conceptual level. It is because they have no practical experience in related business in other organizations (private, government, or NGO).
- They do not have information about the various ongoing urban development projects in Dili area (such as SDP, NSP, Tibar Port, airport, water supply, and sewerage)
- Topics/areas in the urban development sector that they are interested in include land ownership issues, land use planning, transportation planning, and GIS databases.

After the questionnaire survey to the junior group, the same survey for senior and superior staff that has already been employed was performed, and analysis on the different abilities between groups was also done.

Senior and superior staff composed of 11 persons were categorized into 8 males and 3 females. The mean age is 37.3 years old, it is considered elderly if more than 9 years of age than the junior group. It can be further divided into two groups at the capability level. One director and three general managers, i.e., one for information management, one for urban planning, and one for housing manager, are defined as superior group of 4 persons, the other 7 will be referred to as senior group.

The senior group is a bit different in age and years of work experience, the capacity does not deviate much with the newly employed junior group. However, the superior group is rich in work experience in government office and/or company after graduation, although their educational level is the same, their differences with the senior and junior groups in terms of abilities are as follows:

Superior group compared with junior and senior groups.

- There are more number of times they participated in human resources training programs, seminars, and workshops.
- The number of participants in the meetings they attended is huge. Thus, personal connections are wide and they have more reliable information.
- More experience and knowledge in business and useful tools related to urban planning. They can conduct business with high job performance and efficiency. In addition, communication skills (of reporting, explanation, presentation, discussion, etc.) are higher.

All of the above capabilities are of basic importance, as the superior group are about to retire and will soon be replaced by the senior or junior groups, it is believed that they can reach their highest potential by gaining more experience.

It is important that they will learn the practical know-how regarding urban planning and development through the day-to-day activities with the JPT members, public consultations, and working group meetings, which are scheduled in this project.

6.3.3 Issue and Direction of Human Resources Management

(1) Issues to be Solved in the Project Period

- It is required that all staff members should be allocated to any of the divisions/sections, which will be established in the organization development above. It is also necessary to clarify their assigned jobs to be executed. These are important for C/P to be able to understand the responsibilities and missions and absorb necessary information and required expertise. In addition, it is required to prepare a training plan to improve each professional ability on land use planning, urban facilities planning, transportation planning, GIS, design of the building, structure, equipment, civil engineering, etc. The following Table 6.3.2 shows the target of knowledge and know-how to be obtained by C/P.

Table 6.3.2 Knowledge and Know-how to be Obtained by the Counterparts (Target)

Working Group	Data Collection Capacity	Analysis and Synthesize Capacity
Socio-economy	• Population census • Demographic statistics • Employment statistics • Data on poor, informal sector, teacher, doctors, etc. • Industrial statistics • Data on trade investment • Number of registered and approved commercial and industrial enterprises	• Demographic analysis and population forecast • Trend of economic activities in the urban area • Future industrial structure in the national and urban area • Socioeconomic framework for land use planning
Land Use	• Base map • Data on urban expansion • Data on land use • Data on land transaction • Availability of GIS information • Information on related organization and legal system	• Land use change and trend • Distribution of population density and hierarchy • Distribution of building types • Vacant and public owned land • Suitability analysis on land use
Institution	• Spatial and city planning laws and regulations • Land laws related to land transaction • National program for strengthening of government agencies and human resource development	• Status and issues of development of legal system • Status and issues of related organizations for urban development • Approach for the improvement of existing institutional system
Road and Transportation	• Data of transportation • Traffic survey • Information on related organization and legal system	• Analysis of collected transportation data • Method of traffic survey • Utilization of survey data for planning • Approach for the formulation of transportation policy
Infrastructure	• Data of airport, seaport, water supply, drainage and flood control, waste management, power supply, telecommunication, and sanitary systems • Information on related organizations and legal system	• Analysis of collected data of each infrastructure system • Status and issues of each system • Utilization of collected data for planning • Approach for the formulation of each system
Environment	• Data of existing situation of social and natural environment • Information on related organizations and legal system	• Analysis of collected data • Method of Strategic Environment Assessment

Source: JICA Project Team

- It is necessary that all staff members will be able to explain the master plan and further necessary activities in WG meetings, steering committee, and public consultation towards the end of the project. In addition, each staff will be able to explain partly his or her own responsible section in the question-and-answer session in the above meetings. By improving this ability including explanatory technique and persuasion, the members are expected to integrate and coordinate with related directorate/ministry and other stakeholders, towards the approval and implementation of the urban plan.

(2) Activities for Solving the Above Issues

- The professional knowledge and know-how required for formulating urban plan are transferred through OJT by each expert of JPT.
- The C/P staff members are requested to accompany JPT experts to the meeting and information gathering with related organizations, and prepare the meeting record.
- OJT is promoted to be able to take initiative in the preparation and management of the meetings of WG, steering committee, and public consultation.
- The C/P staff members are encouraged to participate in study sessions and learn by themselves.

6.3.4 Current Technology Transfer

Based on the abovementioned issues, the following technology transfer program was made during the project period.

(1) On-the-job Training (OJT)

The following are the targets of capacity building of the C/P by OJT. Through the day-to-day cooperation between JPT and C/P, the technology transfer was carried out. The contents of the technology transfer include the locations and sources of required data, current status of data and officials at each concerned organization, compilation of minutes of the meeting and reports, methods of analysis and data processing, compilation and synthesizing with other information, methods for the formulation of policy and strategy.

- To acquire the basic knowledge and know-how related to urban planning.
- Through active participation in the survey activities of information collection, interviews, and discussions with relevant organizations, obtain the relevant information and personal connections.
- To enhance the performance capacity and efficiency of work.

(2) Working Group (WG)

The working group is a public occasion and opportunity for the presentation and explanation of results of the day-to-day learning experience of C/P from the JPT. It is also the occasion to answer to the official's questions and exchange opinions. The WG becomes an important tool for technology transfer. Table 6.3.3 below shows the knowledge learned and the participants of C/P for the working group meetings that have been conducted.

Table 6.3.3 Record of Working Group Meetings

Date	Working Group	Knowledge learned	Participants of C/P (Title omitted)
May 22, 2014	All Working Groups (WG1-6)	• Outline of the project, functions of the steering committee and working group.	Roger, Filomeno, João J., Antonio, Pedro, Manuel
July 10, 2014	WG 6 Environment	• The Strategic Environmental Assessment (SEA) and public consultation	Filomeno, Mariano, Ana, Luzia, Grace
July 17, 2014	WG 2 Institution	• The relationship among the Dili Urban Master Plan, Spatial Planning Law, and National Spatial Plan; Urban Planning Law in Japan; and capacity development program	Filomeno, Narcisio, Grace, Dinis, João X., Ana, Luzia, Micael, Mariano, Grace, Margarida
Aug 19, 2014	WG 3 Socio-economy	• The socioeconomic framework including population and GDP scenarios	Filomeno, Helder, João X., Ana, Grace, Margarida, Dinis, Narcisio
Aug 26, 2014	WG 1 Land Use	• The way of thinking to establish the preliminary ideas of vision, options of urban spatial structure	Roger, Filomeno, Narga, Denis, Margarida, Grace, Fabiola, Manuel, Simao Dinis, Narcisio, Francsoe, João X., Helder
Aug 27, 2014	WG 5 Infrastructure	• Problem findings of urban disaster prevention, water supply and sewerage, solid waste management, power supply and telecommunication	Roger, Filomeno, Luzia, Carlos, Ana, Grace, Margarida, Antonio, Pedro, Luzia, Dinis, João J, João X., Micael, Narcisio , Carlos
Sep 12, 2014	WG 4 Road and Transportation	• Traffic count survey, traffic demand analysis, and countermeasures to meet the increasing traffic demand	Roger, Filomeno, Michael, João, Helder, Carlos, Narcisio, Luzia, Grace, Ana, Antonio, Margarida
Oct. 22, 2014	WG 2 Institution	• Role and duty of DNHPU and organization	Michael, Joao X, Grace, Narcisio, Luiza, Mariano
Dec. 12, 2014	WG 6 Environment	• Evaluation of the proposed spatial plan alternatives of the Dili Metropolitan Area	Ana, Grace, Micael, Mariano, Helder, Carlos, Narcisio
Dec. 16, 2014	WG 2 Institution	• Land use management and establishment of coordination board	Michael, Denis, Joao X, Helder, Margarida, Mariano, Grace, Narcisio
Jan. 13, 2015	WG 5 Infrastructure（Disaster Management）	• Necessary improvement for the Dili Municipality area	Narcisio, Mariano, Grace, Carlos, Michael, Luzia
Jan. 16, 2015	WG 5 Infrastructure （Waste Management）	• Proposed development plan of waste management	Luzia, Carlos, Narcisio, Joao X, Grace, Ana
Feb. 27, 2015	WG 5 Infrastructure（Water Supply, Drainage and Sewerage）	• Proposed development plan of water supply, drainage and sewerage	Luzia, Narcisio, Joao X, Grace, Mariano
Mar. 2, 2015	WG 5 Infrastructure （Seaport）	• Proposed development plan of Dili Seaport	Luzia, Carlos, Mariano, Grace
Mar. 3, 2015	WG 1 and 2 Land Use and Institution	• Proposed land use plan and its implementation tools	Mariano, Narcisio, Joao J, Grace, Margarida, Joao X, Ana, Denis, Luzia
Aug. 31, 2015	WG 1 Land Use	• Proposed land use plan and its implementation tools	Narcisio, Joao J, Grace, Margarida, Joao X, Ana, Denis, Luzia

Source: JICA Project Team

6.3.5 Outcome of the Technology Transfer

Table 6.3.4 below shows one of the results of the questionnaire survey on individual ability of the junior group, compose of 12 persons, at the start of the project (March 2014) and at the final stage of the project (February 2015), regarding the level of understanding on technical basic knowledge and know-how on urban planning. The answers are based on their self-evaluation.

(1) Results of the answer on the level of understanding of technical knowledge about urban planning

The results of the questionnaire survey conducted at the beginning stage of the project (July 2014) and at the final stage of the project (February, 2015) regarding the level of understanding on the technical knowledge about urban planning is shown in the left list item of the table below to all C/P of the junior group. The level of understanding was set as follows: A: fully understand, B: roughly understand, C: understand a little, D: hardly understand. It is a result that is asked to be answered whether to correspond to any of the items listed below. According to the survey result, almost all the C/P personnel answered that their technical knowledge related to urban planning have increased from the beginning stage of the project towards the final stage of the project as shown in Table 6.3.4 below.

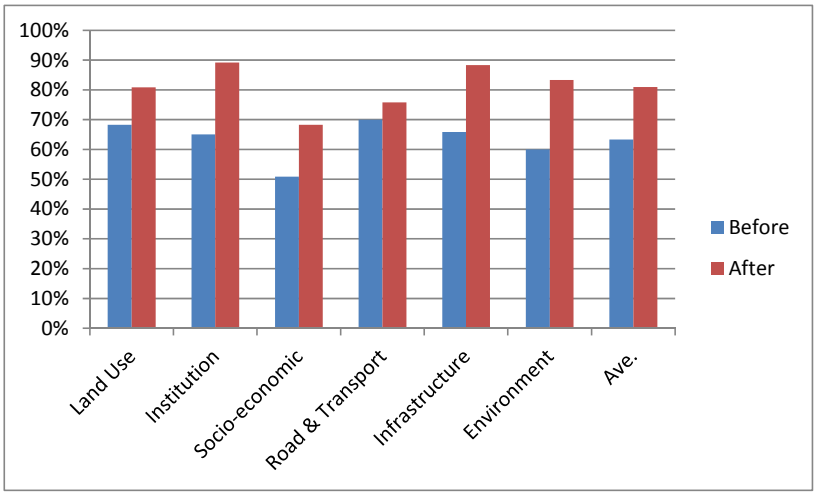
Table 6.3.4 Understanding on the Technical Basic Knowledge of Urban Planning (Self-evaluation)

Basic technical knowledge on urban planning	WG	Land Use		Institution		Socio-economy		Road and Transport-ation		Infra-structure		Environ-ment	
	C/P	1	2	3	4	5	6	7	8	9	10	11	12
Urban sprawl problem	Before	B	A	B	B	C	B	B	B	B	A	B	A
	After	C	B	A	A	C	B	C	A	B	A	C	B
Land and property problem	Before	A	B	B	B	C	C	B	B	B	B	C	B
	After	A	B	A	A	B	B	B	B	A	A	A	A
Institution and organizational problems	Before	B	C	B	C	C	C	B	B	B	B	C	B
	After	A	B	A	A	B	B	B	A	A	A	B	A
SDP 2011-2030	Before	B	C	C	C	C	C	C	C	C	C	C	B
	After	B	B	B	B	B	B	B	C	B	B	B	B
Portuguese study on National Spatial Planning and Law	Before	B	C	C	D	D	C	C	B	C	C	D	B
	After	B	C	B	A	B	B	B	B	B	B	B	C
JICA Study on Master Plan of Dili Metropolitan Area	Before	A	A	B	B	B	B	B	A	B	B	B	A
	After	A	A	A	B	B	B	A	A	A	A	A	A
Building code	Before	C	B	B	C	C	B	C	B	B	B	C	C
	After	B	B	A	B	C	C	B	B	A	B	B	B
Land use planning	Before	A	B	B	B	C	C	B	B	B	B	C	C
	After	A	B	A	B	B	C	B	B	B	A	B	A
Zoning regulation	Before	B	B	B	B	C	C	B	B	B	B	C	C
	After	A	B	A	A	B	B	B	B	B	A	B	A
Traffic survey	Before	B	C	B	B	B	C	B	A	B	B	C	A
	After	B	B	A	B	B	B	A	A	A	A	B	A
Environment assessment	Before	C	C	B	C	C	C	C	A	B	B	B	A
	After	B	B	A	B	C	C	B	B	B	A	A	A
Building and development permission	Before	C	C	B	B	C	D	C	A	C	B	C	C
	After	B	B	A	A	B	C	B	B	B	A	B	A
GIS database	Before	B	B	C	C	C	D	C	B	C	D	C	D
	After	A	B	B	B	C	C	C	B	B	B	B	C
Population forecast	Before	C	C	C	B	C	D	C	B	C	C	C	C
	After	B	B	A	B	B	B	C	C	B	B	B	B
Ongoing projects in Dili area including Tibar Port, Dili Airport, drainage master plan, tourism, etc.	Before	B	B	B	C	C	B	C	B	C	B	C	B
	After	B	B	A	B	B	B	B	B	A	A	B	B

Source: JICA Project Team

Note; A: Fully understand, B: Roughly understand, C: Understand a little, and D: Hardly understand.
Before: At the beginning of the project period (July 2014), After: At the final stage of the project period (February 2015)

The table below shows the difference of the levels of understanding between at the beginning of the project (before the training) and at the end of the project (after the training) of the 12 C/P personnel by each WG. The graph shows that all of the WG staff were able to increase their level of understanding through training.



Note: Points were counted as A=100 points, B=75 points, C=50 points, D=25 points, and the % in the graph shows the average points of 2 persons of each WG.
Source: JICA Project Team

Figure 6.3.1 Level of Understanding on the Basic Technical Knowledge about Urban Planning by WG

(2) Result of the answer to the question about understanding on the technical knowledge of each professional field of WG

This questionnaire survey was conducted at the final stage of the project, about the level of understanding on the left list items in the table below prepared for each WG. A: fully understand, B: roughly understand, C: understand a little, D: hardly understand. The result that is asked to be answered whether to correspond to any of the items listed.

1) Self-evaluation by the two counterpart personnel of the Land Use WG

Level	A	B	C	D
Land use survey	●●			
Distribution of population density		●●		
Analysis of land demand		●	●	
Suitability analysis of land use		●	●	
Utilization of GIS for land use planning		●●		

Source: JICA Project Team
Note; A: Fully understand, B: Roughly understand, C: Understand a little, and D: Hardly understand.

●1 person of C/P

2) Self-evaluation by the two counterpart personnel of the Institution WG

Level	A	B	C	D
Existing legal documents on urban planning	●●			
Related organizations for urban planning	●●			
Foreign examples of urban planning system (law, organization, institution)		●●		
Implementation tools for land use plan		●	●	

Source and note: Same as above

3) Self-evaluation by the two counterpart personnel of the Socio-economy WG

Level	A	B	C	D
Demographic analysis and population projection	●	●		
Trend of economic activities in the Dili area		●●		
Future industrial structure in the nation and Dili area		●●		
Socioeconomic framework for land use planning		●●		

Source and note: Same as above

4) Self-evaluation by the two counterpart personnel of the Road and Transportation WG

Level	A	B	C	D
Purpose and method of traffic survey	●	●		
Utilization of traffic survey data to planning	●	●		
Present status and development issues of road and transportation planning	●	●		
Approach for the formulation of land transportation planning	●	●		
Criteria and standard of road network planning	●	●		

Source and note: Same as above

5) Self-evaluation by the two counterpart personnel of the Infrastructure WG

Level	A	B	C	D
Analysis of collected data of each infrastructure system	●	●		
Present status and development issues of each infrastructure system		●●		
Approach for the formulation of each infrastructure system		●●		
Understanding of the Tibar Port Project		●●		

Source and note: Same as above

6) Self-evaluation by the two counterpart personnel of the Environmental WG

Level	A	B	C	D
Purpose and method of strategic environmental assessment (SEA)	●	●		
Present status and issues of environmental sector	●	●		
Understand the existing environmental studies of ongoing projects including Tasitolu and UNTL projects.		●●		

Source and note: Same as above

7) Number of Participation in Meetings

The table below shows the number of participation in WG meetings and other meetings with related organizations, and number of times the minutes of the meeting of those meetings were drafted during the project period. Although it can be seen the difference in the number of times by WG and C/P personnel, they were able to gain a lot of experience in this project.

WG	Land Use		Institution		Socio-economy		Road and Transport-ation		Infra-structure		Environ-ment	
C/P	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Number of participation in WG meetings	10	10	16	16	8	8	8	6	16	16	16	16
Number of participation in the meetings with related organizations	8	4	35	25	10	10	12	15	9	14	12	20
Number of times the minutes of meeting were drafted	4	2	2	5	3	3	2	3	3	7	8	8

Source：JICA Project Team based on the questionnaire results to each C/P. (2015 end of February)

6.3.6 Orientation of the Capacity Building Program

In setting the capacity development programs for human resources and organizational capacities, the following two types are considered:

Table 6.3.5 Approach for the Improvement of Human Resource and Organizational Capacities

Approach	Period	Contents
Technology Transfer	In the Project	Technologies for plan formulation, development permit, and implementation of urban development projects will be transferred. C/Ps are supported by the JPT members, through information collection, analysis, discussions, synthesizing at WG, and by daily OJT. The most important field of technology transfer is “Plan Formulation” during this period.
Human Resource Development	After the Project	JPT proposed a human resource development program for capacity development of the national institutions related to urban development (especially DNHPU and related ministries/agencies) and local governments (Dili and Liquica municipalities) in Chapter 12 of this report. The program will clearly state the purpose of urban planning and the contents of the fields of planning (plan formulation, development permit, urban development projects, etc.).The most important field of the program is “Development Permit (Land use control)” and “Urban Development Project”.

Source: JICA Project Team

6.4 Database Management and Geographic Information System

6.4.1 General Overview

The Geographic Information System (GIS) is a computerized data management system used to capture, store, manage, retrieve, analyze, and display spatial information. Its capability to handle large volumes of spatial and attribute information has made it an essential tool for facilities/utilities management, environmental or natural resources management, monitoring and inventory, and urban and regional planning. In this context, GIS is an integral part of the Dili Urban Master Plan under the subject of urban management.

(1) Current Status of Geographic Database Development in Timor-Leste

Currently, there is no legal framework which solely focuses on the development of GIS infrastructure in Timor-Leste. Rather, GIS infrastructure is regarded as a tool that facilitates the achievement of respective administrative goals such that government offices with geographic data requirements would likely have their own GIS database. Eventually however, the National Directorate of Land and Property and Cadastral Service (DNTPSC), Ministry of Justice will have functions for creating and establishing a national cadastral and geographic information system according to the ordinance for its organizational structure[1]. Several existing maps and geographic databases in Timor-Leste have been identified and listed below in Table 6.4.1.

Table 6.4.1 Mapping Data and Current GIS Development in Timor-Leste

Source and Type	Scale	Coverage	Year	Reference (contents of data)
1.IMA / Geo-database	1/25,000	Whole Country	1985	Topographic map (printed map, digital data)
2.JICA / Geo-database	1/2,000	Dili City	2000	Topographic map (printed map, digital data)
3.ADIGO / Geo-database	1/50,000	Whole Country	2001	Topographic, Printed map, Orthophoto, Digital
	1/2,000	Major Cities		Orthophoto, Digital
4.ALGIS / Geo-database	1/25,000	Whole Country	2003	Topographic map (printed map, GIS data)
5.DGS/ Geo-database	Various	Whole Country	2004-present	Census and GIS data
6.Sanitation and Drainage Master Plan	1/1,000,	Dili City	2014 June	Topographic Geo-data (0.5 m contour),Orthophoto
7.National LiDAR Project	1/2,000	Whole Country	2014 Dec	Topographic Geo-data (1.0 m contour),Orthophoto

Sources：IMA: Indonesian Mapping Agency, ADIGO: Australian Defense Imagery and Geospatial Organization, ALGIS: Agriculture Land GIS Unit-Ministry of Agriculture and Fishery, DGS: General Directorate of Statistics- Ministry of Finance, Light Detection and Ranging (LiDAR) Survey and Mapping for Timor-Leste Territory by the Ministry of Public Works, Transportation and Communications

(2) Database Development and Capacity in National Directorate of Housing and Urban Planning

Within the National Directorate of Housing and Urban Planning (DNHPU) under the Ministry of Public Works, Transportation and Communications (MoPWTC), there are existing geographic databases covering parts of the study area, from previous projects conducted within the agency such as: (i) 2000 Topographic Map and GIS data by JICA, (ii) 2001 Sucos Survey Data by DNHUP, and (iii) 2006 GIS data by ICIST/GERTiL. These old datasets shall be used as reference, except for the 2001 Sucos Survey Data, which could not be accessed due to the damaged file server containing the said datasets.

In terms of capacity for GIS utilization, DNHPU has a little experienced personnel on GIS operation with the old version of GIS software, but there is no separate GIS division or office dedicated for the maintenance and updating of GIS databases. Local counterparts working under the Land Use Working Group for this project for the Dili Urban Master Plan have assessed themselves to be at the beginner level in terms of GIS knowledge and capacity. They were trained for basic skills and knowledge of GIS operation via coaching and mentoring during the course of the project.

6.4.2 Objectives for GIS Database Formulation

The GIS database for the Dili Urban Master Plan was developed with the following objectives:

- To formulate a basic model for an urban GIS database system intended for future urban planning and management activities of urban authorities in Timor-Leste.
- To utilize spatial data for appropriate urban planning and effective urban management through the establishment of an integrated GIS database system.

[1] Ministério Da Justiça, República Democrática De Timor-Leste, "Geographic Information System (GIS) Infrastructure Development in Timor-Leste 2006-2009, Technical Report to 18th UNRCC-APIn," October 2009, p.2.

- To contribute effectively to an urban monitoring system for urban development and management.

6.4.3 Approach for GIS Database Formulation

To achieve these objectives, the following general approaches are taken:

- Needs Assessment: Set principles or criteria for the GIS, review considerations regarding data components, hardware and software components, personnel components.
- Data Collection, Hardware and Software Setup: Conduct data collection, satellite imagery acquisition, hardware and software setup.
- GIS Database Setup: Setup GIS database file folder structure. Set coordinate system and file-naming standards.
- Base Mapping: Review latest available topographic map covering the study area. Conduct necessary fieldworks and office methods to produce an updated topographic base map at 1:5,000 and 1:25,000 scale.
- Land Use Mapping: Use latest existing base map as background, then delineate existing land use using field or office methods. Prepare 1:5,000 and 1:25,000 scale land use maps.
- Data Processing and Analysis Works: Process collected data for integration into the GIS database. Perform GIS analysis using built-in tools in the mapping/GIS software, as required for the study.
- Thematic Mapping: Prepare other thematic maps as needed for the study.

6.4.4 Needs Assessment

The following factors were carefully considered for the assessment of GIS database requirements:

(1) Criteria for GIS Database

- User friendly data arrangement according to familiar group names for users (urban planner, GIS personnel)
- Consideration of prioritized hierarchical accessibility
- Consideration of integrated framework structure for future data expansion
- User friendly interface

(2) Data Components

- Existing Conditions Data Components
- Urban Planning Components
- Urban Management Components
- Other Data Components

(3) Hardware and Software Components

- Server Personal Computer (PC) hardware
- ArcGIS 10.2 and Autocad Map 3D 2015 software

6.4.5 Data Collection, Hardware and Software Setup

Hardware and software setup were done, and are in use for the preparation of mapping and data outputs. Data collection was conducted with different offices as listed in Table 6.4.2.

Table 6.4.2 Data Collection and Request at Different Offices

Office/Agency	Data Collected/ Data for Collection
JICA	1:2,000 Scale Topographic Map (2000)
National Directorate of Roads, Bridges and Flood Control (NDRBFC/MoPWTC)	Geodatabase of Road Projects in Timor-Leste by Roads for Development Program (R4D)
General Directorate Statistics (DGS/Ministry of Finance)	Administrative Boundaries, Schools, Hospitals and Health Centers
National Directorate of Basic Sanitation (NDBS/ MoPWTC)	Light Detection and Ranging (LiDAR) Data
Agriculture Land GIS Unit (ALGIS/Ministry of Agriculture and Fishery)	Various Geographic Data
National Directorate of Land and Property and Cadastral Services (NDTPCS- Ministry of Justice)	Geodatabase for Cadastral, Government Lands (under request)
Institution of Petroleum and Geology (IPG / Ministry of Petroleum and Mineral Resources)	Geodatabase for Geology
Education Management Information System Unit (EMIS, Ministry of Education)	Geodatabase for Schools
General Directorate of Higher Education (DGES, Ministry of Education)	Geodatabase for Universities and Colleges (under request)
Ministry of Social Solidarity	Historical Data on Hazards (Flood, inundation, subsidence, land slide, erosion, tsunami, earthquake) (under request)
National University of Timor Lorosa'e (UNTL)	CAD data for UNTL
UNDP	Distribution of Mangroves in Dili, Tibar, Hera (under request)
National Directorate of Forestry (DNF, Ministry Agriculture and Fishery)	Geodatabase for Protected Areas (under request)

Source: JICA Project Team

6.4.6 GIS Database Setup

After consideration of the factors as listed previously, the following main folders were prepared for the Dili Urban Master Plan GIS:

(1) Output Data 1: Documentation. This folder shall contain project outputs in the form of documents and files in DOC, PDF, JPEG, PPT, XLS or similar format.

- Documentation files (word, pdf, scanned documents in jpeg or similar format)
- General documentation about the project and GIS system.
- Urban planning documentation (sector plans/programs)
- Urban management documentation (proposed regulations, planning/construction permissions)
- GIS documentation

(2) Output Data 2: Maps. This folder shall contain project outputs in the form of maps and files in MXD, QGS, PDF, JPEG or similar format.

- Maps in mxd/qgs, pdf/jpeg format
- Basic thematic maps
- Urban planning maps (planning area coverage, environment vulnerability, developments suitability maps)
- Urban management maps (zoning maps)

(3) Geodatabase 1: Thematic data layers. This folder contains thematic data layers that have been collected, processed, and analyzed during the project. The data layers in this folder are in vector format, in SHP, LYR or similar file format.

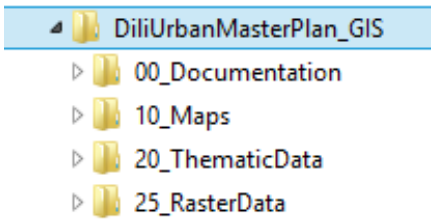
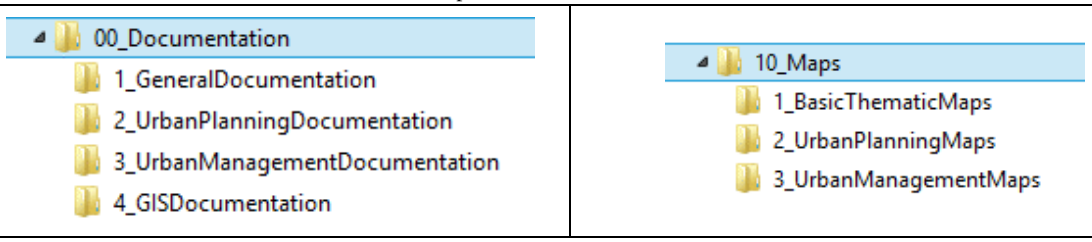
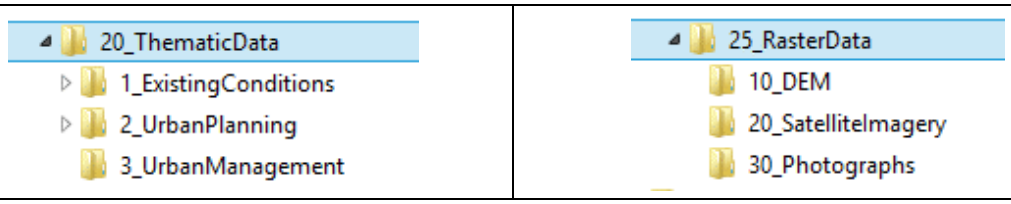
- Thematic data layers in shapefile and layer format
- Existing condition data layers
- Urban planning data layers
- Urban management data layers

(4) Geodatabase 2: Raster data layers. This folder contains raster data layers that have been collected, processed and analyzed during the project. The data layers in this folder are in raster format, in GEOTIFF, ECW or JPEG file format.

- Raster data layers in geotiff/ecw/jpeg format
- DEM
- Satellite imagery
- Geotagged photos

In general, the first two folders are more static in nature, intended as reference for urban planners who will study the outputs of the Dili Urban Master Plan. The last two folders on the other hand, are more dynamic in nature, intended for technical users who will be tasked to maintain and update the GIS database. The folder structure is shown in Figure 6.4.3 and the contents of the folders are listed below:

Table 6.4.3 Dili Urban Master Plan GIS Database File Folder Structure

Main Folders

Output Folders and Sub-Folders

Geodatabase Folders and Sub-Folders


Source: JICA Project Team

6.4.7 Coordinate Reference System

All geographic data included in the geodatabase folders shall be in a uniform coordinate system, which was set to the Universal Transverse Mercator (UTM) Zone 51 South, World Geodetic System of 1984 (WGS'84) datum. All map data gathered from different sources are being processed and re-projected to this coordinate system, for which the parameters are listed in Table 6.4.4.

Table 6.4.4 Coordinate Reference System Parameters

DATUM	
Datum Name:	World Geodetic System 1984
Ellipsoid Name:	WGS 1984
Semi-major Axis:	6378137.000 m
Inverse Flattening:	298.25722356300003
PROJECTION	
Projection Type:	Universal Transverse Mercator (UTM)
Zone No.:	51S
Latitude of Origin:	00°00'00.00
Central Meridian:	123°00'00.00
Scale Factor:	0.9996
False Easting:	500,000.00 m
False Northing:	10,000,000.00 m

Source: ESRI 2013. ArcGIS Desktop: Release 10.2.1. Redlands, CA: Environmental Systems Research Institute

CHAPTER 7 : DEVELOPMENT AND PLANNING ISSUES

7.1 Overview of Planning Issues and Directions

Earlier chapters mentioned the current situations on urban setting of DMA, land use conditions, related institutions, socio-economy, infrastructure, and environment. This chapter summarizes issues and directions to solve the issues based on the analysis of current situation. The issues and directions are mentioned by each sector of the working group, namely: land use, institution, socio-economy, road and public transportation, infrastructure, and environment. This sub-chapter 7.1 briefly introduces the overview of the main issues and directions as shown in Table 7.1.1. Details of the issues and directions are discussed in the following subchapters. More details and related current situations were already expounded in earlier chapters.

Table 7.1.1 Overview of Main Issues and Directions for Each Planning Theme

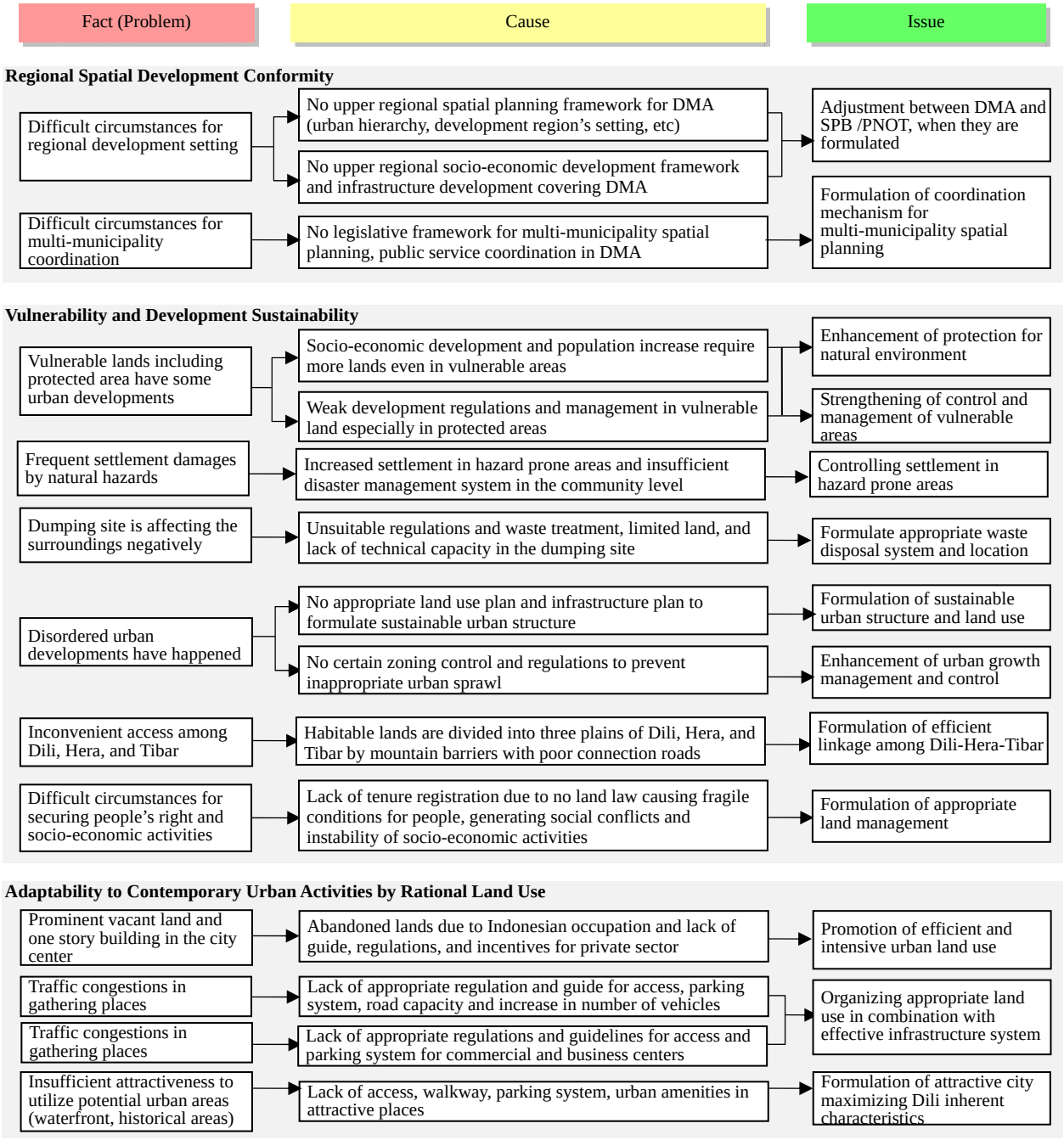
Subject	Main Issues	Directions to be Solved
1. Land Use	Response to large burden on lands of DMA by continuous increase in number of population	Well-organized urban management by controlling inappropriate urban sprawl into fragile land in the hilly areas and implement efficient land use in built-up areas
2. Institution	Proper spatial management and building control and infrastructure development	Preparation of spatial management tools such as Spatial Planning Law, National Spatial Plan
3. Socio-economy	Response to the expected high population density and high unemployment rate in Dili	Achievement of regionally balanced development in Timor-Leste
4. Road and public transportation	Response to increase in transportation demand	Increasing traffic capacity due to road construction and utilization of ITS; Traffic Demand Management (TDM) by introducing mass transit
5. Infrastructure		
(1) Seaport	Smooth implementation of Tibar New Port Project under PPP scheme	Removal of uncertain factors by clarifying role-sharing between public and private sectors
(2) Airport	Improve safety and capacity of airport facilities such as runways, lighting system, terminal building	Promotion of PPP project or improvement of the President Nicolau Lobato International Airport
(3) Disaster prevention	Provision of proper prevention measures, preparedness and timely information to the people at risk	Improvement of institutional and technical capacity at both the national level and district level for implementing disaster risk management
(4) Water supply	Grasping maximum potential of the water resources in DMA in planning water supply facilities	Conducting detailed studies about the yield of surface water and ground water
(5) Sewerage/Drainage	• Improve the channel inlet and flow condition through removal of dust and garbage on the channels • Revise the DSMP based on the latest urban development plan	• Conduct public awareness on the roles of drainage system and proper actions • Clarification of points to be revised in DSMP
(6) Solid waste management	Reducing health and safety risks to waste pickers, workers, and inhabitants near the dumpsite in Tibar	Rehabilitation of the Tibar dumpsite and development of an environmentally acceptable disposal facility
(7) Power Supply	Improvement of distribution network	Increase transformers and low-voltage lines
(8) Telecommunication	Speed up of internet connection	Upgrade the fiber trunk network mainly for international connections by submarine fiber cable
6.Environment	Response to disordered developments especially for tourism developments in protected areas	Establishment of a holistic project approval system with legislations

Source: JICA Project Team

7.2 Development and Planning Issues for Land Use

7.2.1 Overview of Land Use Issues

Taking into account the condition in the preparatory stage for the legislative and upper framework of spatial planning (i.e., the Spatial Planning Bill: SPB, the Land Bill and a National Spatial Plan: PNOT) and physical features by limited habitable lands in DMA, three key issues for land use are identified in the master plan as summarized in Figure 7.2.1, and described in the following sections:



Note: SPB: Spatial Planning Bill (Law), PNOT: National Spatial Plan of Timor-Leste under planning
Source: JICA Project Team

Figure 7.2.1 Issues Structure for Land Use in DMA

7.2.2 Regional Spatial Development Conformity

(1) Necessary Adjustment and Coordination with Spatial Planning of Timor-Leste

The National Spatial Plan of Timor-Leste (PNOT) has drawn a "Plan Proposal" in April 2015 describing qualitative frameworks and model structure systems, in which quantitative framework interpreting the Timor-Leste Strategic Development Plan 2011-2030 (SDP) is not stated. PNOT is necessary for the Dili Metropolitan Area (DMA), however, this has not been approved yet. The following are itemized to be coordinated and cross-referenced between the Dili Master Plan (DMP) and the plan of PNOT in terms of quantitative and qualitative elements such as numerical development framework and spatial planning system in either both the planning stage or after formulation of one or the other.

1) Numerical outputs to be coordinated with PNOT

- Socio-economic development framework (national target population and employment, GRDP reviewed in the PNOT).
- Regional distribution framework (population and employment by cities) of PNOT in conjunction with DMP area.

2) Physical planning outputs to be coordinated with PNOT

- National setting of urban center hierarchy in conjunction with cities and towns in the DMP area.
- Confirmation of national setting of key large-scale infrastructure development (sea port, airport, national trunk road network, and other infrastructure).
- Development policies for the capital of Dili in combination with the policies for industrial development, community formulation, and environmental conservation areas to be described in PNOT.

(2) Necessary Mechanism for Coordination for Multi-Municipality Spatial Planning

The planning area of DMA covers not only Dili Municipality but also Tibar Suco as part of Liquica Municipality. In terms of process of the development plan, there are two issues in the management planning and its implementation, i.e., whether they should be coordinated among relevant authorities or reorganized by a specific urban management authority for DMA.

7.2.3 Vulnerability and Urban Development Suitability

Current development issues for DMA in terms of urban structure and its environment can be identified by the results of spatial analyses and observations through surveys and data collection.

(1) Issues on Development Vulnerability

1) Enhancing Protection for Natural Environment (Protected Areas or Relevant Value Areas)

- Two key tourism developments of the Pacific Tourist Resort Project, the Pelican Tourism Resort Project and the National University of Timor Lorosa'e (UNTL) new

campus project in each protected area (Cristo Rei Protected Area and Tasitolu Protected Area) require the conduct of a careful environment impact assessment with appropriate mitigation measures or modify the protected area boundary in case of unchangeable development.

- The Pacific Tourist Resort Project and Hera Naval Base Project in the proposed protected area of Behau are also required to undergo the same treatment as described in the aforementioned.
- As Tibar Bay is expected to be developed as a new seaport project, being one of the candidates for coastal management program area through mangrove management by UNDP in order to mitigate sedimentation in the coastal areas of Timor-Leste, it is necessary for the Tibar Bay to coordinate and adjust its conservation program and the New Tibar Port Project.

2) Enhancement Disaster Prevention especially by Spatial Development Control Measures

- Flat plain areas in DMA belong geologically to alluvium layer in general involving high level of ground water, subsidence prone area, and weak soil bearing capacity against earthquake, where geographical conditions of DMA would be vulnerable.
- Flood inundation in the rainy season is a potential risk and one of the natural hazards happening in DMA especially in the sucos of Villa Verde, Bairro Pite, Colmera, Gricenfor. The mountain and hilly areas on the other hand are at potential risks of erosion and landslide in DMA due to weak or fragile soil condition as few trees are planted causing flood conditions.
- In combination with the consolidation of disaster management system such as preparedness measures, zoning control, and other regulations in hazard-prone areas should be strengthened.

3) Appropriate Waste Disposal System and Location for DMA

- The current dumping site in Tibar Suco has not been implementing a well-organized treatment and management disposal system. This situation may give negative impacts not only on existing living environment of Tibar villages, but also on expected future settlement in combination with Tibar Port development.
- Although there are plans for future dumping site in Metinaro Administrative Post and a waste incineration plant project in Tibar, appropriate and rational formulation of waste management system in DMA should take into account its conformity with future urban development in Tibar. Negative environment impacts, efficient collection system, and sustainable operation of the plant are essentially required.

(2) Issues on Sustainable Urban Structure

1) Achieving Sustainable Urban Structure with Functional Balance and Environmental Capacity

- Traffic flow for commuters is predominant in the city center where working places especially public offices are located, would need to be reorganized by providing a balanced working and living place distribution in order to avoid disproportionate weight on a single center in association with traffic flow concentration.

- Urban development should be formulated taking into account the environmental capacity (i.e., habitable land without natural hazard, water resource availability) to secure sustainability of urban activities and living environment.
- Tourism and recreational land use as one of the most expected business developments in DMA should be managed by balanced and appropriate land use measures between natural resource protection and optimum use of resources.

2) Strengthening Linkages beyond Mountains between Dili and Hera, Tibar

- Expected urban development area of Dili, Tibar, and Hera in DMA is divided by strong physical barriers of mountains where roads should pass through steep mountain path or narrow road passing a peninsula
- Good and efficient linkage among these three areas of Dili, Hera, and Tibar should be established taking into account the competitive future urban development and resilient and redundant road network

3) Enhancing Urban Growth Management against Strong Trend of Dili Concentration

- Due to continuous population increase including social migration from other municipalities, population concentration would become a large burden on lands of DMA, unless a well-organized urban management is implemented not only at the municipality level but also in the entire country level.
- Inappropriate urban sprawl into fragile land in the hilly areas has occurred. Settlements which are in danger by landslide or erosion needs to be addressed by adequate growth control and regulation on settlement.

(3) Institutional Constraints and Issues on Land

Institutional issues on land matters can be itemized as considerable vulnerabilities for land use planning and management in DMA and Timor-Leste as follows:

- As the land management system after Indonesian occupation has fallen apart by the malfunctioning of land registration of land properties and affecting urban socio-economic activities without one of the rights of living. Land tenure becomes one of essential issues of land management in Timor-Leste.
- Appropriate guides and regulations by authorities for land use including building construction has not been achieved yet due to nonexistence of legislation (Land Bill under discussion) and administrative guidelines to private sector, except some practical implementation by authorities.
- Community lands in DMA are still partially effective to support communities and manage property of their lands. Effective land management may need to utilize and modify traditional communal land system as one of the mitigation measures for social conflict such as involuntary resettlement.

7.2.4 Adaptability to Rational Land Use and Contemporary Urban Activities

(1) Promoting Efficient and Effective Urban Activities through Appropriate Land Use

- Vacant lands including those abandoned by owners who live abroad should be utilized and promoted by efficient land use and management measures.
- Against expected future population increase within limited lands in DMA, development density in buildup areas is at low level by predominant one-two storey buildings for business and commercial and residential land use, where maximization of limited lands and their uses should be enhanced by more dense settlement and mixed-use as an effective urban concept.
- Government properties in association with large open spaces need more efficient utilization of precious lands in the city center, in terms of public land asset management such as multi-purpose office and multi-storey buildings in consideration with joint public facilities or public private partnership.
- Schools including basic, secondary, and higher education in DMA have faced insufficient capacity in terms of facilities and lands as compared with the increase of student demand, therefore efficient use of facilities and land such as multi-grade schools, multi-story building or multi-purpose buildings with other public facilities within limited land and acquisition of lands for schools should be promoted.

(2) Organizing Appropriate Land Use Integrated with Effective Infrastructure Development

- Expected increase in large infrastructure projects would require appropriate measures of land use such as buffer green area, appropriate location setting without negative impacts on neighboring areas or with supportive use expected in a synergistic effect.
- Commercial and business developments along major roads in DMA, have generated traffic jam on the access roads. This should be well-organized by appropriate access control and sufficient parking area to mitigate traffic problem.
- Land use guiding measures harmonized by public transportation system like Transit Oriented Development (TOD) concept should be introduced through the use of incentives and control regulations.
- Mixed use as a trend to land use concept fits with modern urban lifestyle would be applicable to DMA land use. This is a compatible measure between high-density development and attractive urban activities.
- Industrial development as one of essential elements for economic development in DMA needs to be promoted by certain scale of industrial areas in strategic location securing efficient access to ports (air or sea), labor forces and incentives for investors such as SEZ designation.

(3) Formulating Attractive and Charming City Maximizing Dili Inherent Characteristics

- Geographical features of DMA consisting of green mountain and blue sea and river should be enhanced and sustained as essential elements to be incorporated and basis of land use of DMA.

- Historical heritages as Portuguese colonial buildings remained in the urban center of Dili, have attracted visitors and become source of pride for Timor-Leste people, should be succeeded and enhanced by appropriate urban design.

7.3 Planning Issues and Directions for Institutions

(1) Spatial management tools are not available

Spatial management tools including Spatial Planning Law and other laws and regulations are still under development. Building control is executed without proper guidance, which sometimes leads to an unfair process in the issuance of construction permit.

The Spatial Planning Law together with the National Spatial Plan (NSP) are under preparation. In addition to the law and NSP, guidelines and manuals are necessary for the government to administer spatial management. In order to execute proper spatial management, the Spatial Planning Law, NSP, and related guidelines and manuals have to be prepared and provided to government officials and stakeholders.

(2) Organization is still under development and job description is not clear

The National Directorate of Housing and Urban Development of the Ministry of Public Works, Transportation and Communication is established since 2013 and tries to establish sections within the Directorate, however job description has not been prepared yet. Proper job description based on the requirement of spatial management or Spatial Planning Law needs to be prepared.

(3) Coordination among concerned organizations is weak

There is no existing Dili Urban Master Plan and common development framework under a future vision, so project implementation, management, and operation of each urban infrastructure and facility are handled by each responsible ministry individually. A mechanism for all stakeholders to promote coordination for spatial management needs to be established for efficient and effective execution of Dili Urban Master Plan.

(4) Human resources are under development

Most staff members are newly recruited after the Ministry of Public Works, Transportation and Communication has been reorganized in 2013. New staff do not have experience in spatial management, particularly planning and control. In addition, the original staff members who were working for the ministry have not executed spatial management efficiently because there is no spatial management tool. Comprehensive human resources development covering planning, control, and development should be implemented.

7.4 Planning Issues and Directions for Socio-economy

Typical Asian economic development model can be characterized as series of shifts from exploiting and exporting of domestically endowed natural resources to:

(1) Import substituting through increasing productivity of agriculture sector,

(2) Nurturing of labor intensive manufacturing industry by means of foreign capitals that seek for low cost of ample labor force, and

(3) Further nurturing of capital intensive high-tech and sophisticated service industries.

Timor-Leste possesses different models where oil and gas resources are already utilized; wage level is already at moderately high level with other ASEAN countries. Therefore, the country faces difficulty to launch a labor intensive manufacturing industry, which is even export-oriented by foreign direct investment.

The Global Competitiveness Report 2013-2014 assesses 148 countries for productive potential in terms of various indicators like basic requirements such as institutions, infrastructure, macroeconomic environment, health and primary education, and efficiency enhancement such as market size, goods/labor/financial market efficiency. The report concludes that Timor-Leste is ranked at 138 out of 148 countries, whereas Singapore at 13, Indonesia at 33, Philippines at 56, Lao PDR at 74, Cambodia at 83, and Vietnam at 85. It is considered that the most critical factors of low level ranking are work ethics in national labor force, access to financing, inefficient government bureaucracy, inadequate education of workforce, and insufficient development of infrastructure. The Government of Timor-Leste recognizes such critical factors as the SDP declares measures to improve infrastructure conditions and to develop human capital, although it takes considerable effort, costs, and a decade of time.

Unusually high rate of inflation in dollarized economy is persisting. Inflation rate peaked at 15% in 2011, and has remained at double-digits which is likely to discourage household consumption and to hamper ability of Timor-Leste to diversify and generate employment growth. It is analyzed by IMF and MOF that the high level of inflation is due to government investments and expenditures coupled with the rapid growth of the construction sector. The government investment demand is emerging due to high needs of infrastructure development. This trend is considered to continue in the short-run, whereas in the long-run after infrastructures have matured to some degree, government-driven economic growth will slow down. Therefore, the private sector plays a crucial role in economic development, while continuing to improve primary industry production and productivity in an attempt to promote import substitutes for food crops and food-oriented products.

As a consequence of urban-rural relationship, population thereby economic activity tends to be concentrated in the Dili Metropolitan Area. If this trend is accelerated as a result of failure in regional development (either by public or private sector driven), it can be predicted that unexpectedly high population density and unemployment rate will prevail. From such a perspective, a regionally balanced development needs to be achieved, not too much focusing on the Dili Metropolitan Area.

7.5 Planning Issues and Directions for Road and Public Transportation

In Dili Metropolitan Area, the traffic demand is expected to increase as shown in Section 4.1.4, as the countermeasures of above mentioned issues, it is desirable to introduce the following ideas:

(The following ideas are examples and will be re-considered after completion of traffic survey and traffic demand forecasting)

(i) Increasing traffic capacity

- Road construction project (Bypass, road widening, flyover)
- Utilization of Intelligent transportation systems (ITS) (Signal control)
- Traffic regulation (One-way)

(ii) Traffic Demand Management (TDM)

- Introduction of mass transit
  (Public transportation with exclusive lane: Bus Rapid Transit (BRT))
- Peak cut of demand (Encourage or allow flexible-time work schedules)
- Demand control by road pricing or regulation of license plate control
- Regulation for non- high occupancy vehicle (HOV)

The development issues for realizing countermeasures (See Chapter 4, Section 4.1.4) are summarized in Table 7.5.1.

Table 7.5.1 Development Issues for Realizing Countermeasures

Countermeasure	Issues for Realizing Countermeasures
Road construction project (Bypass, road-widening, flyover)	➢ Consensus building with local residents ➢ Securing budget ➢ Land acquisition ➢ Consideration of the project scheme ➢ Maintenance and management institution
ITS (Signal control)	➢ Development of communication infrastructure ➢ Development of control center of operation institution
Traffic Regulation	➢ Consideration of traffic regulation in whole area of Dili Metropolitan Area ➢ Road widen for abolish one-way
Introduction of Mass Transit	➢ Ensure of exclusive lanes (including consideration of traffic management and consensus building with road users) ➢ Development of stations or terminal ➢ Securing budget ➢ Consideration of operation institution ➢ Consideration of regulations for intruder vehicle to the exclusive lane
Peak Cut of Demand	➢ Consideration of regulation or incentives to promote peak-shift for peak time users

Source: JICA Project Team

7.6 Planning Issues and Directions for Infrastructure

The following Table 7.6.1 summarizes the main issues and directions for nine infrastructure sectors: seaport, airport, disaster prevention, water supply, sewerage and drainage, solid waste management, power supply, and telecommunication; which were mentioned in Chapter 5. Not only the issues on improvement of facilities and materials but also the issues on institutional and capacity development, public awareness, and detailed study have been pointed out.

Table 7.6.1 Summary of Main Issues and Directions for Nine Infrastructure Sectors

Sector	Main Issues	Directions
1. Seaport	1. Dili Port The development will be implemented after most of the logistics functions are shifted from Dili Port to Tibar New Port, but the road maps are not clear.	1. Dili Port The development plans for ferry port and waterfront park should be elaborated to address the following: (1) Ferry Port; Construction of ferry terminal (2)Waterfront Park; ● Reflection of public opinion ● Roles of APORTIL ● Responsible organization for improvement, operation and maintenance ● Safety measures
	2. Tibar New Port There are some uncertain factors for smooth implementation of Tibar New Port PPP Project.	2. Tibar New Port Role-sharing between public and private sectors should be decided. Road and transportation issues and resettlement of affected residents should also be addressed.
	3. Hera Port The road map of Hera Port development is not clear.	3. Hera Port Consistency with the urban master plan as well as safety measures in Hera should be secured.
2. Airport	(i) Runway length and width is restricted with normal operation to current medium aircraft such as A310 and B737. (ii) No safety area by the International Civil Aviation Organization (ICAO) standard (iii) Lack of airport lighting system/ only day-time flight (iv) Aircraft parking apron pavement has limited capacity (v) Limited terminal building capacity and inadequate condition to respond to all operational and security requirements for passengers handling	(i)-(v) PPP project for the President Nicolau Lobato International Airport should be promoted to overcome the issues and improve safety and capacity of the airport.
3. Disaster Prevention	(i) Hazard maps could not be utilized for the warning system at the community levels, because the NDMD has provided hazard maps of national level, but not of district levels. (ii) The national warning system has not been developed yet. The DOC could not provide proper and timely information to the people at risk. (iii) There are no real time observation equipment (rainfall and river stage) for early warning of floods, tropical storms, landslides, and also no earthquake monitoring facilities (seismograph and GPS).	(i) More accurate or smaller scale hazard maps would be required for districts and communities to prepare practical warning systems. (ii) Institutional and technical capacities at both the national level and district level, in order to carry out the Districts' DRM responsibilities, especially for preparedness such as early warning, planning and education, should be improved. (iii) Improvement of monitoring equipment, facilities and technological capacities in the area of hazard monitoring/assessment; and also in the area of development of early warning system for floods, tropical storms, landslides and earthquakes.
4. Water Supply	(i) Maximum potential of the water resources in DMA is unknown. (ii) Water in some areas of DMA is not supplied for 24 hours due to disproportion of the water pressure in the distribution network. (iii) Wasteful water use is observed.	(i) Detailed studies about the yield of surface water and ground water should be conducted (ii) Distribution network should be constructed based on the zones planned by DNSA (iii) Instruction to the customers is necessary to reduce water use and water demand.

5. Sewerage/Drainage	(1) Sewerage (i) The existence of WWTPs in certain locations of the Dili center may give negative impact to the development of residential or commercial areas. (ii) In the projection on the volume of wastewater and its pollutant load, certain assumptions were utilized to the DSDMP instead of the evaluation based on the survey result carried out in the project area.	(i) Locations and number of decentralized WWTPs should be scrutinized and coordinated with the development plan proposed in the Dili Urban Master Plan. (ii) Necessity of reviewing the assumptions in DSDMP needs to be discussed after the confirmation of the direction for urban development.
	(2) Drainage (i) DNSB have not recognized certain construction works carried out in Dili, because other organizations also have constructed many structures related to drainage such as roadside channels and pipelines in Dili. (ii) The existing study in DSDMP on the capacity of the drainage system was carried out based on the data of rainfall taken outside of Timor-Leste due to the lack of the necessary data. (iii) Remaining dust in drainage channels and stuck collection pits are observed. The situation seriously affects flow of the rainwater in drainage channels.	(i) In the implementation of the drainage project, especially design and construction, its information in terms of facility type, size, and location needs to be shared among the organizations related to drainage management (ii) Review of the study for confirmation about its validity based on the data of rainfall taken in the project area is necessary. (iii) Public awareness on the role of drainage system and proper action to maintain its performance are necessary.
6. Solid Waste Management	(i) Segregation at source, segregated waste collection, prohibits littering, open dumping necessary for solid waste management are not specified in any laws in Timor-Leste. (ii) The current status of the Tibar dumpsite poses health and safety risks to waste pickers, truck collection crew, and the inhabitants downwind and down gradient of the facility. (iii) Littering; dumping of waste in waterways; burning of waste; mixed waste storage, collection and disposal are observed.	(i) The country needs a comprehensive law which provides regulations and guidelines on various aspects of management, from generation through collection, diversion, treatment and disposal including educational, institutional, and financing aspects. (ii) Rehabilitation of the Tibar dumpsite and development of an environmentally acceptable disposal facility should be implemented. (iii) Education campaign regarding proper solid waste management should be launched and implemented.
7. Power Supply	(i) Distribution network as medium voltage and low voltage are unimproved. Voltage fluctuations in low-voltage networks far exceed the levels of electrical appliances. Old steel poles also have degraded the power distribution network. (ii) Power generation in Timor-Leste highly depends on oil supply running generators, which has negative impact to the environment contributing to climate change and fuel costs.	(i) Improvement of distribution network such as increase in number of transformers and low-voltage lines in Dili, replacing the old steel poles with concrete poles to improve and capable of force should be implemented. (ii) Using renewable energy mainly solar energy should be encouraged.
8. Telecommunication	(i) Slow speed of internet connection and also high internet prices are observed. (ii) Cable laying works under the road conducted by every operator based on their own marking strategy. It affects road traffic and increase the workload of officers in the road sections such as a road is dug up several times to install cables of different operators.	(i) The fiber trunk network mainly for international connections by submarine fiber cable for high speed internet connection, should be upgraded. (ii) Common underground ducts should be provided along the main roads and new urban area or industrial zone. The telecommunications overhead lines in the main route also should be arranged.

Source: JICA Project Team

7.7 Planning Issues and Directions for Environment

Four major planning issues are highlighted from the results of current condition analysis in the environmental and social conditions as follows:

(i) To establish entire project approval system with legislations;

(ii) To establish environmental sections especially in the ministries related to infrastructure;

(iii) To develop waste management system; and

(iv) To promote environmental awareness to reduce adverse impacts on nature (deforestation and other consequent impacts).

The first constraint is that there is no entire approval system for development projects although environmental laws are enforced. Legal effectiveness and relation between the project approval and environmental license are nuclear. This may provoke disordered developments especially for tourism developments in protected areas. Another constraint is the lack of legal procedures of land acquisition and resettlement. This can induce inadequate compensation, loss of livelihoods, difficulty to recover livelihoods, and/or degrade previous living conditions in urban development. Thus, the entire project approval system is required with legislations, which should include requirement and approval of land acquisition and resettlement action plans according to the project magnitude.

The institutional issue is to establish environmental sections especially in the ministries related to infrastructure as little consideration is given to the environmental and social impacts from the infrastructure development activities. The project implementers should avoid, minimize, reduce, and/or mitigate environmental and social impacts due to public projects.

For pollution matters, the most important issue is to develop a waste management system including sewerage/drainage system and solid waste management system. Direct discharge of domestic wastewater without treatment deteriorates the quality of surface water and groundwater. This can worsen public sanitation, induce diarrheal diseases, viral hepatitis, other water borne infections, mosquito borne disease (dengue fever, malaria) and/or offensive odor. Sustainable solid waste disposal and management system should also be established. There are litter (polythene bags, pet bottles, papers) and burning of solid waste anywhere in residential areas of DMA. These conditions can obstruct drainages and generate over flow of rain water that could worsen public health and deteriorate urban landscape.

In the natural and social environments, deforestation and loss of vegetation cover are related constraints. The major reasons are uncontrolled cutting of trees for firewood use and slash and burn practice. Especially, the households of DMA are still highly dependent on firewood for cooking fuel. These constraints cause soil erosion, landslides, flash flood on the steep slope mountains in the south of DMA, and consequently siltation/sedimentation in streams, rivers and drainage, obstruction of drainage and over flow of rain water, and flood. Climate change may also worsen these conditions. These constraints have mixed roots in the geographic/natural characteristics of DMA and still undeveloped human economic activities. For the long-term perspective, the economic activities should be developed with alternatives and improved technology especially in the primary and secondary sectors even in reducing the environmental impacts. In the short-term, communities should be sensitized and made aware of environmental impacts involved in forest protection and watershed management in order to reduce the adverse impacts on deforestation and other consequent impacts.

Other constraint of the social environment is the disorganized land occupation especially on the government-owned lands. The situation generates difficulty of land acquisition and resettlement for urban development without the legal procedures and land registrations. The Ministry of Justice is addressing them but fall behind the urban development. Legal procedures are required immediately.