JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

UNITED NATIONS
TRANSITIONAL ADMINISTRATION IN EAST TIMOR

THE STUDY
ON
URGENT REHABILITATION PLAN
IN
EAST TIMOR

FINAL REPORT

VOLUME 2: MAIN TEXT

August 2000

PACIFIC CONSULTANTS INTERNATIONAL
NIPPON KOEI CO., LTD.
YACHIYO ENGINEERING CO., LTD.

LOCATION MAP OF EAST TIMOR

THE STUDY ON
URGENT REHABILITATION PLAN IN EAST TIMOR

FINAL REPORT

TABLE OF CONTENTS

Location Map

List of Acronyms

Page

Page

THE STUDY ON
URGENT REHABILITATION PLAN IN EAST TIMOR

FINAL REPORT

LIST OF FIGURES

Page

Page

THE STUDY ON
URGENT REHABILITATION PLAN IN EAST TIMOR

FINAL REPORT

LIST OF TABLES

Page

Page

Chapter 7. ENVIRONMENTAL ASPECT

Chapter 9. CONCLUSION AND RECOMMENDATION

THE STUDY ON
URGENT REHABILITATION PLAN IN EAST TIMOR

FINAL REPORT

LIST OF PHOTOES

Page

List of Acronyms

ADB	Asian Development Bank
AusAID	Australian Agency for International Development
CAP	UN Consolidated Inter Agency Appeal for the East Timor Crisis
CEP	Community Empowerment and Local Governance Project
CFA	Central Fiscal Authority
CNRT	Conselho Nacional da Resistencia Timorese (National Council of the
D/D	Detail Design
DFID	Department for International Development (UK)
DPU	Public Works Department in Indonesia
DSRSG	Deputy Special Representative of Secretary General
DTW	Department of Transport and Works
DWT	Dead Weight Tonnage
ECHO	European Commission Humanitarian Office
EIA	Environmental Impact Assessment
EPU	Environmental Protection Unit
FAO	Food and Agricultural Organization
FY	Fiscal Year
GOJ	Government of Japan
GWT	Gross Weight Tonnage
IDA	International Development Agency
ILO	International Labor Organization
IMF	International Monetary Fund
IOM	International Organization for Migration
JAM	Joint Assessment Mission
JICA	Japan International Cooperation Agency
MOU	Memorandum of Understanding
NCC	National Consultative Council
NGOs	Non-Governmental Organization
NTG	Northern Territory Government
O/M	Operation and maintenance
OCHA	Office of the Coordination of Humanitarian Affairs
PAET	Power Authority of East Timor
PKF	Peace Keeping Force
PQ	Per-Qualification
QIPs	Quick Impact Projects
QP	Quick Project
ROW	Right of Way
S/W	Scope of Work
SRSG	Special Representative of Secretary General
TFET	World Bank-Administered Trust Fund for East Timor
	Timorese Resistance

UNDP	United Nations Development Programmed
UNFPA	United Nations Population Fund
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations International Children's Fund
UNOPS	United Nations Office for Project Services
UNPKF	United Peacekeeping Force
UNTAET	United Nations Transitional Administration in East Timor
USAID	United States Agency for International Development
WFP	World Food Programmed
WHO	World Health Organization
WUA	Water User Association

CHAPTER 1

INTRODUCTION

CHAPTER 1 INTRODUCTION

1.1 Background of the Study

In response to the request of the United Nations Transitional Administration in East Timor (hereinafter referred to as "UNTAET"), the Government of Japan decided to conduct "The Study on Urgent Rehabilitation Plan in East Timor" (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

The Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for technical cooperation programs of the Government of Japan, was assigned to undertake the Study in close cooperation with authorities connected with UNTAET.

In January 2000, JICA dispatched a Economic Cooperation Mission headed by Mr. Katsuro Nagai to East Timor for the preparatory work as well as discussion on the Scope of the Study, and the Scope of Work(hereinafter referred to as "S/W"), attached herewith in Appendix for TOR, was agreed and signed by Special Representative of the Secretary General of UNTAET and JICA mission on January 12, 2000.

According to the signed S/W, JICA dispatched the Study Team, headed by Mr. Haruo Sakashita on February 17, 2000.

This Report presents studies on the sectors of roads, bridges, ports, power and irrigation.

1.2 Objectives of the Study

The objectives of the study are (a) to plan and implement Quick Project (so called Quick Impact Projects in UNTAET) in road and bridge sectors and (b) to formulate Urgent Rehabilitation Plan for road, bridge, port, power and irrigation sectors of East Timor in order to contribute to UNTAET's infrastructure rehabilitation plan for the period of three (3) years up to June 2003. The Study was carried out in close coordination with the other international organizations and bilateral donors.

1.3 Study Area

The Study area covers all the area of East Timor except the Districts of Ambeno, Bobonaro and Cova Lima(See location map).

1.4 Scope of works

UNTAET is implementing a program of humanitarian assistance in East Timor. The primary objective of the transport and power infrastructure is to provide access of local population to this humanitarian relief. In its current significantly deteriorated state, the transport sectors are not able to facilitate the humanitarian efforts nor the security of the country. Furthermore, the Dili Port in port sector has become a bottleneck in the logistics chain for channeling humanitarian aid to the population. Taking into account the present situation in East Timor and UNTAET's program, the Study covers the following main items, in addition to normal practices for the study such as site survey, inventory survey, preliminary design and cost estimates, etc., in order to achieve the objectives mentioned in Clause 1.2.

(1) Urgent Rehabilitation Plans

The urgent rehabilitation plans for each infrastructure sector of roads, bridges, ports, power and irrigation are formulated with the purposes of facilitating efficient transport of humanitarian aid and security, ensuring salvage of the infrastructure assets and inducing revival of economic activity, considering that the plans are materialized by June 2003.

(2) Quick Project

Taking into account keeping the roads and bridges open as a highest priority together with irrigation in UNTAET's program, the Quick Project, which is called Quick Impact Project (QIP) in UNTAET, has been formulated for only road, bridge and irrigation sectors in the course of the Study and implemented during the months of April, May, June, July and August by labor intensive method with the main purpose of creating job opportunity to the East Timorese.

The Study was carried out based on the scope of work which was agreed upon between UNTAET and JICA mission on January 12, 2000.

A Work Flow Chart was prepared as shown in Figure 1.1.

1.5 Final Report

This Final Report contains summarized findings and recommendations following the descriptions of all the works carried out in the Study.

This Final Report consists of the volumes as listed below;

Volume 1: Summary

Volume 2: Main Text

Volume 3: Manual (Main)

Volume 4: Manual (Annex)

1.6 The Study Members and Counterparts

The study members and counterparts were as follows;

UNTAET Counterparts

- INFRASTRUCTURE

1.	Mr. Bob Churcher	Director of Infrastructure Dpt. (Feb.-Jun.2000)
2.	Mr. Diego Zorrilla	Deputy Director of Infrastructure Dpt. (Feb.-Jun.2000)
3.	Mr. Phil Piper	Manager, Road Authority, Infra. Dpt. (Feb.-May 2000)
4.	Mr. John Bertram	Head of Roads, Transportation Dpt. (May-Jul.2000)
5.	Mr.Yogesh Saksena	Director of Transportation Dpt. (Jun-Jul.2000)
6.	Mr.Chandra Perera	Staff of Transportation Dpt. (Jun-Jul.2000)
7.	Mr. Owen Peake	Director, Public Utilities Dpt. (Jun.-Jul.2000) Adviser, Power Authority (Feb.-Jun.2000)
8.	Mr. Trevor Fry	Head of Power, Public Utilities Dpt. (Jun-Jul.2000)
9.	Mr.Gunnar Hansen	Head of Port, Transportation Dpt. (Jun-Jul.2000)
10.	Mr. Mohd Ahmed	Manager of Port, Transportation Dpt. (Jun-Jul.2000) Manager of Port Authority,Infra. Dpt. (Feb.-Jun.2000)
11.	Mr. Edgar Pacheco	Staff of Port, Transportation Dpt. (Jun-Jul.2000) Staff of Port Authority,Infra. Dpt. (Feb.-Jun.2000)

- AGRICULTURE

12.	Mr.Serge Veruniau	Acting Head of Agriculture Dpt. (Feb.-Jun.2000) Director of Agriculture Dpt. (Jun.-Jul.2000)
13.	Mr. Jose Abel	Staff of Agriculture Dpt. (Feb.-Jul.2000)
14.	Mr. M. Auzib	Staff of Agriculture Dpt. (Feb.-Jul.2000)
15.	Mr. Chen Zhijun	Staff of Agriculture Dpt. (Feb.-Jul.2000)
16.	Mr.Sindayigaya Livingstone	Staff of Agriculture Dpt. (Feb.-Jul.2000)
17.	Ms. Maria Reginal Ismail	Staff of Agriculture Dpt. (Feb.-Jul.2000)
18.	Mr. Jurmi Wangeluk	Staff of Agriculture Dpt. (Feb.-Jul.2000)

JICA

1. Mr. Junsaku Koizumi	Special Technical Adviser (Feb.-Mar.2000)
2. Mr. Nobuo Iwai	Staff of JICA Headquater (Feb.-Mar.2000)
3. Mr. Susumu Yuzurio	Staff of JICA Headquater (Apr.-Aug.2000)

JICA STUDY TEAM

1. Mr. Haruo Sakashita	Team Leader
2. Mr. Toshio Hotta	Deputy Team Leader, Road Rehabilitat. Planner
3. Mr. Tetu Nakagawa	Deputy Team Leader, Bridge Rehabilit. Planner
4. Mr. Masaaki Ehara	Road Design Engineer
5. Mr. Nobuyuki Suzuki	Bridge Design Engineer
6. Mr. Takakazu Kajima	Port Rehabilitation Engineer
7. Mr. Hideya Sakurai	Port Design Engineer
8. Mr. Sumio Shindou	Irrigation Rehabilitation Planner
9. Mr. Shinichiro Matsumoto	Irrigation Rehabilitation Engineer
10. Mr. Mitsuhisa Nishikawa	Power Rehabilitation Planner
11. Mr. Kazuhiro Nakamura	Power Rehabilitation Engineer
12. Mr. Katsuaki Nishikatsu	Road Engineer for Quick Project
13. Mr. Hiroaki Kobayashi	Bridge/Irrigation Engineer for Quick Project
14. Mr. Takayuki Ohno	Irrigation Engineer for Quick Project
15. Mr. Kazushi Honma	Construction Plan/ Cost Estimate Engineer (1)
16. Mr. Katsuyoshi Maeda	Construction Plan/ Cost Estimate Engineer (2)
17. Mr. Yoshiteru Yamamura	Construction Plan/ Cost Estimate Engineer (3)
18. Mr. Tetsuya Maeda	Assistant

19. Mr. Sang Gyoon Lee	Assistant
20. Mr. Hiroyasu Kato	Assistant

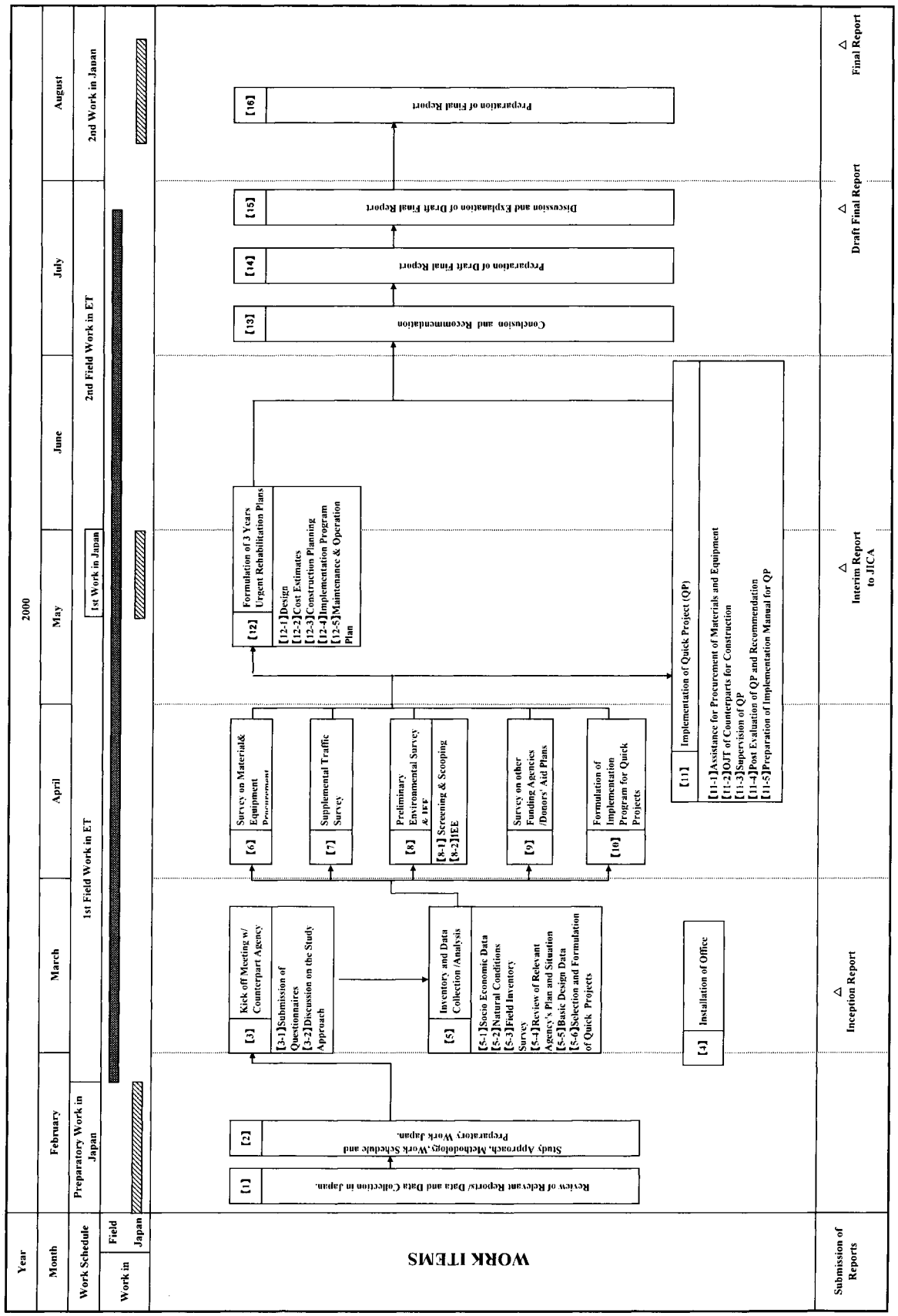


Figure 1.1 Work Flow Chart

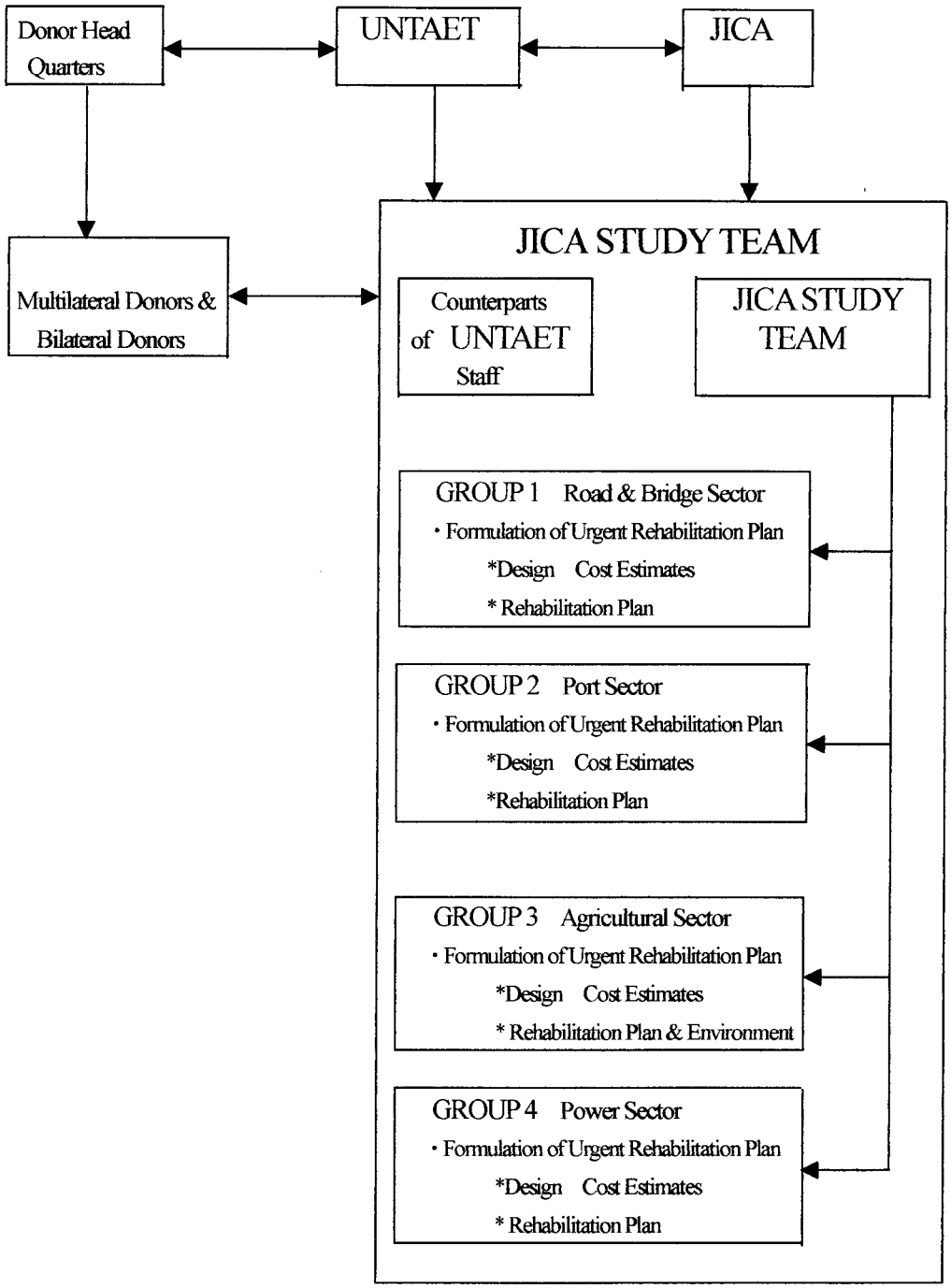


Figure 1.2 Study Organization

CHAPTER 2

GENERAL BACKGROUND

CHAPTER 2 GENERAL BACKGROUND

2.1 Topography and Geology

A chain of mountainous islands known as the Lesser Sunda Islands stretches to the east of Java. Timor island in Southeast Asia in the Malay Archipelago, is located at the edge of the Sunda Islands and has the largest island of the group. The island of Timor lies in a northeast to southwest direction and is 450 km long and approximately 80 to 100 kilometers wide. The northeastern half of the island is East Timor covering some 14,862 square kilometers. The island of Timor is mountainous and much of the island is characterized by rugged terrain and small narrow valleys. In East Timor, the island's highest mountain, Tata Mailau (2,950m) is located.

Geologically, the East Timor has young mountain systems (about 8-10 million years). The island is still in the process of rising from the seabed. Slopes, therefore, are very steep and largely covered with basalt-rich colluvial talus. These taluvial soil on slope are continually on the move downwards during rainy season. These are common to young orogenic mountains and leading frequent gullies, and deep incision of valleys. Parallel to island, mountain ranges cross Timor with more than 2000 m high mountain ridges. Its steep slopes fall sharply into the sea.

Tributary streams have steep slope and they show abrupt changes in channel width, and bed gradient where they enter the main flood plain. These changes cause deposition of large quantities of sediment in the form of alluvial fans. The river in East Timor is classified as active alluvial river: they are scouring banks and beds or depositing much sediment on the banks causing damage to bridges and their approach roads.

2.2 Meteorology

The climate of Timor is determined by the seasonal winds, dry southeast trade winds that blow from June to November from the Australian continent and a northwest monsoon that brings humid air and heavy rain from December to May from the South China sea. The annual precipitation of Timor Island ranges roughly from 1000 to 2000 mm except for a mountainous region where the rainfall is much heavier. The annual precipitation for the northern coastal area is approximately 1000 mm or less. It is lighter in the eastern area. The rainy season is over six months, from December to May in the western area and four months from January to April in the eastern area. Annual rainfall in1989 is approximately 1,200mm in Dili, 85% of which is concentrated during December and May. The monthly rainfall in Dili, Baucau and Viqueque is shown in Figure 2.2.1.

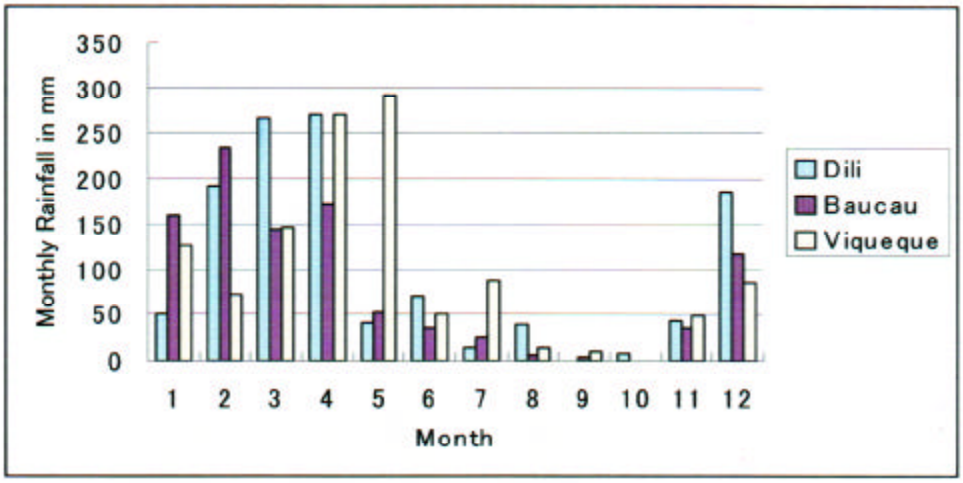


Figure 2.2.1 Monthly Rainfall in Major Cities

The annual mean temperature ranges from 31.5℃ to 22.5 ℃ in Dili. The highest temperatures are usually recorded from November to December, before the start of the monsoon, while the lowest temperatures are normally recorded in July and August. The monthly mean temperature in major cities is shown in Figure 2.2.2.

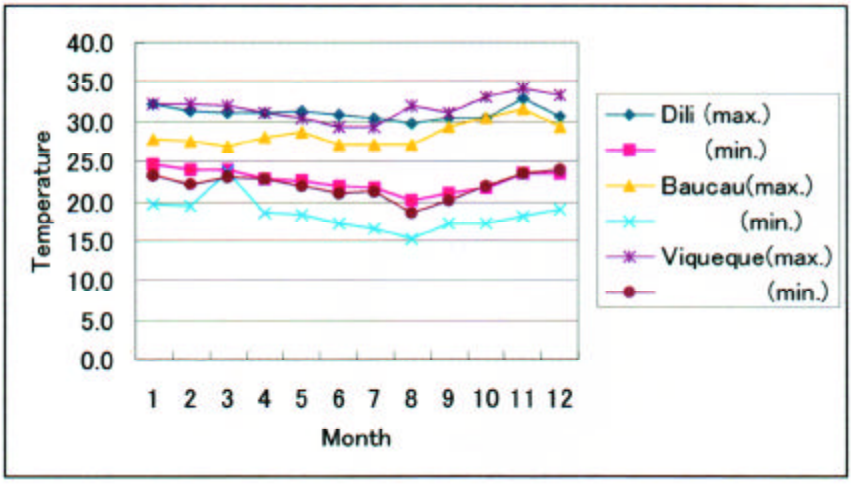


Figure 2.2.2 Monthly Mean Temperature in Major Cities

With regard to seismology in East Timor, East Timor is located in the southern edge of the Pacific earthquake belt. Intermediate shocks are frequent and the strongest earthquake over the past 30 years occurred at 46 km (8.38S, 125.13E) from Dili with a magnitude of 6.9 on 14th May, 1995 in Dili, and at 136 km(7.53S, 127.77E) from Lospalos with a magnitude of 6.8 on 13th July, 1994 in Lospalos; then the largest acceleration in Dili was about 140 gal and 60 gal in Lospalos.

2.3 Socio - Economic Conditions

Prior to the recent crisis, East Timor was primarily an agriculture economy, with a single significant export (coffee) and about 90 % of population living in rural areas. Food self-sufficiency was not assured and foodstuffs such as rice, flour, maize and sugar had to be imported. The islands was one of the poorest areas in Southeast Asia, with severe problems of illiteracy, malnutrition, malaria and tuberculosis. An estimated 30 % of households – or double the ratio for Indonesia – were below the poverty line. GDP per capita in East Timor amounted to the equivalent of $ 431 in 1996, while the national average was $ 1,153.

Total population in East Timor was 884,000 in 1998. After the popular consultation of 30 August 1999, it is estimated that about 300,000 persons were displaced by the violence and reduced to acute poverty in refugee camps. Another 200,000 people were displaced within East Timor. More than 50 % of the total population were dislocated by the violence. Although, by the end of April, 162,000 refugees had returned to their villages from West Timor with the assistance of UNHCR and IOM, it is reported that some 90,000- 120,000 refugees still live in precarious conditions in West Timor. The distribution by a sub- district of the total population in 1998 is shown in Figure 2.3.1.

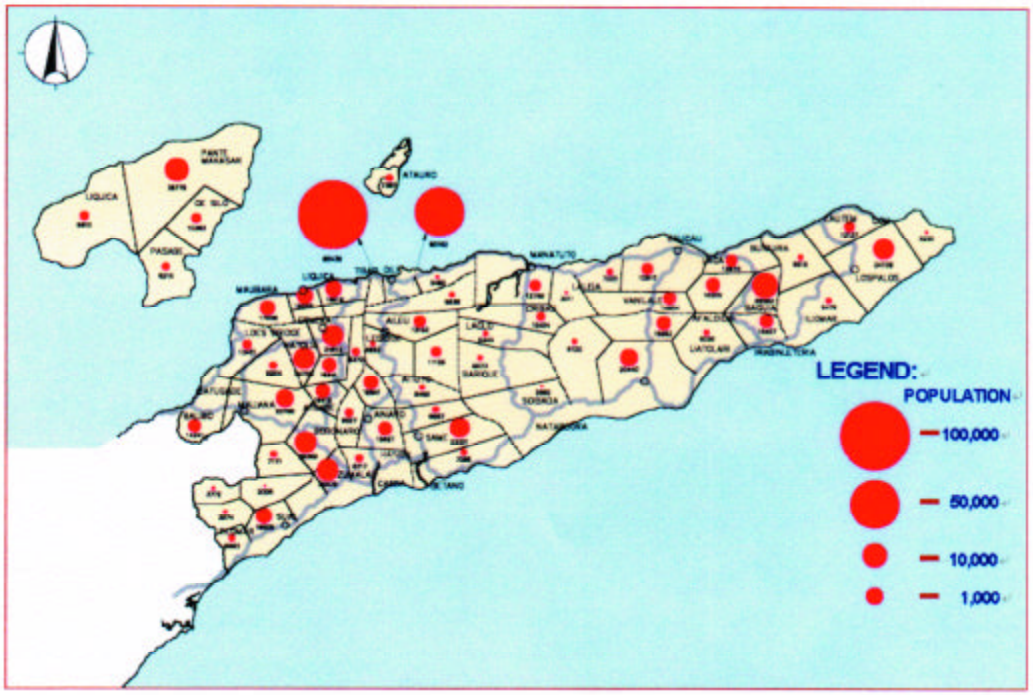


Figure 2.3.1 Distribution of Population in 1998

The violence following the results of the popular consultation not only caused a sharp drop in economic and social indicators, but struck a territory which was already one of the poorest in East Asia in both economic and social terms. With GDP per capita of $ US 424 in 1998, poverty rates more than twice the average in Indonesia, East Timor had little economic buffer with which to face the destruction of assets and livelihoods. Whilst GDP growth in 2000 and 2001 are predicted at 15

percent[1], it will take sustained growth rates over at least 5-6 years to regain pre-crisis income levels.

During the first half of 2000, overall economic activity started to pick up, led by commerce, basic service, and reconstruction of public and residential buildings. By early June approximately 35 restaurants, 8 hotels and 4 car rental firms were operating again in Dili and Baucau, and one telecommunication company and several foreign and domestic construction enterprises and shipping companies have expanded their presence in East Timor. In the first half of 2000, around 2,300 firms were registered, with about 5 per cent being foreign firms.

This observed recovery is in line with expected real GDP growth of at least 15 per cent per annum in FY 00/01, led by agriculture, commerce, basic services, and reconstruction of public and residential buildings. Agriculture is projected to grow strongly. Coffee output is expected to be about 8,000 tons, having recovered from less than 5,000 tons in 1997 and 1998. Rice and maize production in 2000/1 could reach as much as 70 per cent and 75 per cent of the 1996/97 bumper levels respectively.

The reconstruction effort is particularly intense during FY00/01 and FY01/02 and total investment is projected to average about 50 per cent of GDP during these years. Private reconstruction activity and hence investment is expected to be more intense in the first year due to housing reconstruction. This high transitional level of investment is expected to be supported by grant financing from abroad. East Timorese domestic savings will be negative for the next few years before gradually recovering to their traditional level of about 20 per cent of GDP that prevailed in 1995-97.

Given the severe domestic supply constraints many goods and materials used in the reconstruction process must be abroad. The external accounts are therefore likely to register large deficits in FY00/02 as imports are projected to rise sharply reflecting grants from abroad and foreign investment.

Table 2.3.1 Major Economic Indicators in East Timor

	97	98	Est.99	Proj.00
GDP per capita (in US dollars)	374	424	304	-
Population (in thousands)	843	884	750	-
Real GDP growth(in percentage)	4	-2	-38	15
Inflation rate (in percentage)	10	80	140	20

[1] World Bank/IMF staff estimate

2.4 Institutional Organization

2.4.1 General

In accordance with security Council resolution 1272(1999) of 25 October 1999, United Nations Transitional Administration in East Timor(UNTAET) has overall responsibility for the administration of East Timor and is empowered to exercise all legislative and executive authority, including the administration of justice.

UNTAET's mandate consists of the following elements;

- To provide security and maintain law and order throughout the territory of East Timor;
- To establish an effective administration;
- To assist in the development of civil and social services;
- To ensure the coordination and delivery of humanitarian assistance, rehabilitation and development assistance;
- To support capacity-building for self-government;
- To assist in the establishment of conditions for sustainable development.

The hand-over of command of military operations from the multinational force (INTERFET) under a unified command structure headed by Australia, to UNTAET was completed on 28 February 2000.

(1) Legislative Framework

UNTAET is reviewing and reforming all existing legislation in East Timor, including business-related legislation. Indonesian law will apply until new legislation to be promulgated. Regulation No. 2000/4 on the **Registration of businesses**, which was promulgated on 20 January 2000, is the newest commercially related legislation. A new Central Payments Office was recently created, establishing the basis for central banking operations. A new law on bank licensing, supervision and regulation is in preparation and should be passed in February 2000.

(2) Currency

The United States dollar was adopted as the national legal tender of East Timor. Regulation No. 2000/5 on the Licensing of Currency Exchange Bureau was on 20 January 2000.

(3) Business Registration

To operate as a commercial enterprise in East Timor, all businesses are required by law to complete the UNTAET Temporary Business Registration Form and

submit it to the UNTAET Business Registration Office. As of 20 January 2000, more than 500 locally and foreign-owned businesses have applied to register their business with UNTAET. This temporary registration is only an administrative monitoring mechanism. A permanent business registration form will be available soon.

(4) Judicial System

Ten East Timorese judges were appointed in January 2000 to begin re-building the judicial system and re-establishing the rule of law. A new law on courts is under preparation.

(5) Property

Currently, the property environment is in flux. UNTAET is working toward establishing a real estate system in East Timor. Further announcements on stabilizing the property law will be posted as soon as they are available.

Initially, businesses are advised to try to identify privately-owned property in which to establish operations. Steps to utilize property are as follows:

Public property: Contact the relevant UNTAET District Office upon arrival to inquire about the potential rental of public land and buildings.

Private property: Contact the owner directly.

(6) Customs and Immigration

Customs and immigration are established in the Dili International Airport and the Dili port. Permits to stay in East Timor are issued on arrival at the airport.

2.4.2 Organization of UNTAET

In order to achieve UNTAET's final goal for establishment of an independent East Timorese public administration and governance capability, and the organization of elections for a constitution and democratic Government, UNTAET has established a transitional Cabinet on 7 July 2000 to exercise governmental responsibility in East Timor. The transitional Cabinet, of which establishment is one of three key elements in the transition strategy, consists of eight portfolios, four of which are held by East Timorese and four by international UNTAET staff. The second key element is the creation of a National Legislative Council to replace the National Consultative Council consisting of 33 timorese members with representation from each of the District and a variety of civil society groups. The third is the progressive Timorisation of the Administration into various positions.

The organization of UNTAET Transitional Government is presented in Figure 2.4.1.

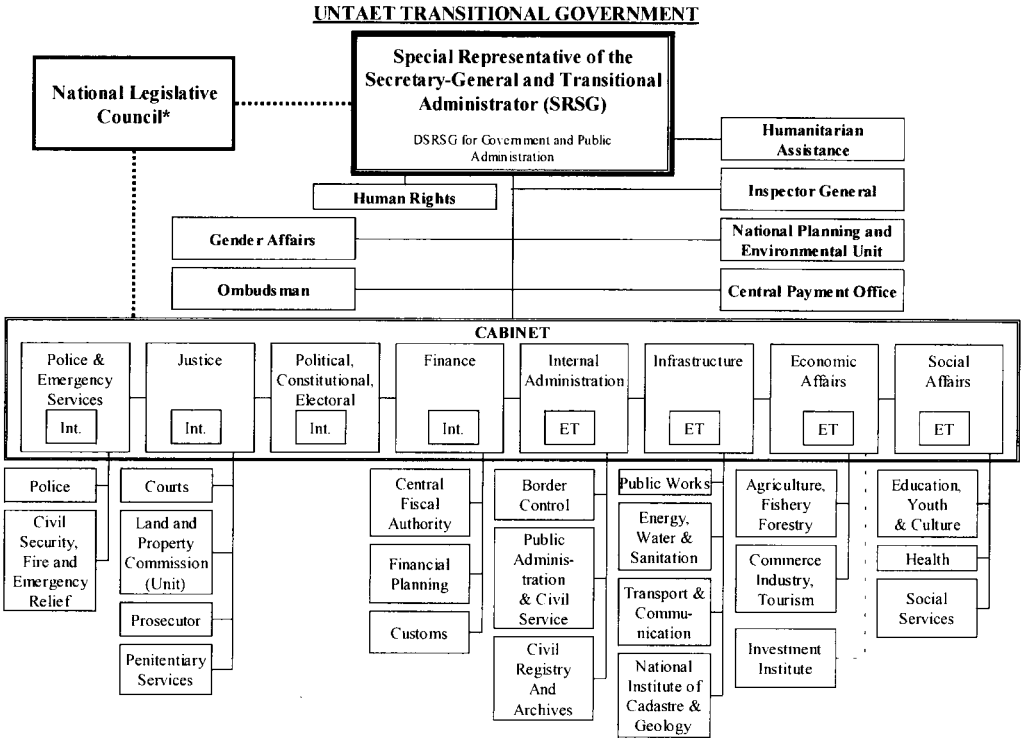


Figure 2.4.1 UNTAET Transitional Government

2. 5 Coordination with International Funding Agencies and Bilateral Donors

International Funding Agencies and bilateral donors are presently working to assist the East Timorese people and UNTAET in the reconstruction and economic and social development of East Timor. The Study has therefore conducted in close coordination with such International Funding Agencies and bilateral donors as listed below in order to effectively and efficiently use the limited resources.

- UNDP :United Nations Development Program
- WB :World Bank
- ADB :Asian Development Bank
- DFID :Britain's Department of International Development
- AusAid :Australian Aid
- US Aid :United State of America's Aid
- Portugal

Further agencies may be added to the above list.

A list of projects committed by the International Funding Agencies or bilateral donors is tabulated in Table 2.5.1(1) to (4).

Table 2.5.1 (1) Project Data Committed by the Donors

Project : Infrastructure (Road and Bridge)

Implementing Agency	Projects	Relavent Area	Period	Activity	Cost	Remarks
UNDP (Norway Fund)	QIP for National & Provincial Road	·Dili - Ermera ·Dili - Aileu ·Aileu - Meubisse	3 months (Feb. 1, 2000 - May 8, 2000)	Repair of pot holes, drainage, pipes, slope failure &	0.5 million US$	UNDP is implementing QIP
UNTAET (DFID/UK Fund)	QIP for National & provincial roads	·Baucau - Viqueque ·Baucau - Com - Lospalos ·Dili - Manatuto ·Manatuto - Laclubar ·Dili - Maliana - Hatolina ·Ariana - Suai	3 months (Feb. 1, 2000 - May 1, 2000)	Repair of pothols, drainage, pipes, slopes & bridges	1.6 million US$	1. D.A.C Enterprises Pty Ltd - Section 1: Liquicia and Bobonaro Districts 2. East Timor Plumbing & Gas Pty Ltd - Section 2: Kova Lima and Ainaro Districts 3. T.I.C East Timor Pty Ltd - Section 3: Dili and Manatuto Districts 4. Timor Asphalt Resources Pty Ltd - Section 4: Baucau, Viqueque & Lautem
ADB	Design, QIP & rehabilitation of roads	Districts of Baucau, Dili, Same Maliana & Ambino. Total length of road is	27 months (Apr. 2000 - Jun. 2000)	Repair & rehabilitation of roads & bridges	20 million US$	US$ 30 million covers road, power & port sectors. US$20 million out of US$30 million will be for road rehabilitation.
US Aid	Rehabilitation	Atsabe		Junp up Rehabilitation	0.03 million US$	
UNDP (JAPAN Fund)	Emergency Repairs	· Dili - Aileu - Ainaro Road	17 months (Sep.2000-Jan.2000)	Rehabilitation of pavement, drainage, pipes, slope foalure &	4.42 million US$	
JICA / JAPAN	·3 years plan for Urgent Rehabilitation ·QIP	Nation wide	6 months (Feb. 17, 2000 - Aug. 31, 2000)	· Planning, design, cost estimates and implementation schedule ·Dili/Baucau Road, Dili/Ainaro Road & Laga/JC Road	A part of 3.2 milion US$	Submit the study report by end of Sept., 2000

Note : QIP ; Quick Impact Project
PQ ; Pre-Qualification

Notes : 1) Short list was made by PQ for international contractor : the UNTAET projects. At present, 7 contractors have been passed(6 Australian companies, 1 Philippine Company) for PQ.
2) North Coastal Road have been selected for QIP.
3) Southern Coastal Road will be selected to be 3 years Urgent Rehabilitation Program.

Table 2.5.1 (2) Project Data Committed by the Donors

Project: Infrastructure (Port)

Implementing Agency	Project	Relevant Area	Period	Activity	Cost	Remarks
ADB	Design, Emergency Port Rehabilitation	Dili Port Beach Landing site of Suai, Betano and Beacu	16 months (Sep. 2000 - Dec. 2001)	Wharf extension at Dili Port Restoration of the landing craft slipway at Dili Port Restoration of container yard at Dili Port Beach matting at Suai, Betano and Beacu Emergency port repairs Equipment for landing of goods	2.06 million US$	30 Million US$ covers road, power & port sector.
Portugal	Harbor Master Port Engineer		11 Feb – 31 May 2000	Short term harbor master Short term engineering services	N/A	
Interfet	Hera Port Improvement in connection with shipment of military veicles	Hera Port		Port Improvement allowing for loading Interfet vehicles	N/A	
UNDP (JAPAN Fund)	Emergency Repairs	Dili Port	7 months (Sep.2000– Apr. 2001)	· Restoration of Navigation Aids and Fender System · Restoration of Revetment	4.502 million US$	
JICA / JAPAN	3 years plan for Urgent Rehabilitation	Dili port, Com port, Carabela port	17 Feb. – 31Aug. 2000	Planning, design, cost estimates and implementation schedule for urgent rehabilitation	A part of 3.2 million US$	Submittal Study Report by end of Sep. 2000

Table 2.5.1 (3) Project Data Committed by the Donors

Project : Infrastructure (Power)

Implementing Agency	Projects	Relavent Area	Period	Activity	Cost	Remarks
UK, DFID	Operation & power supply	21 power stations	~Mar. 31, 2000	Supply of diesel oil, trucks & payroll	?	3.1million US$ (21.3c/li) is needed for the cost of diesel oil with an increase of 1.3% per month from Mar.1,2000 to Dec.31,2000
UNDP (Portugal Fund)	Institutional study and small power stations	Nationwide and 4 power stations	Mar. 2000 to Dec.2000 (10months)	Institutional and capacity building, and 4 small power stations (Quellicai, Luro, Laclubar, Natarbora)	1.0million US$	Electrical power company to be considered whether national, public or private organization. Because of the requirement of Portugal, Portugal company will be appointed directry for the contract. UNDP will collect 3% as administration cost..
Australia (Northern Territory Government)	Restoration of power station	Nationwide	~Apr. 30, 2000	Supply of 2 technicians and materials	a few 10,000A$ per month	
ADB	Rehabilitation of power station	Nationwide	Apr.,2000 to Dec.,2000 (21months)	1.Rehabiritations of Switchgear in Komoro Power Station 2. Supply of Administration Equipment 3.Supply of Communication Equipment 4. Re-construction 15 small P/S 5. Supply of tools for small P/S		
UNDP (JAPAN Fund	Emergency Repairs	17 Power Stations	Mar. 2000 to Dec.2000 (10months)	· Maintenance of Komoro Power Station · Reconstruction of 17 small Power Station	5.19 million US$	
JICA (JAPAN)	3 years plan for Urgent Rehabilitation	Nationwide	Feb. 17, 2000 to Aug. 31, 2000		a part of 3.2 million US$	Submit the Study Report by end of Sep. 2000

Table 2.5.1 (4) Project Data Committed by the Donors

Project: Infrastructure (Agriculture)

Implementing Agency	Project	Relevant Area	Period	Activity	Cost	Remarks
UNDP	Immediate recovery and improvement of Agriculture production	Maliana, Baucau, Viquequ Manatuto Sui and Same	12 months	Farming machines, seed, fertilizer	0.5 millionUS$	The Project is being funded by Norway.
FAO	1.Urgent Maize and Rice seeds multiplication during off season at community level Urgent	All the districts	10 months	Maize and Rice seeds	0.42 million US$	Project Proposal distributed to all potential donors
	2.Cattle vaccination campaign	All the districts	10 months	Vaccines for the cattle	0.329 million US$	
UNDP (JAPAN Fund)	Emergency Repairs	Manatuto Baucau Viqueque	15 months (Sep. 2000 –Nov.2000)	Rehabilitation of Irrigation facilities	7.261 million US$	
JICA / JAPAN	· 3 years plan for Urgent Rehabilitation · QIP	Nationwide	Feb. 17, 2000 – Aug. 31, 2000	· Planning, design, cost estimates and implementation schedule for Urgent Rehabilitation · Maintenance works for Laclo irrigation system (1.0 million US$)	A part of 3.2 million US$	Submit Study Report by end of Sep. 2000

CHAPTER 3

ROADS AND BRIDGES SECTORS

CHAPTER 3 ROADS AND BRIDGES SECTORS

3.1 Present Situation of Roads and Bridges

3.1.1 Present Road Conditions

(1) Road Network

The road network in East Timor has a ladder-shaped as shown in Figure 3.1.1. Two corridors run along the coastal line from east to west on both northern and southern sides of the island. These corridors are connected with south-north roads forming ladder steps. The most important road in East Timor runs along the northern side coastal line of the island starting from the border with West Timor, linking Dili, capital city of East Timor, Manatuto, Baucau, the second largest city, and Los Palos at the eastern end. Between Dili and Manatuto, about 50 km in length, the road runs along the coastal line crossing several steep ridges directly facing the sea.

The southern coastal road runs in coastal areas consisting of arable and wide flatlands, but is located, in areas less developed and populated than that along the northern area. Most arable lands in the southern coastal region are located near the mouth of the river where the alluvial layer deposits. The southern coastal road therefore crosses many rivers having large watershed area because of the mountains. A large number of bridges have been constructed under Indonesian rule. Due to insufficient bridge maintenance and lack of river training works, several bridges and their approaches have however been washed away by the previous floods. South-north roads connecting the northern and southern coastal roads provide accesses to the developing area of the southern coastal region, but also function as penetration roads for development of the southern region.

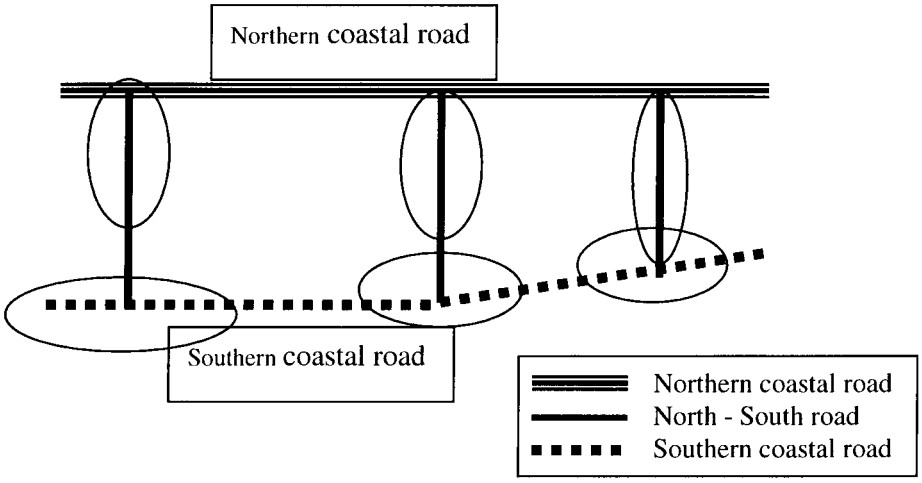


Figure 3.1.1 Concept of Road Networks

(2) Road Classification

During the Indonesian era, the arterial roads were classified into national, provincial, and district (kabupaten) roads. This classification is not consistent with their hierarchy. Once a road, for instance, has been constructed by the Road Department (Bina Marga), the road with function of district road is classified as national. In this Report, National and Provincial roads and district road as called in Indonesia era are defined as Arterial Road and local road respectively.

Table 3.1.1 Definition of Road Classification

Road Classification in Indonesia Era	Definition of Terminology in this Report	Original Definition
National roads:	Arterial Road	Roads connecting several provinces
Provincial roads:		Roads connecting administrative units of kabupaten and Kota
District roads:	Local Road	Roads connecting further smaller administrative units of desa and kotamadya

Table 3.1.2 Road Classification by Pavement Type

Unit: km

Old Classification	New Classification	Asphalt	Gravel Stone	Earth	Other	Total
National Road	Arterial Road	584				584
Provincial Road		761	100			861
District Road	Local Road	2,167	678	1,990	83	4,918
Total	Total	3,513	777	1990	83	6,363

Table 3.1.3 Road Classification by Surface Condition

Unit: km

Old Classification	New Classification	Good	Moderate	Damaged	Seriously Damaged	Total
National Road	Arterial Road	584				584
Provincial Road		481	180	200		861
District Road	Local Road	1,671	1,118	1,365	767	4,918
Total	Total	2,736	1,297	1,565	767	6,363

(3) Road Inventory Survey and Survey Results

Taking into account the purposes of the Study to formulate an urgent rehabilitation plan, the road inventory survey was carried out in terms of road defects, deficiencies and damages requiring urgent restoration. A summary of the findings resulting from the inventory survey is described below;

In East Timor, most arterial roads occur in mountainous terrain, and the road standard applied is lower than Japanese standard one for a design speed of 20 kph. In particular, the horizontal alignment standards for the mountainous terrain are quite low, with a minimum radius curve of 20 m or less found in many locations. Sections of S-shaped curve with a small radius have almost no transition section, and circular arcs are mostly directly counter-turned.

The necessary road facilities, such as drainage, bridges and slope protection, and safety devices are poor. As a result, the roads are substandard due to adverse meteorological and geological conditions as described below:

- The roads intersect many small mountain streams and have low- alignment standards in rugged terrain. As drainage facilities accommodating the run-off from these streams are poor; the discharge overflows over the road's surface, which in turn causes collapse of the road surfaces and shoulders.
- To cross steep streams in mountainous terrain, causeways are directly placed on top of the riverbed so that a low cost river crossing structure can be used instead of bridges. Furthermore, strong rainfall causes a washout of roadbed and cross drainage due to lack of any appropriate check dams or stream training works upstream and downstream to cope with the erosion and scoring.
- Because of rugged terrain, many road sections have been constructed with cut slope on the mountain side and fill slope on valley side, but almost no slope protection is provided. Consequently, slope failures including surface erosion and landslide frequently occur due to rainfall and water penetration.
- Some of the road widths are narrower than 6 m. Therefore, even small scale slope failures interrupt smooth traffic flow, resulting in road closure.
- Drainage facilities are insufficient and their capacity is not enough to accommodate runoff discharge flowing under the roadbed and to prevent water penetrating into the pavement structure, which in turn results in pavement failure and washout of the road bed.
- Where the road crosses steep mountainside slopes, the valley side fill slope is often steep. In this case, penetration of water occurs under the roadbed and causes landslides for the valley-side fill including the shoulder.

- Where the road gradient is steep, the surface drainage is not properly treated in most of cases. Accordingly, the road surface becomes a drainage channel during rainfall, which in turn washes away or deteriorates the road surfaces and shoulders.
- In East Timor, limestone is commonly observed as a ground layer or bedrock in many areas. In mountain streams, slippery clayey soil deposits composed mainly of weathered limestone causes many landslides. Road crossing these sections by means of embankment, causes landslides due to loss of balance. Landslides are very common.
- Since no prevention measures are taken for those landslide sections, rainfall penetrating into the ground tends to induce landslides.

A quantitative summary of the road inventory survey in terms of defects, deficiencies and damages on a link basis is tabulated in Table 3.1.4 together with definition of each section as shown in Table 3.1.5.

Table 3.1.4 Summary of Road Inventory

Investigation Items	UNIT	Route (No)																
		①	②	③	③−1	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	Total
Route Length	KM	135.8	55.5	46	20	48	90	85	74	64	57	25.0	48.5	47.0	61.4	64.3	141.0	1,061
Cut Slope Slip Dawn																		
Cannot pass through	M				300	300								100	200	600		1,500
More than 1m width	M	600	400	210	1,120	1,300	80	200	760	80	2,500							7,250
Less than 1m width	M	1,000	700	500	1,270	760	100	3,300	1,300		300						150	9,380
Ditch Buried	M	800		17,400	3,800	1,000	1,000	7,700	23,200		4,500					3,000	100	62,500
Slip Dawn of Shoulder																		
Less than 1m heights	M	200	50	50	10	100		150	130	200	20					100	100	1,110
From 1m to 3m heigh	M	300	100	50	30	410	265	415	260	145	50					190	200	2,415
More than 3m heights	M	400	300	200	835	1,285		100	60	740	500			200	200	600	60	5,480
Land Slide (whole)																		
Less than 1m heights	M	400	400	60	760	530	150	1,350	150	530	700			80	50	50	700	5,910
More than 1m heights	M	600	400	200		300			300	1,530	1,000							4,330
Damage or Renewal																		
Bridge Protection	PLS													6	6	6		18
Pipe Culvert	PLS	4	7	7	7	5	6	5	9	3	5	3	5	5	8	6	7	92
Inlet or Outlet	PLS	4	14	11	12	10	9	8	5	6	12	5	8	8	15	3	14	144
Ditch	M	1,700	1,500	2,000	18,000	25,500	500	1,500	5,000	20,930	1,000	600	1600	1200	1400	1,200	2,100	85,730
Pavement	M	4,000	20,000	1,000	18,900	4,000	3,000	18,600	3,000	6,600	1,000	300	800	600	700	600	4,000	87,100
Shoulder	M	1,800	5,000	10,000	9,000	10,900	2,000	20,000	2,000								1,000	61,700
Safety Device	M	14,000	5,000	5,000	500	3,600	1,000	2,700	2,600	900	5,000						5,000	45,300
Over Lay		40,740	16,650	13,680	6,000	14,250	26,910	25,380	22,050	19,260	17,160	7,500	14,550	14,100	18,420	19,290	42,300	318,240

Table 3.1.5 Definition of Each Section

Section No.	Section	Length (km)
(1)	Dili-Aileu-Aituto-Ainaro-Cassa	136.0
(2)	Laga-Baguia-Afaloicai	42.0
(3)	Tibar-Ermera	46.0
(3)-1	Ermera-Hatolia	20.0
(4)	Ermela-Letefoho-Atsabe	48.0
(5)	Laga-Lautem-Los Palos	90.0
(6)	Manatuto-Cribas-Natarbora	85.0
(7)	Dili-Tibar-Liquica-Maubara-Loes Bridge	74.0
(8)	Baucau-Venilale-Viqueque	64.0
(9)	Aituto-Same-Betano	57.0
(10)	Cassa-Betano	25.0
(11)	Betano-Natarbora	48.5
(12)	Natarbora-Viqueque	47.0
(13)	Viqueque-Beacu-Uatolari-Irabinleteria	61.4
(14)	Irabinleteria-Illiomar-Los Palos	64.3
(15)	Dili-Manatuto-Baucau-Laga	141.0

The typical road width for arterial roads are shown in Table 3.1.6.

Table 3.1.6 Typical Road Width

Arterial Road	Mountain Terrain		Flat Terrain	
	Carriageway	Shoulder	Carriageway	Shoulder
Northern Coastal Road	4.5 m	0.75 m	4.5 m	1.5 m
Southern Coastal Road	4.5 m	1.50 m	4.5 m	1.5 m
North - South Roads	3.0-3.5 m	0.50 m	3.5-4.5 m	1.0 m

Most of the present surface pavement consists of macadam pavement (asphalt macadam) with cut-back asphalt or asphalt emulsion on the binder course, over which tack coating and a 3 cm surface layer of hot mix are provided. Many provincial roads in the mountainous terrain are provided with asphalt macadam only.

Of the 1400 km of arterial road, 93% or more are provided with some sort of pavement. For the 6300-km road network including local roads, the pavement ratio is high (55% or 3500 km). Because of lack of maintenance and passing heavy vehicles of PKF and UNTAET at present, the pavement damage has been aggravated. Nevertheless, the overall pavement is in acceptable condition.

In addition to above survey, the road inventory survey within Dili City was also carried out and the survey result is summarized in Table 3.1.7. It is noted that all the traffic signs at 11 intersections in Dili City have been totally destroyed and need urgent replacement.

Table 3.1.7 Summary of Dili City Road Inventory

Link No	Pavement		Drainage		Masonry		
	Asphalt	Gravel	Repair	New Construction	Repair	New Construction	
	Repair	New Pavement					
	M2	M2	M	M	M	Length	H(m)
1	171	0	150	0	0	0	0
2	416	2,190	47	1,517	60	0	0
3	1,492	2,250	444	375	25	375	1-1,5
4	244	0	214	0	0	0	0
5	480	0	289	2,320	180	790	2,0-3,5
6	1,716	0	115	2,327	0	700	0,5-1,0
7	37	1,680	20	607	0	0	0
8	2,615	0	121	120	150	600	2,-3,5
9	522	0	181	720	0	70	0,5-1,5
10	152	0	443	250	0	0	0
11	245	0	353	860	0	0	0,5-1,5
12	26	0	45	0	0	30	0
13	28	0	0	1,510	0	500	1,0-2,0
14	31	0	0	930	0	0	
Total	8,175	6,120	2,422	11,536	415	3,065	

The locations of link number, restoration works required derived from the road inventory survey are shown in Figure 3.1.2.

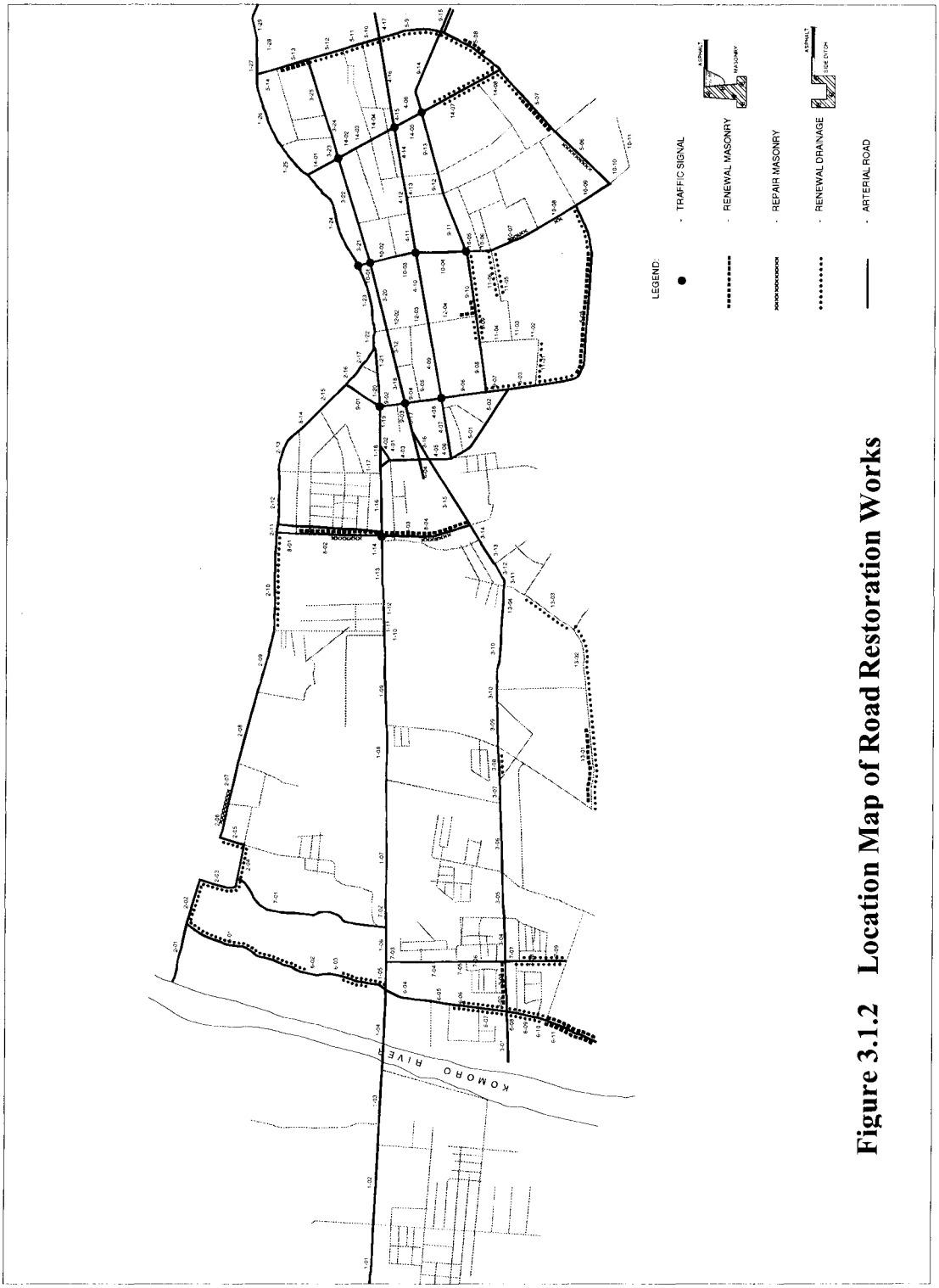
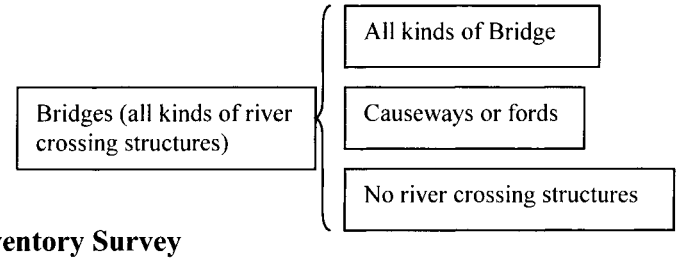


Figure 3.1.2 Location Map of Road Restoration Works

3.1.2 Present Bridge Conditions

In general, river-crossing structures should have three functions. These functions are of load carrying capacity (required durability), traffic flow accommodation capacity (required bridge width) and flood flow accommodation capacity (required bridge opening). It is defined that a bridge structure has all of these three functions. It is however observed in the Study area that no river crossing structures or only causeways with insufficient bridge soffit clearance are provided at crossing sites. Hence, all of these river crossing structures including causeways are to be defined as bridges in this Study.



(1) Bridge Inventory Survey

The bridge inventory survey covering all kinds of river crossing structures along arterial roads covered in the Study was carried out by means of ocular inspection, measurement and photography. The survey covers bridge data gathering such as bridge identification, classification of bridge type, measurement of bridge length, span length and girder arrangement, and condition rating of all major members including detecting type and extent of defects/damages and degree of deterioration. An interview survey of local residents with regard to flooding condition and year built, and photographing were also conducted.

(2) Survey Results

The typical bridges in East Timor are broadly divided into two categories. One category consists of through type of steel truss bridges, most of which are located along northern and southern coastal roads. These bridges which have been standardized into four types and are relatively in good condition. They were built in early 1990s. The other bridges are small to medium length bridges built mostly in 1980s and located along the penetration roads. These bridges are either of reinforced concrete which have T-shaped beam (RC T Shape Girder) or slab bridges (RC Slab Bridge). These bridges have various defects and, deteriorated substructure and superstructures probably caused by poor workmanship and local scouring. A summary of findings through the inventory survey is briefly described herein under and these typical bridges in East Timor are shown in Photo 3.1.1.

- None of the bridges have been damaged by the post consultation destruction, and all the bridges have suffered from a long term lack of maintenance in general.

- It seems that no hydrological and hydraulic study was made in bridge planning stage since an inadequate bridge opening or improper bridge location has been observed at many places.
- Many of the existing bridges have been suffering river bed aggradation or degradation resulting from the deforestation, which is in turn reducing the bridge vertical clearance or exposing the bridge foundations,.
- Due to river aggradation or degradation, river bank protection and check dam installation on both sides of the bridge are required to keep the bridge in sound condition.
- Most of the existing bridges are in very poor from the anti-seismicity aspect, even through East Timor belongs to a moderate seismic zone.
- There are typical concrete bridge defects such as sagging at bridge center, flaking exposed rebars probably resulting from poor workmanship of supporting /scaffolding work and poor concreting work.
- Typical defects in steel bridges such as steel truss and I shape beam are corrosion, deformation and rupture due to vehicle collision.
- A signboard showing allowable loading is not provided at all.

Based on the survey results, all the bridges by type are tabulated in Table 3.1.8 and a summary of the existing bridge conditions are tabulated in Table 3.1.9.

Table 3.1.8 Bridge Classification by Type

No.	Type	Number in group (Weighted %)	Remarks
01	Steel truss bridge	36(8.8%)	Standard truss (Australia, Holland, Austria and Indonesia products), Including three bridges for which construction has been suspended.
02	RC Two girders bridge	9(2.2 %)	Single lane bridge constructed in 1970s
03	RC T shape girder bridge	58(14.1 %)	Indonesia standard design (Including two bridge where construction has been suspended)
04	RC slab bridge	176 (42.9 %)	With stone masonry abutments
05	Multiple box culvert	7 (1.7 %)	More than five cells
06	Multiple pipe culvert	1 (0.2 %)	More than five pipes
07	UB steel bridge	11 (2.7 %)	
08	Causeway	3 (0.7 %)	Concrete pavement
09	Bailey Bridge	8 (0.9 %)	
10	Wooden bridge	4 (1.0 %)	
11	Box culvert	53 (12.9 %)	Less than 4 cells
12	Pipe culvert	24 (5.9 %)	Less than 4 cells corrugated steel pipe
13	Concrete arch	2 (0.5 %)	
14	Stone masonry arch	6 (1.5 %)	
15	No river crossing Structures	12 (2.9 %)	
Total		410 (100 %)	

Photo 3.1.1 Typical Bridges in East Timor

Steel Truss Bridge

Reinforced Concrete Slab Bridge

Reinforced Concrete T girder Bridge (Indonesia standard)

Table 3.1.9 Bridge Classification by Condition Rating

No.	Road section	Total Number of structures inspected	No river crossing structure *1	Cause-ways	Condition Rating		
					Poor*2	Fair	Good
1	Dili-Aileu-Ainaro-Cassa	55			3		52
2	Dili-Liquica-Tutobaba	37				3	34
3	J.C. of Dili-Liquica road-Gleno-Ermera	30			5	3	23
4	J.C. of Gleno-Ermera road-Hatolia	25			3	1	21
5	J.C. of Gleno-Ermera road-Atsabe	16	2	1	2	1	10
6	Atsabe-Bobonaro	7			3		4
7	Dili-Manatuto	23				2	21
8	Manatuto-Biculie-Natabora	31	2			5	24
9	Aituto-Same-Betano	22			2		20
10	Betano-Natabora	9	1		1	1	6
11	J.C. of Same-Betano road - Cassa	5	1		1		3
12	Manatuto-Baucau	29			1	5	23
13	Baucau-Laga-Lospalos	19		1		1	17
14	Laga-Baguia-J.C. of coastal road	9			1		8
15	Baucau-Viqueque	23	1		3	1	19
16	Viqueque-Uatorali	34	1		4	1	28
17	Viqueque-Natabora	22			2	1	19
18	Lospalos-Irabinleteria	4	1			2	1
19	Cassa-Jumalai-Bobonaro	8			2		6
20	J.C. of Cassa-Jumalai raod-Suai	2					2
	Total	410	8	2	33	27	340

Table 3.1.10 Condition Rating of Bridges in Dili City

No.	Road section	Total Number of structures inspected	No river crossing structure *1	Cause-ways	Condition Rating		
					Poor*2	Fair	Good
	Dili City Road	9		1	2	2	4

Note:

*1: Including bridges for which construction has been suspended.

*2: Including Bailey bridges and wooden bridges.

Poor: Severe deterioration or damage for the structural elements and thus requiring urgent rehabilitation/restoration.

Fair: Moderate deterioration or damage for the structural elements and thus requiring detailed inspection and assessment.

Good: No specific deterioration or damage in the structural elements i.e. non-detrimental to the structure but requiring periodic inspection and maintenance.

3.2 Traffic Study

3.2.1 Vehicle Registration

According to 1996 statistics before the conflict, the registered number of passenger cars, buses, and trucks was 2,600, 1,380, and 3,450 respectively, totaling 7,430. There were also 16,000 registered motorcycles. As a result of the conflict, most of them were lost or transferred to West Timor, and vehicles running at present mostly belong to the UN or Aid agencies. Based on the information from the Border Control Section in UNTAET, the number of imported vehicles is increasing rapidly and as of May 2000, about three hundred vehicles has been imported in an average per month.

3.2.2 Traffic Survey

The traffic survey carried out in the Study are as follows:

- Traffic counting survey at 14 locations in inter-district road link and at 12 intersections in Dili City, and
- Road side OD survey at 6 locations.

The traffic counting locations at 14 locations in inter-district road link and at 12 intersections in Dili City are shown in Figure 3.2.1 and Figure 3.2.2 respectively. The survey does not cover all the road links in the Study Area due to limited time. However, these survey stations are enough to depict the traffic movement between the main districts.

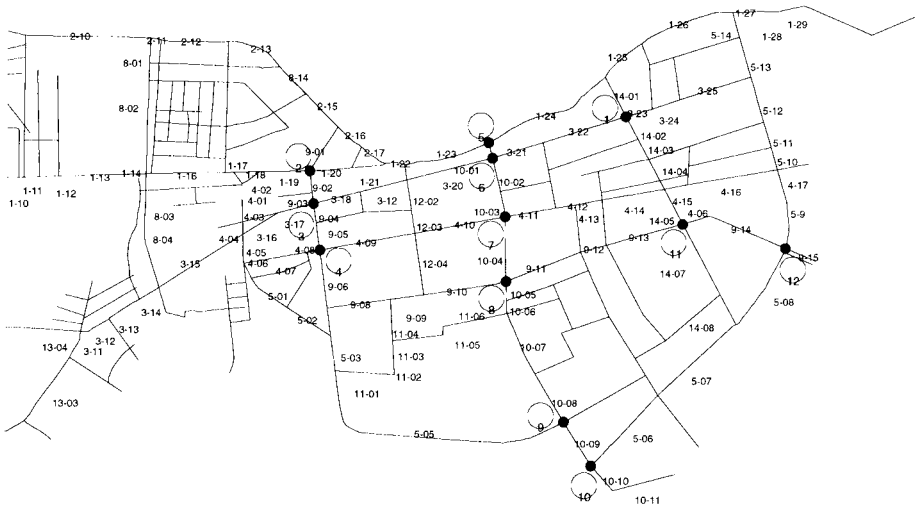


Figure 3.2.1 Traffic Counting Survey Locations in Dili City

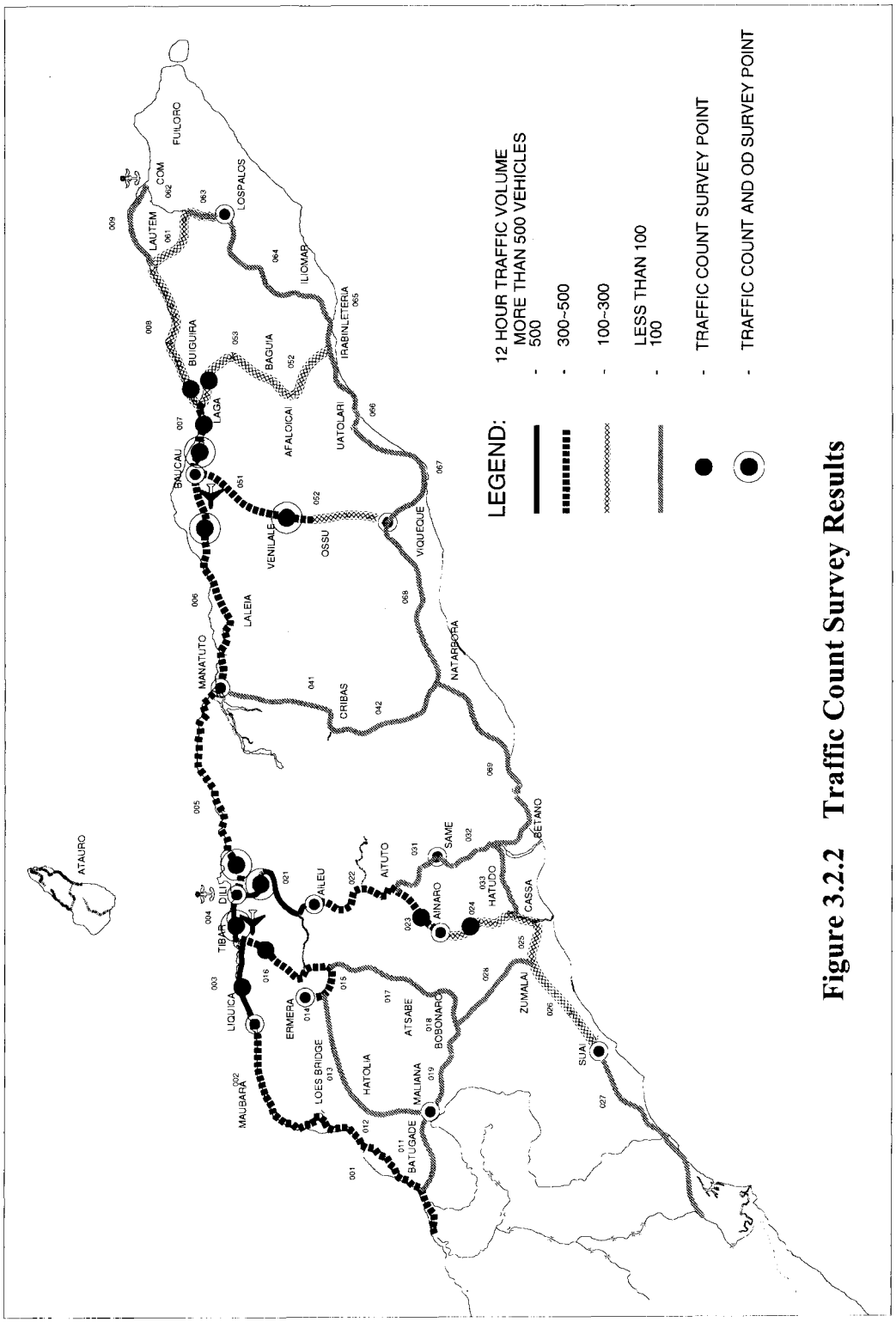


Figure 3.2.2 Traffic Count Survey Results

3.2.2.1 Traffic Counting Survey

(1) Inter-Region Road

Table 3.2.1 shows the 12 hours traffic flow at 14 survey locations. The highest flow of about 8,500 vehicles/12hrs is at Dili city survey station. At two stations out of 14 stations, 12hrs.traffic flows were less than 100, and 100 – 500 at the eight stations. More than 500 vehicles/12hrs stations are located on road section of Dili-Liquca and Dili –Aileu. Figure 3.2.2 shows categorized traffic flow based on traffic count survey results.

Table 3.2.1 Traffic Counting Results (12 hours)

	Location	Car	Truck	Bus	Motorcycle	Total
1	El Mera – Tibar	331	292	1	102	724
2	Dili-Tibar	622	397	20	188	1,227
3	Tibar-Liquica	353	127	20	99	599
4	Dili-Aileu	281	125	2	131	539
5	Aileu-Ainaro	29	26	2	27	84
6	Ainari-Suwai	10	12		19	41
7	Dili-Manatuto	339	60	29	63	491
8	Manatuto-Baucau	213	65	27	51	356
9	Baucau-Viqueque	172	42	10	119	343
10	Baucau-Buruma	150	24	3	143	320
11	Laga-Baucau	86	39	6	81	212
12	Laga-Baguia	55	25		32	112
13	Laga – Los Paro	63	22	5	48	138
14	Dili(Comoro Br.).	3,103	1,886	1,931	1,481	8,662

(2) Dili city

Table 3.2.2 shows 12-houres traffic volumes at 12 intersections in Dili City of which locations are shown in Figure 3.2.2. The most busy flow of about 17,000 Vehicles/12-hours is at survey station No.7 at Gorkar(ll). At five (5) stations out of 12, the 12-hours intersection traffic flows were more than 10,000, and 6,000 – 10,000 at six stations. The lowest flow of 5,341 vehicles/12-hours is at the station No.10 at entrance of city from Aileu district. The largest number of 2,736 bus were observed at the survey station No.7 near the market.

Table 3.2.2 12 hours traffic volumes in Dili City Intersection

No.	Intersection Name	Car	Small Truck	Truck	Mini Bus	Motorcycle	Total
1	Rosa Lay	3,493	1,020	456	68	1,532	6,569
2	Rumah Adat(1)	6,826	3,034	576	1,790	2,727	15,088
3	San Tai Hoo	4,275	1,676	607	645	2,250	9,453
4	PLN	5,412	1,933	79	1,239	2,239	10,902
5	Olympia Hotel	7,133	1,715	508	149	2,697	12,202
6	Acait	5,619	1,817	203	596	2,366	10,602
7	Golkar(ll)	7,590	2,152	1,181	2,736	3,551	17,210
8	Mercad Lama	4,053	1,112	119	2,355	1,877	9,763
9	Balide	4,860	589	223	34	2,259	7,955
10	Balide Bridge(ll)	2,446	420	71	307	1,644	5,341
11	Bemori	3,849	1,259	641	1,685	2,370	9,804
12	Kuluhun(ll)	3,699	949	58	766	1,524	7,006
	Total	59,255	17,676	4,722	12,370	27,036	121,895
	Composition(%)	49	15	4	10	22	

Passenger car shows the highest share of 49%, followed by motorcycles (22%). The highest bus share of 24% was observed at the survey station No.8 adjacent to the market.

3.2.2.2 Road Side OD Survey

1) Sample Rate

The road side OD interview survey was carried out at six points where road rinks connect to Dili and Baucau cities. Table 3.2.3 shows the interviewed sample rates of each survey station by direction. The overall average sample rate was calculated at 30%. The data collected from the road side OD surveys are expanded to the full size information based on these sample rate by station and by direction.

Table 3.2.3 Interview Sample Rate

Place	Direction	Traffic Count	Interviewed Sample	Sample Rate (%)
1	Baucau-Dili	186	37	20
	Dili-Baucau	179	53	30
2	Baucau-Los Palos	157	69	44
	Lospalos-Baucau	163	60	37
3	Baucau-Viqueque	184	36	20
	Viqueque-Baucau	159	40	25
4	Dili-Aileu	252	50	20
	Aileu-Dili	292	71	24
5	Manatuto-Dili	228	128	56
	Dili-Manatuto	242	113	47
6	Dili-Liquica	546	109	20
	Liquica-Dili	460	134	29
	Total	3048	900	30

2) Characteristics of Traffic Flow

The traffic flow surveyed is characterized by a high percentage of long trips. Figure 3.2.3 shows the intra-zone District flow rates at each survey station.

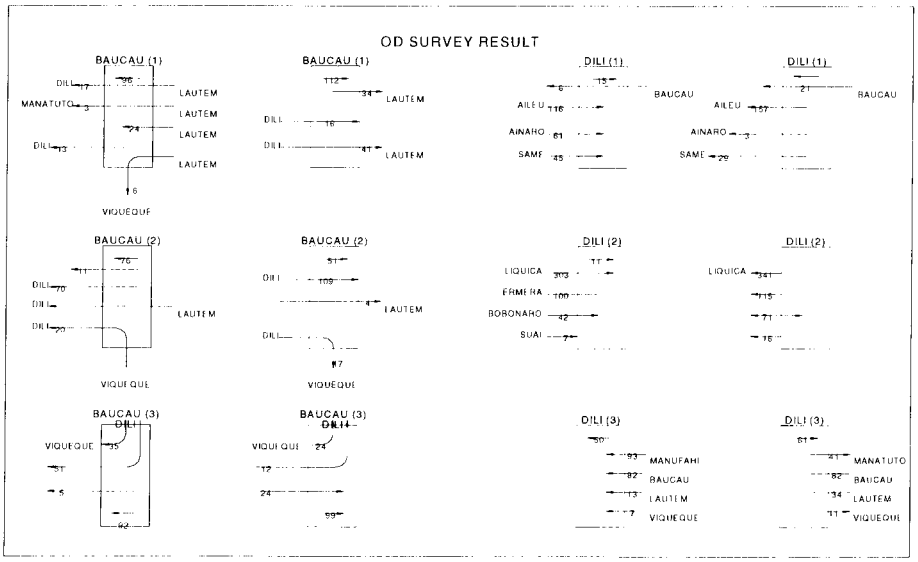


Figure3.2.3 OD Survey Results