

Transport Sector Master Plan for East Timor



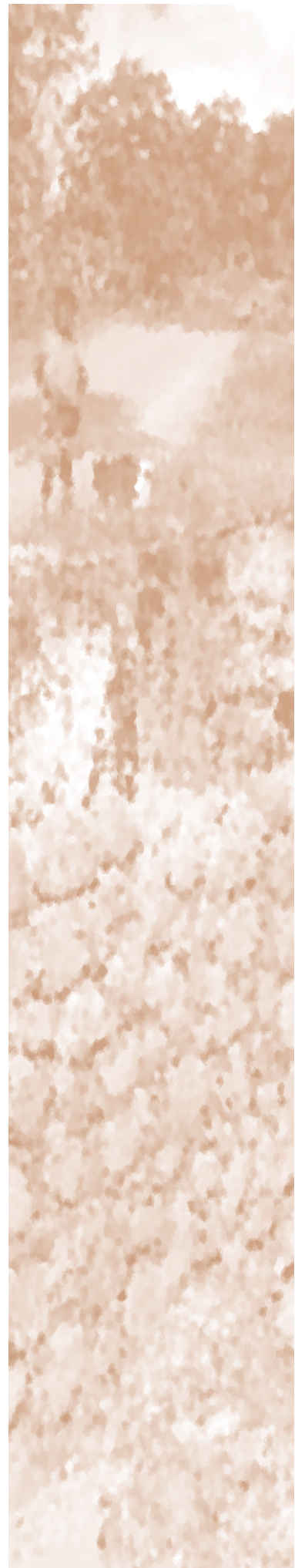
Pacific Department
Asian Development Bank

May 2002

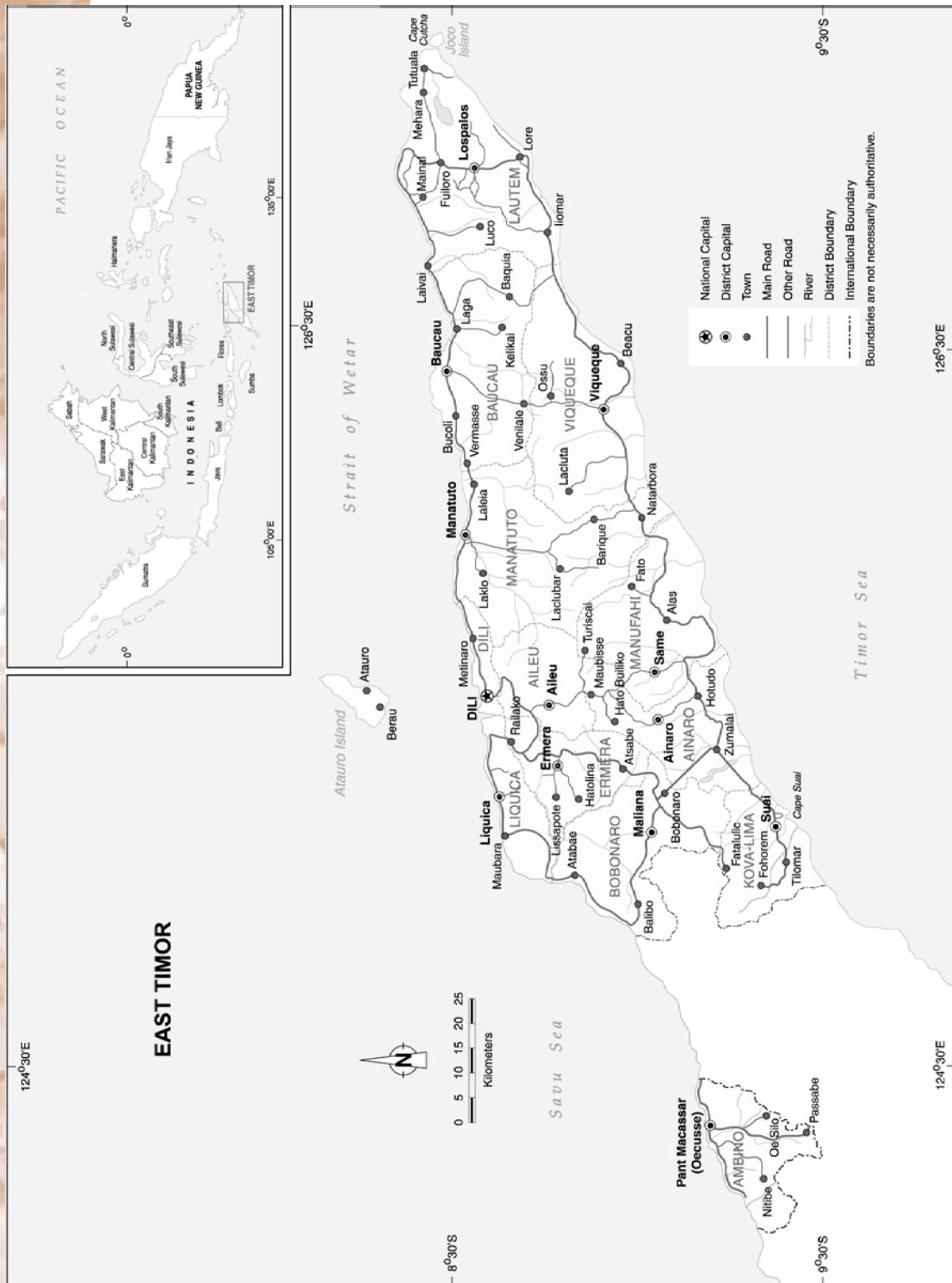
TRANSPORT SECTOR MASTER PLAN FOR EAST TIMOR

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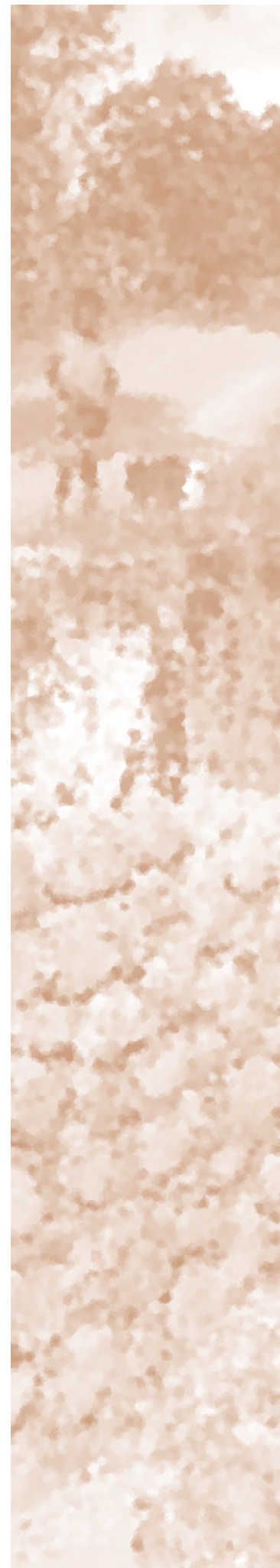


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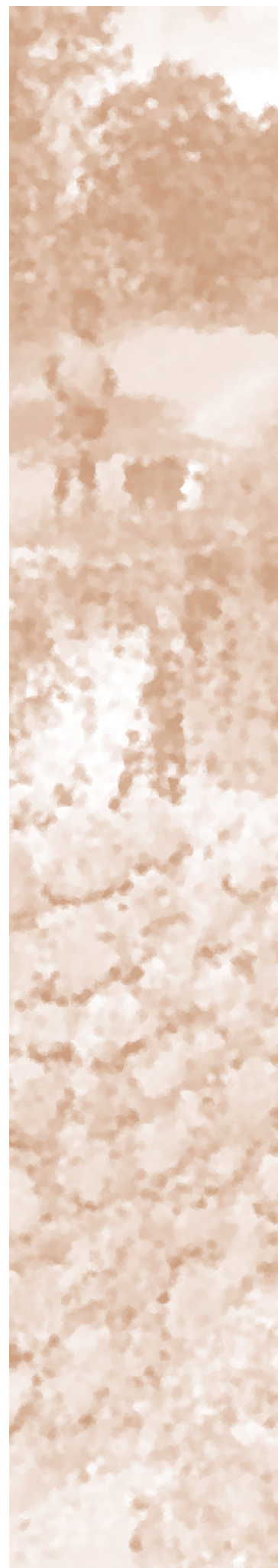
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Abbreviations

CFA	Central Fiscal Authority
CFET	Consolidated Fund for East Timor
CivPol	Civil Police
DCA	Directorate of Civil Aviation
EDTL	Eletricidade De Timor Lorosae
EIRP	Emergency Infrastructure Rehabilitation project
ETPA	East Timor Public Administration
ETTA	East Timor Transitional Administration
FIR	Flight Information Region
GDP	gross domestic product
JICA	Japan International Cooperation Agency
km	kilometer
km/h	kilometer per hour
m	meter
PMU	Project Management Unit
TFET	Trust Fund for East Timor
MMP	Multi-Modal Plan
MOCT	Ministry of Communication and Transport
MVO	Motor Vehicle Office
MWPW	Ministry of Water and Public Works
NDP	National Development Plan
UNPKF	United Nations Peace Keeping Forces
UNTAET	United Nations Transitional Administration in East Timor

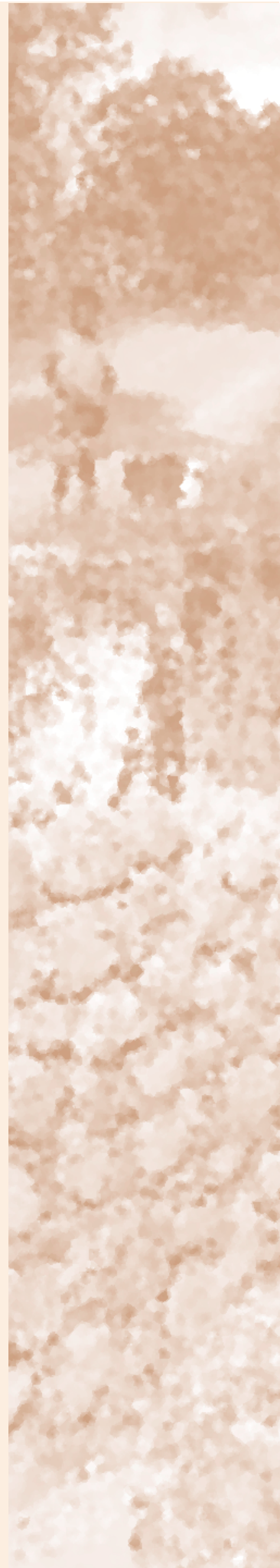
NOTES

In this Report, "\$" refers to US Dollars.

Part A

Transport Sector Master Plan

- **National Development Context**
- **Transport Sector Policy and Coordination**



INTRODUCTION

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In February 2000, the Asian Development Bank (ADB) provided a technical assistance grant to East Timor for the Transport Sector Restoration Project,¹ which covered five areas:

- Legal, regulatory, and policy framework analysis;
- Transport sector management and administrative structures for roads, ports, and airports;
- An immediate and long-term restoration and procurement program;
- A competitive tendering scheme for Oecussi and Atauro shipping; and
- An intermodal transport sector master plan and feasibility study.

Concurrently, ADB has provided assistance for an Emergency Infrastructure Restoration Project (EIRP) under Grant 8181-ETM, administered through the Trust Fund for East Timor (TFET). These projects have involved 2 years of sustained effort to restore the transport infrastructure of East Timor to an operable and maintainable condition, and to assist in developing government administrative structures, legislative framework, sector policies, and investment planning for the transport sector.

The Multi-Modal Plan (MMP) was one of the many outputs of this work, produced in draft in December 2000 and as a final report in October 2001.²

In January 2002, ADB commissioned a short review and update of the reports prepared under TA 3401, in the light of recent changes and new information. The aim was to consolidate this work into an updated multimodal transport sector strategy and agenda that will contribute to the Government's planning and preparation of the National Development Plan. The focus of the strategy is principally on physical planning, but it also considers institutional development, legal framework, cost recovery, and other policy issues.

This report is organized into three sections: Part A covering general and cross-modal issues, Part B dealing with physical development of the road network and the roads administration, and Part C with the land transport, maritime, and aviation sectors. This division was made to report separately on the areas of responsibility of the two lead Ministries of Water and Public Works (MWPW) and Communication and Transport (MOCT).

During the course of the work, assistance was provided to the two ministries in their preparation of the National Development Plan by way of comments on draft submissions and working papers on specific issues.

¹ TA 3401-ETM: *Transport Sector Restoration Project*, approved for \$1.0 million, in February 2000.

² TA 3401-ETM: *Transport Sector Restoration Project, Final Report*, October 2001.

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1. National Goals and Objectives

A master plan for the transport sector must be supportive of the aspirations of the Government and people of East Timor. Accordingly, a starting point for planning is to set out those national goals and objectives toward which the transport system can contribute, and to help identify where deficiencies and constraints in the transport system could act as a barrier.

1.1 Financial Independence

While supported by international grant funding during the reconstruction period, a long-term goal for the nation is to be economically independent of international aid, and to secure sufficient budget revenues to fund the economic development and social programs planned for the future. Roads, ports, and airports require large capital and maintenance cost inputs, so efficient and effective use of public funds is a priority, together with cost recovery from transport users where this is reasonable and practicable.

1.2 Economic Development

Transport forms part of the consumer price of all imported goods and adds to the market price of exports. A reliable and efficient internal transport system is therefore important for agricultural, forestry, and mineral development, for local marketing of surplus production, and for transport of cash crops to urban markets and to overseas ports. Economic development provides the base for taxation and the Government's ability to fund social programs.

1.3 District Development, Food Security, and Poverty Alleviation

The Government has a short-term objective of food security, as there are still periods and regions where there is a shortage of staple food. Also there is a desire to discourage population drift to Dili, to decentralize administration to the district level, and to support to district and rural populations. Generally, the rural poor are also those most disadvantaged by remoteness and least developed transport links.

1.4 Access to Health and Education

This remoteness limits access to health and education services, and makes distribution of social services more difficult. Without specific emphasis on development of areas with relatively low human development indicators,

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transport funds will tend to migrate to the most heavily used transport routes that can demonstrate savings to a larger number of users. The evaluation process for transport investment must address this imbalance in equity by giving more weight to investment that will benefit such disadvantaged groups.

1.5 Environmental Protection and Management

Transport presents a threat to the natural environment and to human habitation from the direct impacts of construction to the presence of traffic streams with attendant safety risks, noise and fumes. It puts pressure on sensitive areas of biodiversity or historical and cultural value through improved access. Transport plans and policies therefore must balance the gains from easier access against the environmental costs, and include environmental protection and management measures.

1.6 Private Sector Development

A national objective is to develop opportunities for private citizens to set up businesses, mobilizing entrepreneurial potential and reducing the relative size of the government sector. Transport presents an important opportunity for private sector participation through engineering design and construction, contracted maintenance, and the operation of passenger and freight transport services. The Government's role is to provide an enabling environment in which the private sector can thrive, while instituting the necessary regulations to promote fair competition, safety, and sustainability.

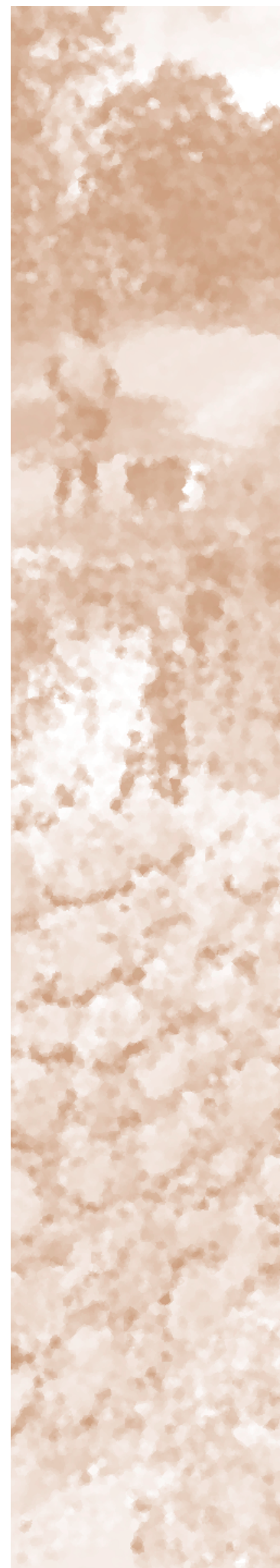
2. Goals and Objectives for the Transport Sector

The goals and objectives for the transport sector that will support the national goals determined through the political process are proposed to be:

2.1 An Efficient Transport System

- appropriate design standards and guidelines
- system capacity suited to transport demand
- vehicles suited to the infrastructure
- expenditure justified by economic and social benefits

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2.2 A Sustainable Transport System

- public sector costs matched by transport revenues in the long term
- transport network matched to maintenance capacity and capability

2.3 Efficient Transport Sector Agencies

- efficient organization structures with clear functions and responsibilities
- effective interagency coordination and liaison
- clear responsibilities, annual targets, and performance reporting
- appropriate and efficient asset management and financial systems
- clear technical and operational guidelines for all agency functions
- well-trained, appropriately paid staff suited to their positions

2.4 An Appropriate Legal Framework

- to confer agreed legal authority and powers to public agencies responsible for infrastructure
- to regulate transport vehicles, operators, and traffic control

2.5 Transport Network Supportive of Economic and Social Development

- Transport connections to district centers
- Accessibility for rural communities
- Support to agricultural production and marketing
- Affordable and accessible transport for the disadvantaged

2.6 Minimum Adverse Impacts on People and the Environment

- A safe transport system: safe infrastructure, careful drivers/operators, and safe vehicles
 - Separation between people and high traffic flows, heavy vehicles, and high-speed vehicles
 - Acceptable resettlement and compensation practice where land is used for transport infrastructure
 - Air quality standards in urban areas
 - Pollution control of natural water
 - Acceptable disposal of old transport equipment
 - Minimum adverse effects on plant and animal ecology
-

3. Economic Growth and Social Development

3.1 Transport and Economic Activity

The amount of passenger and freight transport is closely related to the wealth of the people and the trading activity within the domestic economy and with overseas countries. Good roads and efficient ports and airports keep transport costs down, make travel more affordable, and make imported goods cheaper and exported goods more competitive. Transport improvements help stimulate economic activity and social interaction, which leads to a more prosperous community, which in turn leads to increased transport demand.

3.2 Economic and Population Forecasts

Forecasts of international air passengers, cargo through Dili port, and traffic on the roads, are all influenced by population and economic growth, measured as gross domestic product (GDP).

After growth of 45% and 15% during the period of restoration, GDP growth is expected to be zero for 2002/03 and 2003/04 as the international presence winds down, followed by more sustained growth from domestic economic activity at a lower level of around 5%.³

The population of East Timor in 2001 was estimated to lie between 785,000 and 800,000 with a best estimate of 790,000.⁴ Population growth historically has been marked by periods of migration and conflict, but taking a broad view of growth rates over the past 20 years, a future annual rate of 1.5%–2.5% can be expected over the period to 2020, given stable social and economic conditions. Urban growth rates may be higher, depending upon the success of decentralization and rural development policies.

4. Transport Sector Institutions and Coordination

4.1 Transport Sector Institutions and their Roles

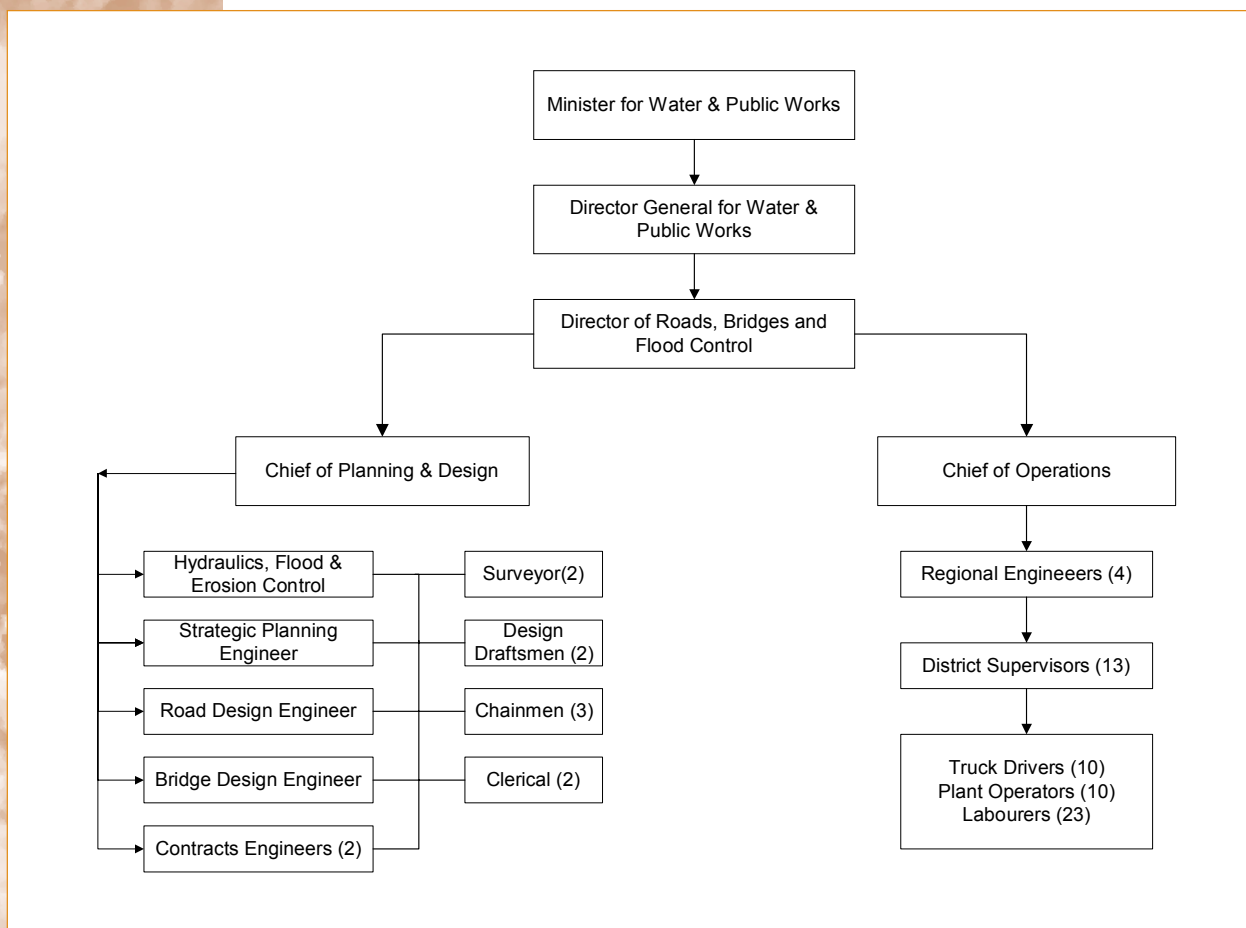
In East Timor, the transport functions are handled by

- (i) the Ministry of Communication and Transport (MOCT), which is responsible for road transport regulation supported by the police for regulatory enforcement ports and shipping and airports and aviation; and

³ East Timor Combined Sources Budget 2001-02, Mid-Year Update.

⁴ The 2001 Survey of Sucos, ETTA/ADB/World Bank/UNDP, October 2001.

Figure 4-1: **Proposed Structure for the Division of Roads, Bridges and Flood Control**



- (ii) the Ministry of Water and Public Works (MWPW), which is responsible for the public road network.

Dili Port and Comoro Airport have been established as semi-autonomous agencies, administratively responsible to the Director General of Communication and Transport through the Port Manager and the Director of Civil Aviation but self-funding and with a degree of managerial independence. The Port and Airport agencies are also responsible for the minor ports and airports. Land transport is administered as a division of MOCT.

Within MWPW, Roads Services constitutes a separate division from other ministry functions, headed by the Chief of Roads, responsible through the Director-General to the Minister. The Roads Services division is organized into sections for strategic planning, engineering design, works and maintenance, and administration. The works and maintenance section governs the activities of the four regional depots, each headed by a regional engineer responsible for construction and maintenance of the network within the region. The new structure envisages a division responsible for roads, bridges, and flood control, headed by a director, and organized as shown in the Figure next page.

4.2 Coordination

Coordination occurs between the two leading transport institutions at the following interfaces:

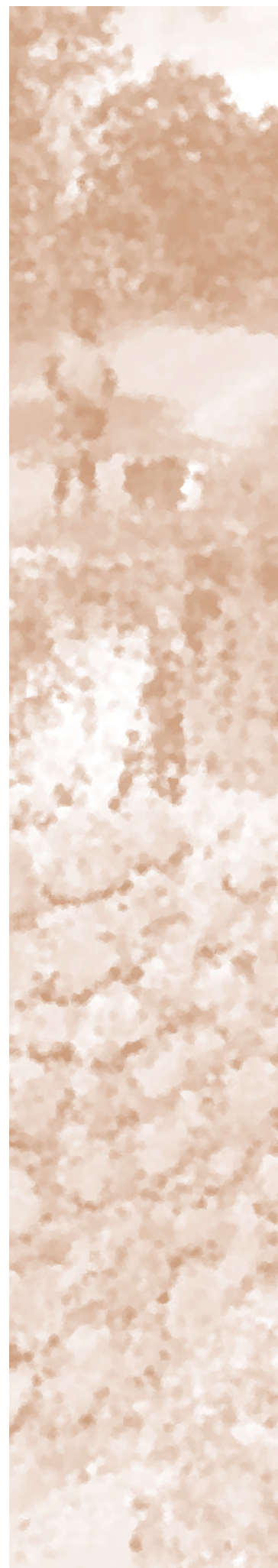
- between roads and road transport—on matters such as traffic design, vehicle weight and dimension limits, on road safety;
- between Dili port and the local road network, and issues of modal competition and intermodal coordination between coastal and road transport;
- to a lesser extent, between Comoro airport and the local road network.

There is also coordination between MOCT and the Civil Police (CivPol) who are responsible for traffic law enforcement on the road and traffic control duties. They can play an active role in any road safety program, such as in accident recording and reporting.

5. Intermodal Transport Planning

Internal transport in East Timor is all by road on the mainland, with the exception of offshore islands and Oecussi enclave which, since 1999, has been supported by a free coastal ferry or a UN-provided air service. Oecussi could be served by a land bridge through West Timor, which was constructed by the Indonesian Government. The free sea and air service is to be replaced by a

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semi-commercial ferry service, operated under a franchise agreement tendered to the private sector.

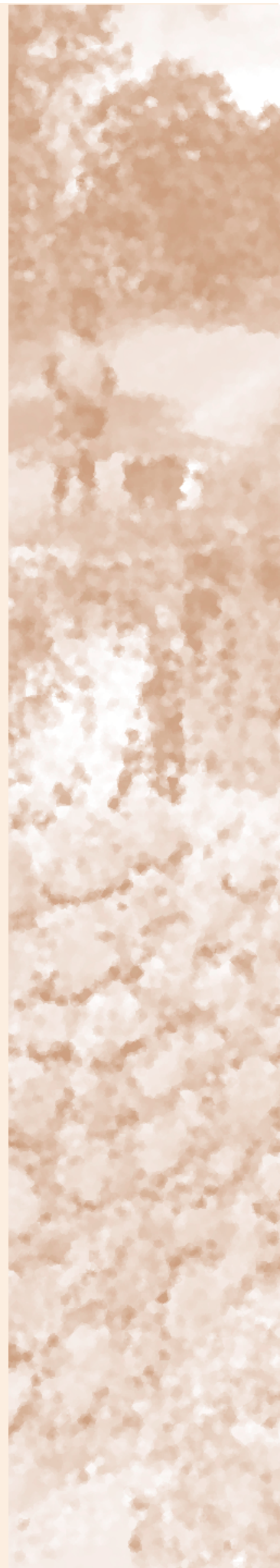
The islands of Atauro and Jaco are accessible only by sea, but have no regular commercial transport service. While there are a number of small coastal wharves and landings, there is no coastal shipping service because of limited demand. Road distances and travel times are generally too short by sea to offer a competitive alternative for general goods transport, although the light construction of the road system, and costs of strengthening, may provide a case for moving heavy and bulky loads by sea. Similarly, due to low demand and short distances there is no internal air service, although Dili airport is capable of handling B737 and Baucau B747 aircraft. Overall, there is relatively little competition between modes of transport, but there is some scope for coastal shipping and internal air transport if operated as an extension to international transport services (cabotage for coastal shipping and fifth freedom rights for air services).

The main port at Dili provides the interface between sea and road transport. Its proximity to Dili's business and government center creates some conflict between city traffic and heavy vehicle access and (de)consolidation of cargo. This is a situation that urban planning will need to confront in the future.

Part B

Transport Sector Master Plan

- **Roads**



1. Introduction

1.1 Background

East Timor has the legacy from the Indonesian period of an extensive, though lightly constructed and somewhat narrow, road network of 5,000 kilometers (km) of main and secondary roads, of which half are bitumen-surfaced. The roads have had little to no maintenance since 1997, and the combined effects of this, the passage of military vehicles, and one bad year of flooding have caused some damage. An Emergency Infrastructure Rehabilitation project (EIRP) funded under Trust Fund for East Timor (TFET), together with bilateral assistance from Japan and the efforts of the United Nations Peace Keeping Forces (UNPKF), has achieved some stabilization of the road condition, such that it is timely to consider a longer term plan. The focus of this work has been mainly at restoring road drainage structures together with short lengths of resurfacing at washouts and areas of land instability. A regional maintenance capability is being developed through four regional depots and, centrally, a road asset management system is being progressively implemented.

1.2 Issues

There are many issues to be worked on, some of an engineering nature, others related to the institutions administering the road network, the law governing roads, capacity building of organizations and human resources and, in particular, funding constraints. Some of these are listed below

(i) Legal Issues

- road reserves are not legally declared
- no recognized or legal road classification
- rights over land under roads need to be defined
- access to and rights over natural materials for construction

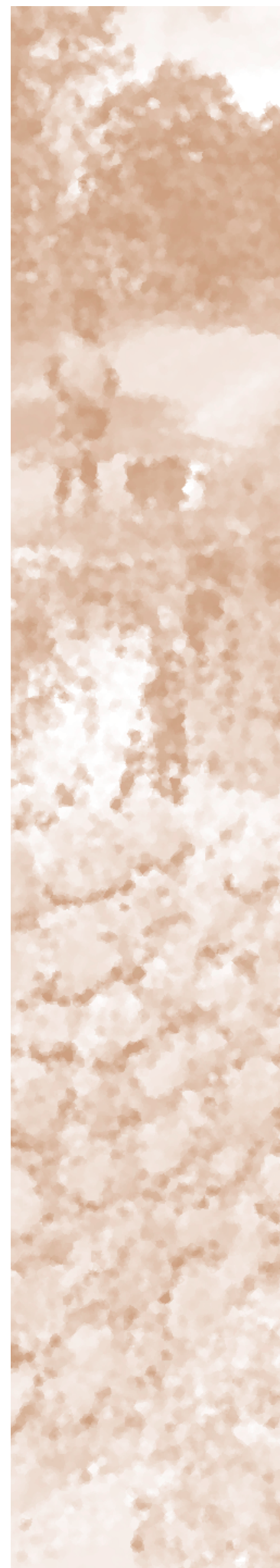
(ii) Costs and Sustainability of the Network

- an extensive network for the population and level of motorization
- limited numbers and ability to contribute to accost recovery system
- Government's recurrent budget Consolidated Fund for East Timor (CFET) highly constrained, covering routine maintenance only
- Longer-term prospect of boost to Government funds from Timor Sea petroleum royalties
- interim difficulty of funding periodic maintenance and urgent capital improvement needs for economic development
- careful setting of priorities for constrained funds

(iii) Engineering of Rural Roads

- narrow road widths and restricted geometry, particularly in mountainous areas

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- unstable geology and high rainfall/flash flooding
- some missing river crossings, many small old vulnerable structures
- roads unsuitable for long and heavy traffic, or heavy axle loads
- (iv) **Urban Roads (Dili)**
 - have not been a priority so far
 - condition deteriorating from heavy traffic loads
 - road drainage deficiencies contribute to problem
 - intersection traffic controls damaged, markings and signage inadequate
 - general requirement for traffic management
 - some narrow streets with parking/loading problems
 - port access near center of town, some traffic conflicts
 - one unofficial bus area requiring reconstruction, need bus terminal facilities in up to 4 areas
- (v) **Management Systems**
 - Document management and office systems – no formal system
 - Financial management systems – using CISPE system, not suitable for transport and works ministries, suitable system required
 - Asset management systems – basic road inventory and condition rating system established under EIRP needs extending to district roads; and general system enhancements and training
 - improve GIS mapping base and link to inventory desirable – ArcView within Roads Department but no trained operators; limited data on secondary and village roads
- (vi) **Institutional Structure**
 - A new structure has been agreed for Roads, Bridges and Flood Control Directorate
 - Filling, training, and retention of key technical/professional staff positions with East Timorese
 - Role of regional depots, management, and training at regional level
 - Balance between contracting to the private sector, use of government resources, and community maintenance
 - Interface and cooperation with MOCT, Civic Police (CivPol) and others for road safety, legal administration of roads, and vehicle load control

1.3 National Development Plan

During the preparation of this report, the 2002-03 Budget and National Development Plan (NDP) process was underway. Assistance has been provided in consolidating the draft plan for the infrastructure sector from MWPW, MOCT, and power sector Working Group inputs. The short-term plan for roads

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infrastructure in this report should therefore be in line with both the Budget submission and the NDP. Below are the key components of the draft NDP for the road sector.

1.3.1 Sector Vision

The vision of the NDP for roads is to ensure the provision of a safe and reliable road network throughout East Timor to support the movement of people and goods essential for social and economic development.

1.3.2 Goals

- (i) To identify the national district and rural road network essential for the support of economic and social development;
- (ii) To establish standards for the national road network;
- (iii) To identify and implement capital improvement to the road network as required to achieve the development objectives;
- (iv) To preserve the existing road assets as the first priority, through appropriate allocation of road funds and establishment of sustainable maintenance management plan and support systems;
- (v) To establish an institutional structure and develop the technical and administrative capacity of East Timorese staff to manage, maintain, and improve the road network; and
- (vi) To establish and implement sustainable strategies for the maintenance of rural access roads.

1.3.3 Guiding Principles for the Ministry of Water and Public Works

- (i) To establish and maintain a position as the primary organization responsible for the management, engineering, and operation of infrastructure in East Timor;
- (ii) To work in cooperation with other government ministries, agencies, district administrations, and communities in ensuring the efficient delivery of services;
- (iii) To utilize the private sector to the maximum extent possible in the cost effective delivery of projects, programs and services, and to support and promote the development of the private sector in this role;
- (iv) To generally ensure that ownership and management of facilities and services is undertaken at the lowest appropriate level in the community;
- (v) Wherever possible, to promote equity between regions and between urban and rural communities; and

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- (vi) To ensure the protection of the natural and man-made environment, safety from natural disasters, and the protection of human life.

1.3.4 Key Development Indicators

- (i) Routine maintenance contract implemented [measured by km of road, area of pavement repaired, length of lined drain/culvert, area of retaining wall;
- (ii) Number of district centers with all-weather road access to Dili;
- (iii) Number of days per year of road closures on the national road network;
- (iv) Percentage of the population having all-weather road access to the nearest District center;
- (v) Percentage of projects delivered within time;
- (vi) Percentage of projects delivered within budget; and
- (vii) Number of positions filled by East Timorese staff with appropriate qualifications and training.

1.3.5 Issues and Constraints

- (i) **Legislation**
 - Requirements for the enactment of laws to define road reserves, drainage easements and access to land for the propose of road construction and maintenance;
 - Requirements for enactment of laws for the purpose of obtaining naturally occurring materials (sand, gravel, rocks) and compensation arrangements;
 - Requirements for classification of all roads (urban, national, provincial and subdistrict roads) and assessment of maintenance responsibility to appropriate organization (national, municipal, and others).
- (ii) **Human Resources**
 - Shortage of experienced East Timorese staff results in reliance on external assistance. Education and technical administration training needs to be established to ensure necessary skills are available for effective service delivery.
- (iii) **Supporting Facilities**
 - The main office currently situated in the PLN building in Caicoli may need to be relocated in the medium term if the power authority is required to expand;
 - Roads services do not have any heavy equipment necessary road works. Use is made of private contractors but there is a shortage of equipment from this source also, particularly outside of Dili;

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- Procurement processes are slow, leading to extended program implementation periods;
 - Communication with districts is often poor, leading to inefficiencies.
- (iv) **Funding**
- Insufficient level of funding for routine periodic maintenance needs results in only priority sections of the road network being reasonably maintained; a large proportion will receive no maintenance at all.
 - No funding is currently identified for capital projects or upgrading of existing roads.

2. The Road Network

2.1 Extent

The main national road network and the more important district roads are shown in Map 2.1. There is no official road classification system in place but, if connections between international borders, main ports, national and district centers of population are regarded as the national road network, then the total length is 1,245 km, all of which is, or has been in the recent past, bitumen-paved. The main district roads are a further 631 km, making a total of 1,876 km of core network. Most of these main district roads are bitumen-paved and carry as many vehicles as the lower traffic main roads, and provide connections to significant centers of population and agricultural production. Overall there are 5,200 km of roads, based on pre-1997 information, of which about half, or 2,600 were bitumen-paved, 500 gravel, and the remaining 2,100 km earth roads.

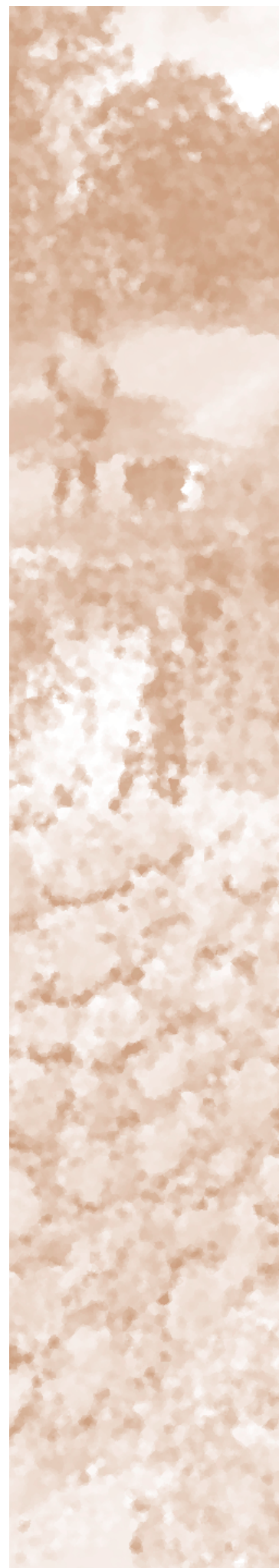
Within Dili, there is an estimated 50 km of urban streets, about half of which is paved, with kerbs and channel drainage. Other centers have small street networks by comparison.

2.2 Road Numbering and Classification

After reviewing the various suggestions for determining each road's importance in the network by staff of the United Nations Transitional Administration (UNTAET), work under TA 3401-ETM by the Japan International Cooperation Agency (JICA) reviewing the road network, and the current road asset inventory, most of which give similar findings, we suggest a system as follows:

A system of route numbering that radiates from the capital Dili, for the purposes of defining the main national network. A system developed by the Project Management Unit (PMU) is shown below. Roads are numbered A1 to A14. A1 is the north coast road east of Dili to Com, A2 the cross-island road via

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Ainaro to Suai (and could be extended to the border if desired), and A3 is the north coast road west of Dili to Batugade and inland to Maliana (see Map 2.2). The numbering is also generally consistent with the importance of the routes in terms of interdistrict linkages and traffic levels. The classification of roads to indicate the nature of the road (urban, rural, etc.) and for purposes of maintenance policies and responsibility and for labelling the road in the asset inventory, need not be the same as the route numbering, and the following method proposed by the PMU appears logical:

National		District		Urban	
NH	- national main	DM	- district main	UM	- urban main
NM	- national main	DF	- district feeder	US	- urban secondary
NS	- national secondary				

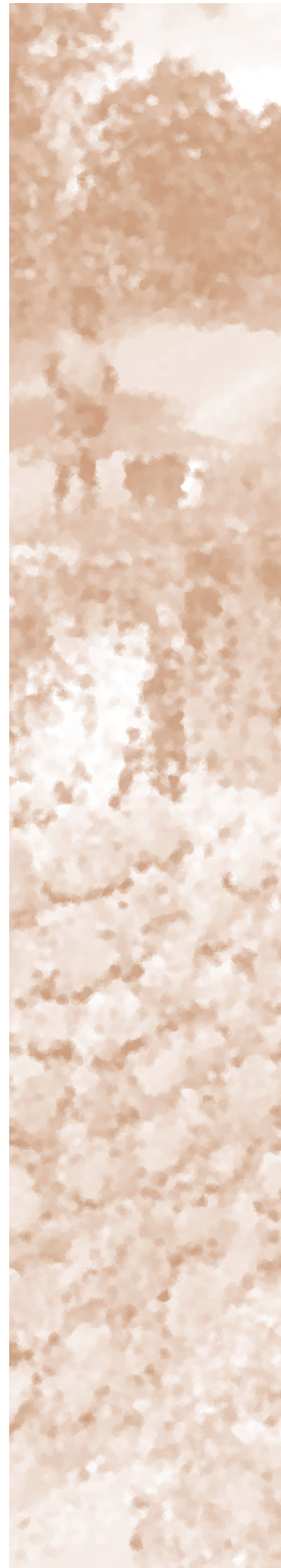
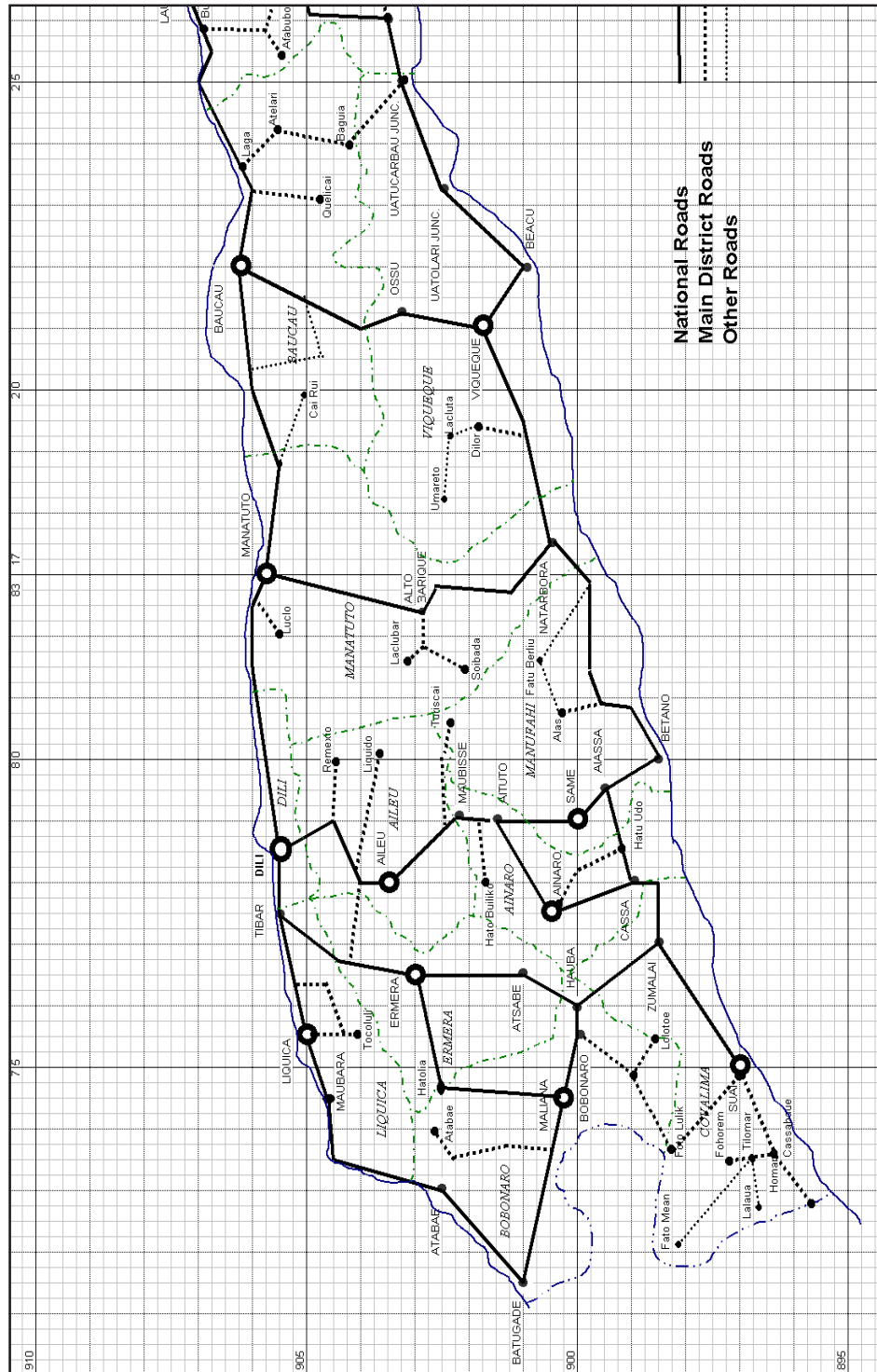
In this system, parts of route A1 closing in to Dili with higher traffic volumes would be NH – national highway, most of the remainder NM–national main, but the last section to Com could be NS – national secondary (depending on the importance of the Com port in future). Designations can be changed as the road network develops. Below this, there will be systems of numbering short road links for identification and engineering purposes only.

2.3 Road Referencing System

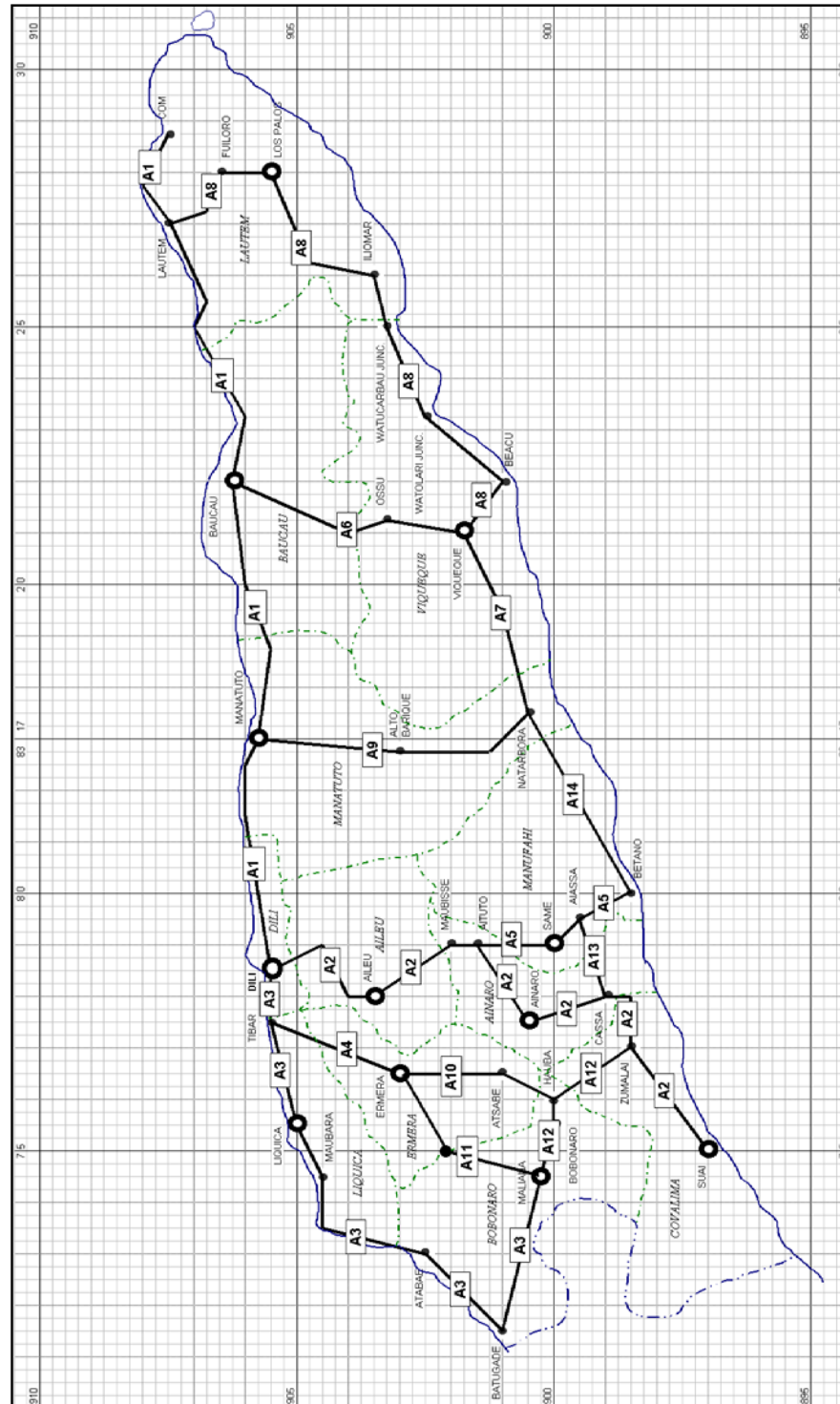
For maintenance management, a clear road position referencing system is needed so that locations can be clearly indicated when controlling contracts and measuring work. The road referencing system must be able to deal with changes in road lengths as sections of road are realigned. The normal way of doing this is to identify a series of route positions such as intersections or major bridges, which are clearly identifiable in the field, and these are given a route position based on the nominal distance from the start of the road. For example, A2/21.50 would be at 21.5 km from the start of A2. These positions should be marked on a structure, such as a bridge or milestone. Intermediate points are then referenced as an offset distance from the last route position—for example, A2/21.50 + 2.63 would be a further 2.63 km along the road from A2/21.0. Structures such as culverts can be marked with their route position and offset as well as being given an identifying number on the inventory. The use of global positioning system to establish the route positions and for general use in locating and plotting the road locations can also help.

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Map 2.1: Main Road Network



Map 2.2: Proposed Route Numbering System



2.4 Road Design and Condition

The pre-1997 paved roads are bitumen penetration macadam surfaced over gravel or crushed stone base, with nonstructural asphalt overlays. These surfaces have limited heavy axle capacity, and their design life may have been seriously reduced by the passage of heavy trucks and military equipment over the past 2 years. Replacement sections of road pavement constructed under the EIRP, which are mainly short lengths of bridge approach or repairs at slip sites, are structural asphalt hotmix construction on a crushed stone base. Bitumen surface treatment with stone chip has not been used much in East Timor.

Some sections of paved road have reverted to gravel through lack of maintenance during 1997–2000, but most of the original paved network is still in maintainable surface condition. A difficulty in allowing roads to revert to gravel is the poorly graded base material which is often large river stone cobbles that give a very rough surface.

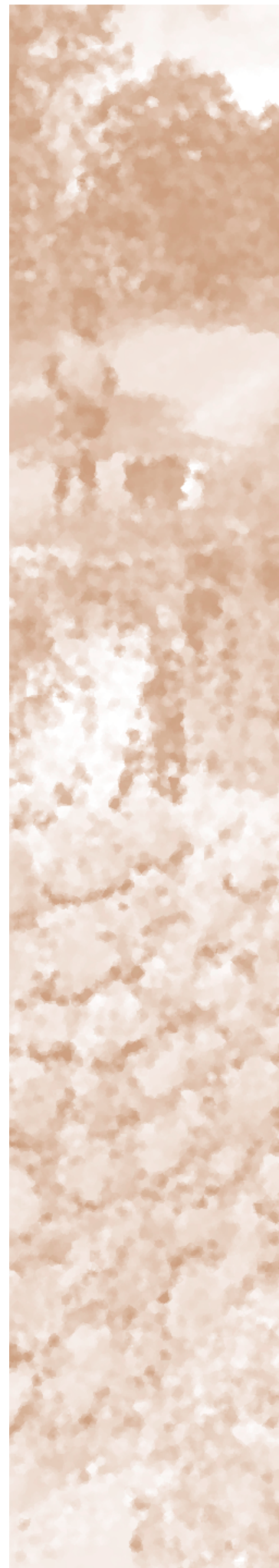
Indonesian design standards were for pavement widths between 3.5 and 5.5 meters (m), and design speeds from 60 kilometers per hour (km/h) on the wider roads on flat terrain down to 20 km/h for narrow roads in mountainous terrain. Roads across the central dividing range are characterized by a narrow road bench, winding alignments with limited sight distance, sections of unstable geology, and steep watercourses subject to flash flooding with bedloads of large boulders. On the coastal margin, the main roads are better aligned, wider, and generally in better surface condition.

The wider river crossings are mostly bridged with well-founded steel through-truss structures on concrete piers and abutment, of about 20–30 years age, and in good condition. A few of the river crossings are passable only by ford, but delays from seasonal flooding are normally only of few hours duration. There are numerous small old bridges of stone arch and masonry construction that are in poor condition and require replacement.

The main street network in Dili has a number of damaged sections, particularly on the approach roads from the airport and other areas subject to heavy traffic loads. A condition inspection under Japan International Cooperation Agency (JICA) funding in 2000 identified 8.2 km of asphalt pavement repairs and 6.2 km requiring a new gravel surface.

The busier intersections in Dili were traffic signal controlled before 1998 but the signal installations have been severely damaged and peak period traffic control is now carried out by pointsmen. Road markings have deteriorated and most traffic signs are missing. All roads are now operating two-way, although there has been some one-way operation in the past.

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2.5 Design Standards and Guidelines

There should be reasonable consistency in design for roads carrying similar levels and mix of traffic, in similar terrain and geological conditions. Also, it is undesirable that road geometric design varies unpredictably along a road, as this contributes to road safety problems. However, it will not always be possible to achieve set standards for road width and alignment, as this will often be too costly or impractical. While it is useful for the Roads Services division to have sets of standards for their design and construction work, these should be separated into *guidelines*, which are desirable but can be varied, and *standards* that should always be followed (for example standards for engineering materials and testing).

Roads in East Timor have been constructed generally to Indonesian design standards and these provide suitable guidelines for use in the short to medium term as shown in Table 2.1.

The design speeds in this table will not always be achievable due to the limited sight distances and many sharp radius bends. General upgrading to a higher standard of design speed in hilly and mountainous terrain will be very costly, involving large amounts of cut and fill, which will be destabilizing in difficult geotechnical conditions and environmentally undesirable. On flat open terrain, where traffic volumes are relatively high (say over 500 vehicles/day), or

Table 2.1: Indonesian Design Standards and Recommended Application by Terrain Category

Traffic Volume (vehicles per day)	Terrain	Flat to Rolling		Hilly		Mountainous	
		Desirable	Minimum	Desirable	Minimum	Desirable	Minimum
> 500	Design Speed	80	50	60	40	40	30
	Pavement Width	5.5	4.5	5.5	4.5	5.5	4.5
	Shoulder Width	2.0	1.5	1.5	1.25	1.5	1.25
500 – 201	Design Speed	60	40	40	30	30	30
	Pavement Width	5.0	3.5	5.0	3.5	5.0	3.5
	Shoulder Width	1.5	1.25	1.25	1.0	1.0	1.0
200 – 50	Design Speed	60	40	40	30	30	30
	Pavement Width	4.5	3.5	4.5	3.5	4.5	3.5
	Shoulder Width	1.5	1.0	1.0	1.0	1.0	1.0
<50	Design Speed	50	30	30	30	25	20
	Pavement Width	4.5	3.0	4.5	3.0	4.5	3.0
	Shoulder Width	1.0	0.75	1.0	0.75	0.75	0.75

Source: Report on Roads in East Timor, TA 3401-ETM, July 1990

for key national roads carrying between 200 and 500 vehicles/day, some widening to 6.5 m may be considered where it is proven economically worthwhile to do so.

The opportunity to provide shoulders to the width in Table 2.1 is constrained by the extensive use of lined drains on the high side of the road, which, in some cases, are almost abutting the edge of the pavement. An absolute minimum of 0.5 m should be provided, where available width is confined, and wider shoulders should be aimed for on roads carrying a high percentage of heavy vehicles.

3. Road Traffic

3.1 Introduction

Constructing and maintaining a road network is expensive, and the only reason for doing so is to provide for road traffic. Measuring the amount of traffic on the road and the amount that can be expected in future as population and economic growth occurs, is most important to an investment strategy.

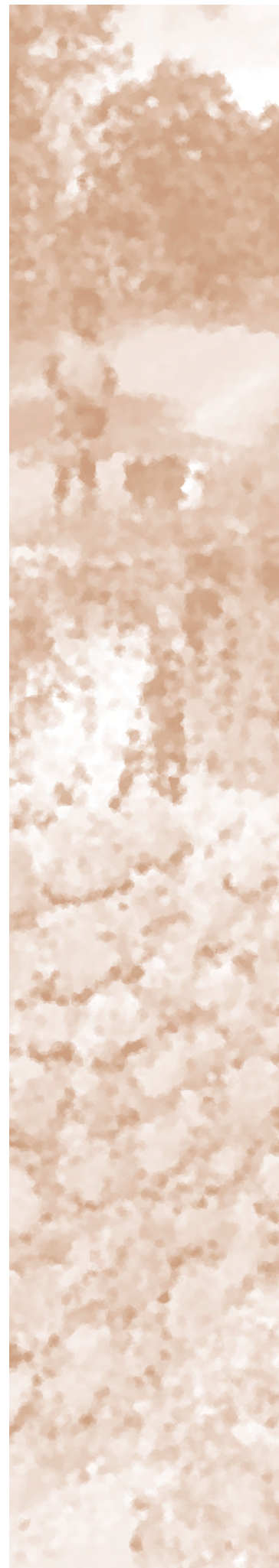
3.2 Existing Traffic Counts

There are traffic counts from the Indonesian period, although most of these are known to be exaggerated. However, there was a reasonably well-conducted survey in the early 1990s and this provides some basis for an historic picture of traffic at that time. Traffic counts were made in November 2000 as part of the multimodal project (2 day count), and also by JICA sometime earlier in 2000 (the dates not specified, nor is the period of count). In January 2002, the Roads Services division carried out 7-day counts. The results from these various counts are difficult to reconcile.

- short period counts on low volume roads have a wide margin of error;
- the actual dates, durations, start and end times, exact location of the counts, who undertook them, and the quality control employed are often absent in the reports; for the most recent counts about half of the count locations are quite unclear; and
- UN traffic forming a large proportion of the traffic, which is identified in one count, but which is changing over time.

Overall, the existing traffic count data are most inadequate for estimating present vehicle, passenger, and freight demand, and are certainly not capable of identifying trends. Consequently, analysis based on these counts can be expected to have a wide margin of error.

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3.3 A Traffic Counting Program

It is recommended that a properly organized and supervised set of traffic counts be carried out to provide a sounder basis for future planning. In view of the unrepresentative nature of traffic over the next 2 months, this count would probably be better timed for, say, July 2002, and repeated in January 2003. This task needs to be centrally organized and carefully supervised, and should not be carried out by the districts. At the same time as the classified traffic counts, an origin destination and commodity movement survey should also be mounted at 4-5 key locations on the network.

Beyond this, there is a need to set up a regular traffic counting program with fixed and clearly identifiable count locations that are not subject to variations in local traffic (i.e., not in the middle of a village). Each count station should have a site diagram and report. Traffic counts should be over 7 days and held at approximately the same time each year, and desirably twice a year at some key locations to establish seasonality. Classified manual counts of 12 hours with occasional 24-hour counts to establish 24/12-hour scaling factors will be sufficient. The classified counts should have a strict system for vehicle type recognition, with appropriate visual training materials, so there is consistency of approach. Counts should be supervised sufficiently to ensure that people are on-station and that counts are not being falsified.

The traffic counting program should be the responsibility of the transport planning engineer in the proposed Roads, Bridges and Flood Control Directorate. There will be a need for training from a transport/traffic specialist with experience in undertaking traffic counts in similar countries.

3.4 Existing Traffic Volumes

From the information that is available, some commentary can be made on traffic flows. Traffic volumes outside of Dili excluding motorcycles, which form up to 50% of the traffic flow on some routes, vary from 1,000 vehicles/day on the Dili to Tibar section down to 20 vehicles/day on the lower volume main roads. Heavy vehicles form about 5% of this traffic volume on the coastal routes east of Dili to Baucau, and up to 20% on the Batugade to Dili route. The roads across the island carry few heavy vehicles. Buses contribute up to 45% of the traffic on some routes.

Figure 3.1 shows the daily traffic on the main network estimated from all available information. The level of accuracy for flows over 250/day is probably of the order of $\pm 25\%$ and for lower flows could be $+100/-50\%$.

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3.5 Traffic Growth Projections

Future traffic growth estimation could be based on projections of GDP, agricultural production, and vehicle operating costs on road links (Figure 3.1). As road links are improved, travel costs reduce, which generates a response in agricultural production as well as any stimulus from other agricultural development programs.

Overall, over the 20-year period and on a total network basis, a growth rate of between 0.5% and 1.0% above the base would appear more likely. The effect is for traffic volumes to increase by 35% over 20 years in the base case and between 50% and 65% over 20 years if short-term improvements are made.

3.6 Heavy Vehicle Control

There is no legislation governing vehicle maximum weights and dimensions or any systems in place for surveying gross vehicle weights and axle loads on the road network. The lightly constructed pavements, together with heavily constrained funding for road maintenance, indicate the need for legal powers and enforcement in this area.

Legislation would most likely be the responsibility of MOCT, while enforcement would be carried out by the Police or by a special unit within MOCT. Typical maximum load limits for countries that are not able, or need, to invest in heavily strengthened roads for large volumes of road freight are:

- Gross combination weight 39 tons
- Single twin-tired load axle 8.2 tons
- Tandem twin-tired axles 14.5 tons (depending on axle spacing)
- Tri-axle 17.5 tons (depending on axle spacing)

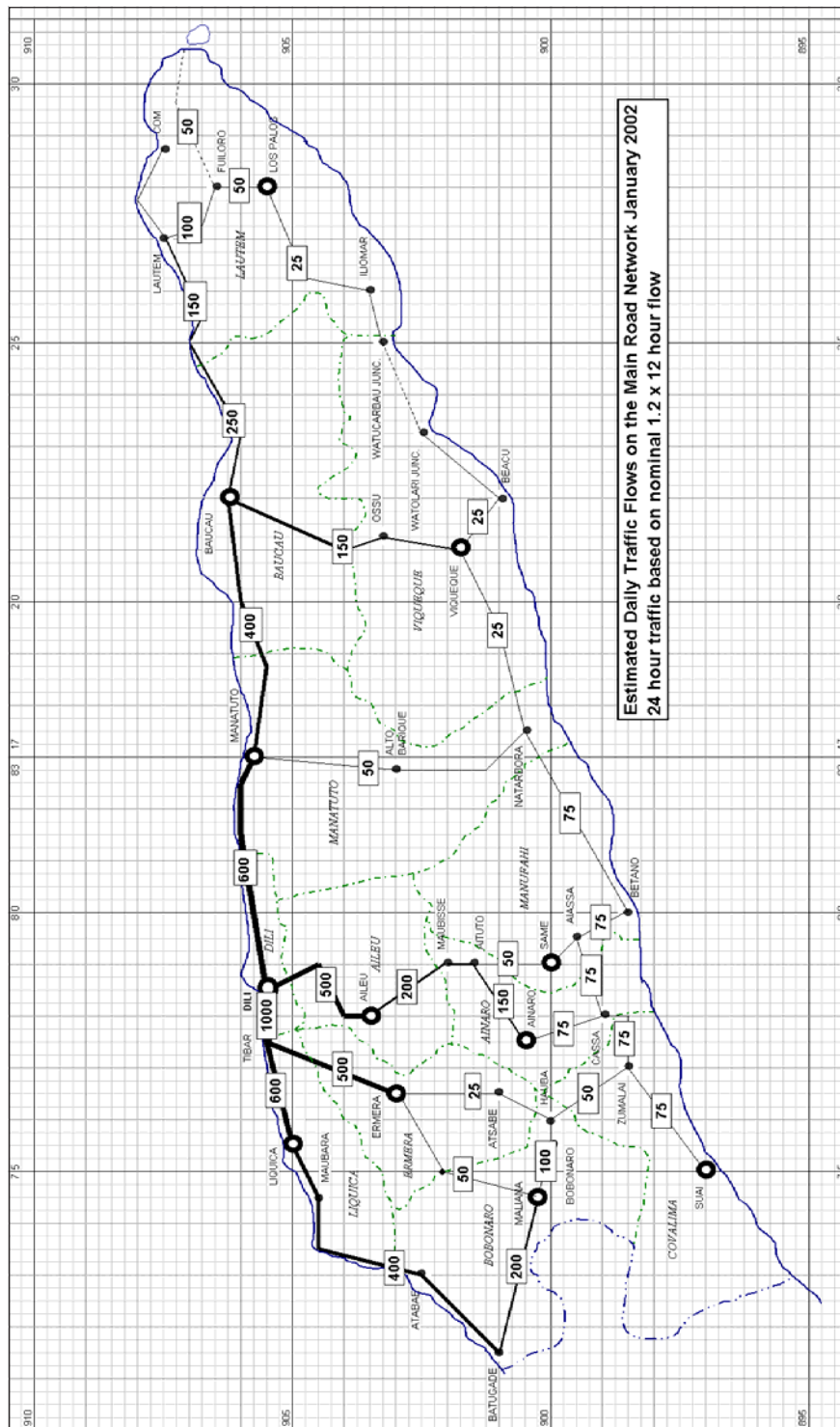
These are standard axle loads for engineering design purposes. Often, it is 2-axle single unit trucks that do the most damage, and it is possible to load 13 tons onto a single-rear axle, which is equivalent to 6 legal maximum vehicles, the damaging effect increasing with the fourth power of axle weight.

In order to protect the road asset over the next critical 5-year period, it may be desirable to impose a lower load limit for the more vulnerable roads. The North Coast Road (Routes A1 and A3), which is on flat terrain and forms the main spine road to several of the larger towns, could permit maximum loads.

All other roads could have axle load restrictions in the interim at 80% of the maximum, that is, 6.5 tons on a single twin tired rear axle, 11.5 tons on a tandem axle, and 14 tons on a tri-axle. This would reduce the damaging effect of a legally fully laden vehicle by almost half, taking account of the additional travel needed to move the load. An excess weight permitting system should be

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Figure 3.1: Estimated Traffic Volumes on Main Network



put in place to enable large indivisible loads to be moved subject to an engineering clearance for the road and the structures, and with the payment of an appropriate fee. In most cases this load restriction will not affect the movement of goods, as most vehicles will be below the limit. Training of MOCT, MWPW, and CivPol staff is required on vehicle weighing techniques and equipment care, together with the appropriate equipment to enforce axle load regulations.

4 Road Investment Plans

4.1 Road Maintenance Costs

Estimating the future costs of road maintenance is complicated by the artificial cost environment that has been created over the period of restoration. Unit rates for materials and labor have been driven up, compounded by dollarization. Consequently, experience from this period should not be assumed to continue into the future.

Road maintenance comprises routine tasks that can be accomplished through community labor such as drain clearing and grass cutting, and spot surface and shoulder repairs. Included in the routine maintenance cost budget, or shown as a separate item, is the clearance of and repairs of slips. This has been a very large item over the past 2 years, in part due to one very wet season in which a lot of damage occurred. The drain clearing and grass cutting tasks should be accomplished within a budget of \$600/kilometer/year. The pavement repairs double this to around \$1,200/km or \$2.2 million for the main road network. An allowance for slip clearance on top of this should be based on an average over several years but, allowing for the steep terrain and runoff characteristics, an allowance for slip clearance at 75% of the routine maintenance tasks is probably advisable. This routine maintenance over the whole network costs \$3.9 million.

Periodic maintenance involves the full overlay of the road surface at intervals to provide one or more of the following: strength improvement, smoothed running surface, and rejuvenation of the existing surface layers (construction techniques employed in East Timor do not provide for strength improvement). The whole road surface needs a periodic treatment about every 5 years for a low volume gravel road and every 10 years for a low volume paved road. Periodic treatment can be done in large sections of gravel resheeting or overlay, or piecemeal as the needs become apparent, which is perhaps less efficient but more conserving of materials.

The cost estimates for periodic maintenance in the multimodal project, which were based on an analysis of contract rates and a cost model related to terrain, geology and climate, gave periodic maintenance costs, after short term improvements are complete, of \$14,400/km per year, which is extremely high when compared with experience elsewhere. After some comparison with other

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Table 4.1: Funding Needs for Road Maintenance

Road Category	Length (km)	Maintenance (US\$ million)		
		Routine	Periodic	Total
National Roads	1,245	2.6	5.0	7.6
Main District Roads	632	1.3	2.5	3.8
Main Network	1,877	3.9	7.5	11.4
Other Roads				
Paved	780	1.2	2.3	3.5
Gravel	514	0.9	0.8	1.7
Earth	1,989	1.6	–	1.6
Subtotal	3,283	3.7	3.1	6.8
Total Network	5,159	7.6	10.6	18.2

countries, we consider that \$4,000/km/year is a reasonable provision for periodic maintenance or \$7.5 million annually.

Other paved and gravel roads are estimated at a unit rate 75% that of the main network, while earth roads are assumed to be maintained by communities at a total cost of \$800/km/year (or equivalent in donated services).

The funding requirements to maintain the main road network in the medium to long term are therefore estimated as shown in Table 4.1.

4.2 The Outlook for Road Maintenance Funding

Roads are currently being funded mainly from TFET with the bulk of the expenditure channeled through the EIRP, now about to go into a second phase. CFET funds have been directed mainly at the district level network over this period but will, increasingly, be required to fund the national roads. Based on the recent budget submission, the funding outlook for road maintenance is as follows:

The routine maintenance budget request is in line with past appropriations and expected ability to increase these in the future (Table 4.2). If approved, it would still only cover about half of the requirement. In the case of periodic maintenance, this has been included as a capital item as there is no real expectation that it can be met from government recurrent expenditure. The sum requested would fund the national road periodic maintenance requirement, once all of the upgrading works are complete, but district roads would be left unfunded and only about half of the paved network would be able to receive periodic treatment. Overall, there is expected to be a shortfall in both the routine and periodic maintenance budgets over the next 5 years unless some external assistance is provided.

Table 4.2: Road Maintenance Budget 2002/03–2006/07

Item	2002/03	2003/04	2004/05	2005/06	2006/07
CFET Budget					
Routine Maintenance					
National and District Main	1.9	2.1	2.3	2.5	2.8
Secondary	0.1	0.2	0.2	0.2	0.2
Subtotal	2.0	2.3	2.5	2.7	3.0
Capital Works					
Periodic Maintenance		5.0	5.5	6.1	6.6
TFET Budget					
Backlog Maintenance	0.9				
Slip Repairs	0.9	0.5			
Subtotal	1.8	0.5	0.0	0.0	0.0

4.3 Short-Term Road Improvements

The short-term plan was developed under the technical assistance with a 6-year time scale (2001–2006) and the objective of restoring roads that have deteriorated, part of which is being funded under the EIRP. It also identified specific improvements, such as short lengths of realignment, to reduce loss of service and to decrease future maintenance requirements. The short-term plan evaluated covers 1,170 km of national roads and involves expenditure of \$46.5 million over 6 years, or \$7.8 million/year, in selected upgrading, split evenly between road and bridge works. The short-term plan assists in reducing the longer-term maintenance costs as well as in providing lower vehicle operating costs, improved journey times, and induced agricultural production benefits and was calculated to give a rate of return of 17% overall. Recognizing short-term budget limitations, a realistic plan for short-term improvements based on the assessed benefits and capital costs are shown in Table 4.3. This requires a capital expenditure of \$1.3 million/year to fund the highest rate of return projects, which are improvements on the main roads from Dili to the west as far as Batugade and south to Ermera. For an expenditure of \$4.5 million/year improvements to the road from Dili to Manatuto to Bauacau to Lautem to Los Palos are the next highest priority, together with the road south from Dili to Aileu and as far as Maubisse, and the route from Ermera to Hauba.

The assessment under the TA did not consider urban roads, particularly the needs of Dili, and some provision in the short-term capital works plan is highly desirable. Recognizing that there will be limited budget available, a total of \$2 million over 6 years or an average of \$0.33 million/year should be sufficient

Table 4.3: Priority Short Term Improvements Over 6-Year Period

Priority	Route	Road Link	Roads	Short -Term Improvements (\$M)		Total	Internal Rate of Return (%)
				Bridges			
1	A3	Tibar	Liquica	1.0	0.2	1.2	52.2
2	A3	Dili	Tibar	0.6	0.2	0.8	33.7
3	A4	Tibar	Ermera	1.5	0.5	2.0	27.7
4	A3	Liquica	Batugade	2.5	1.4	4.0	25.0
5	A1	Dili	Manatuto	1.5	0.7	2.2	24.8
6	A2	Dili	Aileu	1.7	0.1	1.8	23.3
7	A12	Hauba	Zumalai	0.9	0.0	0.9	23.0
8	A10	Ermera	Hauba	3.0	1.1	4.1	22.3
9	A1	Manatuto	Baucau	2.6	0.2	2.8	21.1
10	A1/A8	Baucau	Los Palos	3.9	1.9	5.8	20.6
11	A2	Aileu	Maubisse	0.9	0.2	1.1	20.1
							(\$M/yr)
Total	> 20%	IRR	20.3	6.5	26.7	4.5	
Total	> 25%	IRR	5.7	2.3	8.0	1.3	

Source: Multi-Modal Master Plan.

to arrest the deterioration and make progress towards restoration of the paved urban road network. While this would include a small provision for District towns, the majority of the expenditure would be in Dili.

Additionally, the Natabora and Cassa bridges require a relatively minor percentage of their total cost to complete and so gain all of the benefits. For this reason, if capital funds become available from an international or bilateral source either as grant or at attractive concessionary rates, then completion of these two bridges should be considered. A further small allowance should be made for support to the Road Safety Plan, which will primarily be driven from MOCT. Road safety improvements are generally found to be highly beneficial in terms of savings in medical costs, lost production, and the social costs to victims and relatives. A small allocation of initially \$50,000/year is proposed.

4.4 Short-Term Capital Budget

The short-term capital budget arising from the Master Plan, which is largely reflected in the current budget round and National Development Plan, is as shown in Table 4.4.

The short-term capital budget, if the CFET funding is met, totals \$22.5 million over 6 years, or \$8.6 million for short-term main road improvements. This compares with the capital requirement of \$8.0 million for the highest priority

Table 4.4: Short-Term Capital Budget

Item	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	Total
CFET Budget Submissions							
Selected Road Upgrading		1.00	1.10	1.21	1.33	1.46	6.10
Urban Roads	0.20	0.40	0.44	0.48	0.53	0.59	2.64
Road Safety Projects		0.05	0.05	0.05	0.05	0.05	0.50
Cassa, Natabora							
Bridges	0.90	0.90					1.80
South Coast, Oecussi							
Bridges			0.45	4.00	4.45		8.90
Oecussi Roads FS				0.10			0.10
Subtotal	1.10	2.35	2.04	5.84	6.36	2.10	20.04
TFET Budget							
Ossu – Viqueque	0.50	1.00					1.50
Maliana – Bobonaro	0.30	0.70					1.00
Subtotal	0.80	1.70					2.50
Total	1.90	4.05	2.04	5.84	6.36	2.10	22.54

Note: Excludes periodic maintenance, shown under the maintenance budget but part of the CFET capital budget submission; TFET is capital project costs only, excludes PMU costs and support to regional engineers, training and design services, and contingencies

short-term improvements, but leaves unfunded approximately \$18.0 million of economically viable improvements.

4.5 Medium- to Long-Term Investment Planning

4.5.1 Priorities for Longer-Term Investment

In the long term, the ability of East Timor to implement improvements to the road network will be constrained by revenue, the share of government revenue allocated to the transport sector, and the country's capacity and willingness to take advantage of concessionary funding from multilateral and bilateral donors. Also, as a first principle, available funds should go into maintenance and improvement tasks in the following priority order:

- (i) **Routine Maintenance.** Routine maintenance is relatively low cost and very important in preventing, particularly, flood damage; prompt patching of potholes avoids accelerated degradation which is more expensive to repair later.
- (ii) **Periodic Maintenance.** A policy of overlaying full sections of roads when they start to exhibit distress from vehicle loading or embrittlement, but before they deteriorate so far as to need more

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extensive rehabilitation or reconstruction, may be difficult to achieve within the funding constraints. It will be important to preserve the pavement strength and life by protection from axle overloads, and a reduced load limit on the cross-island (north/south) roads may assist this. About 80% of normal maximum axle loads is suggested, although this would need to be considered further. It may also be necessary to consider whether low cost treatments for surface rejuvenation are possible, where ageing is the primary deterioration mechanism. Over the short to medium term it may be necessary to accept a higher proportion of patching and a rougher surface than is normally desirable, so that periodic maintenance funds are conserved.

- (iii) **Unstable and Flood Damaged Sections.** A large proportion of the expenditure in the past 2 years has been directed at repairing flood damage at stream and river crossings and in areas of unstable geology. In the case of land instability, there is an urgent need for geotechnical inspection and testing of difficult sections, so that solutions can be designed that are cost-effective. In some cases it may be cheaper to accept the instability and continued maintenance, possibly leaving sections unpaved, rather than invest in expensive realignment or stabilization works that have a risk of failure.

In the case of river crossings, there is a need to evaluate the catchments, concentration of runoff and stream bedloads, before deciding on design solutions. In some cases, a higher capital cost solution (longer span or realignment) may be warranted rather than constantly rebuild a temporary or inadequate lower cost works. However, inadequate design and poor construction quality appears to have been as much responsible for premature failure of structures installed in the past 2 years. While this may have been, to some extent, understandable in the prevailing conditions, future works should have tighter design and construction control.

- (iv) **Upgrading and New Construction.** While improvements to the national road network are desirable, and may in some circumstances be economically justified, upgrading and new construction should be undertaken only from funds remaining once maintenance work has been adequately funded. This may require the Ministry of Water and Public Works (MWPW) limiting the extent of the network that it attempts to maintain, so that this can be done adequately, rather than spread funds too thinly.

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At present the 1,876 km of national and main district roads are informally regarded as the core network, but there are insufficient funds to maintain this extent of network from the short-term budget of the Consolidated Funds for East Timor (CFET). It is possible that unit rates for maintenance will fall once the inflationary effects of the international presence are removed. Also there may be scope for cost-efficiencies in the techniques employed. However, the Government should be prepared to reduce the size of the core network if necessary, noting that road access to all district capitals from Dili could be maintained with a network of less than 1,000 km.

As an alternative to reducing the extent of maintained network, the Government could also look to international funding on a grant or concessionary loan basis to bridge the gap over the short to medium term.

If considering upgrading or network extensions, it will also be important to achieve some balance between the national, district, feeder, and urban roads. In terms of priority, the short-term improvements in Table 4.3 should take precedence. This accounts for \$26.7 million of investment, of which only 24% would be covered if the CFET capital budget is approved. There is a further \$14.5 million quantity of short-term projects of a similar nature showing rates of return above 12% that should take precedence over other upgrading.

4.5.2 Funding Constraints

Forecasts of the Government's fiscal position in future years are given in the Mid-Year Update¹ and in a staff statement of an International Monetary Fund donors' meeting.² Total revenue from domestic source and oil revenues as a percentage of GDP is forecast to grow from around 8–10% of GDP in the 2000/01–2003/04 period to 45% of GDP by 2005/06 and then slowly decline to 20% of GDP over the long term.

Government expenditure is projected to also trend to 20% of GDP in the long term, falling from the high levels of the 2000/01–2002/03 period of reconstruction. The Government's budget is projected to be in deficit until 2004/05 but then to rapidly move into surplus in 2005/06. Government expenditure is forecast to grow at 8% over the 2002/03–2005/06 period. As GDP growth picks up from 2005/06 this expenditure growth rate will be sustained at much the same level. Allowing for some price inflation (assume 1.5% p.a.), real growth in the Government's budget can be expected to be around 6.5%. The share of the CFET budget appropriated for infrastructure as a whole is unlikely to exceed 20% (a guideline figure was 17% in the latest budget round) and the appropriation for roads is unlikely to exceed 15%, and may be no more than 10% (see Table 4.5).

¹ East Timor Combined Sources Budget 2001-02, Mid Year Update, Ministry of Finance.

² IMF Donor's Meeting on East Timor, Staff Statement, Oslo, December 2001.

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Table 4.5: Future CFET Projections would in this case be:

Item	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	Total
Government Revenue ^a	34.0	51.0	71.0	185.0	185.0	185.0	711.0
Roads appropriation @15%	5.1	7.7	10.7	27.8	27.8	27.8	106.7
Roads appropriation @10%	3.4	5.1	7.1	18.5	18.5	18.5	71.1
Roads appropriation @5%	1.7	2.6	3.6	9.3	9.3	9.3	35.5
Requirement, for 1,876 km							
Routine	3.9	3.9	3.9	3.9	3.9	3.9	23.4
Periodic	7.5	7.5	7.5	7.5	7.5	7.5	45.0
Subtotal	11.4	11.4	11.4	11.4	11.4	11.4	68.4
Improvements, short term							
1 st Priority (> 25% IRR)	1.3	1.3	1.3	1.3	1.3	1.3	7.8
2 nd Priority (> 20% IRR)	3.2	3.2	3.2	3.2	3.2	3.2	19.2
Subtotal	4.5	4.5	4.5	4.5	4.5	4.5	27.0
Total	15.9	15.9	15.9	15.9	15.9	15.9	95.4

^a From Mid-Term budget update, leveling off of petroleum revenues assumed from 2005/06.

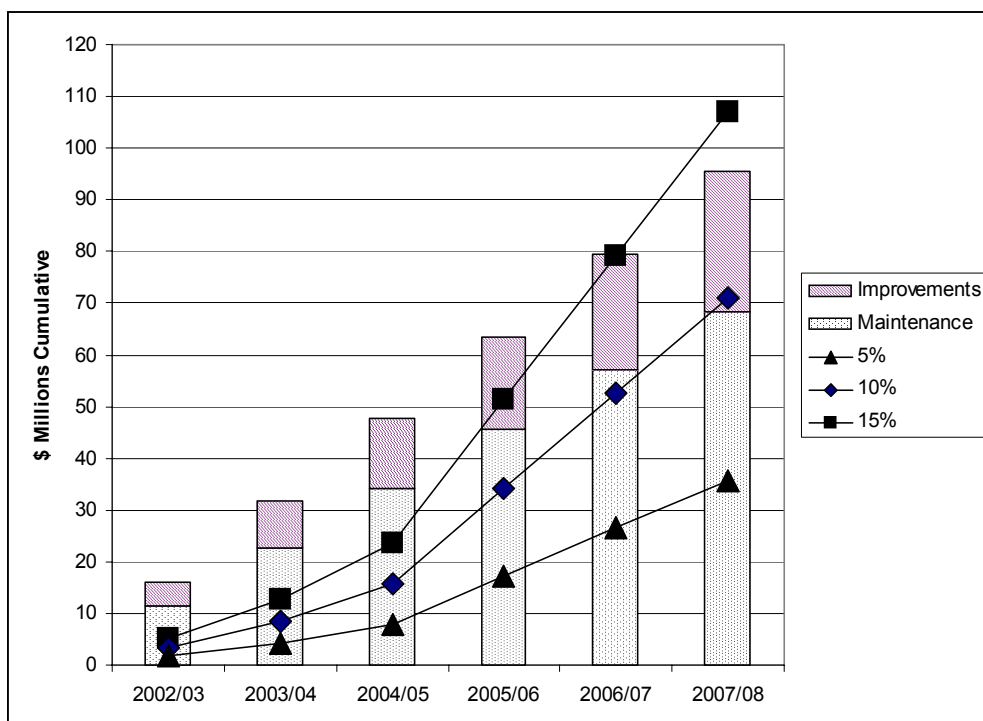
For 2001/02 the total expenditure on roads from CFET, TFET, and bilateral funds combined is approximately \$20 million (equivalent to 32% of the CFET budget), of which only \$2.3 million was CFET (3.6% of the CFET budget).

The conclusions that can be drawn are that a roads appropriation of at least 10% of the CFET budget is required to fund maintenance alone on the main national and district network. If an appropriation of 15% of the CFET budget was secured, then high priority short term improvements would also be fundable. However, there would still be a shortfall over the first 4 years until the Timor Sea revenues become available, as shown in Figure 4.1.

If the budget appropriation was to cover maintenance only, then 10% of the projected CFET budget would make up the backlog by 2006/07, but there would be deferred (and likely higher cost) maintenance from the earlier years. If short-term priority upgrades are also to be funded, then a budget appropriation of 15% of the CFET budget would be required, but again there would be a backlog until 2006/07.

The revenue position would be improved by the establishment of a road fund and with fuel excise and annual licensing fees set to levels that recover at least part of the cost of maintaining the road system. In the next section it is estimated that an aggressive introduction of road user charges could raise about \$15 million over a 6-year period, equivalent to about 65% of the routine maintenance expenditure requirement.

Figure 4.1: Funding Shortfall for Maintenance and Priority Improvements



4.5.3 Implementation Capacity Constraints

The capacity to implement road maintenance and improvement work is also constrained by the Government's capacity to administer programs and of the contracting industry to undertake them. The Roads Services division has had some difficulty in disbursing its 2001/02 appropriation and this could be read as a constraint on implementation capacity. However, it is clear from the TFET-administered work that there is a capacity to implement \$10 million–\$20 million of work each year, which is in line with the anticipated expenditure.

However, it does point out the need for MWPW to build the capacity of its internal management over the next 18-month period, so that it can assume a larger program as the TFET program runs down.

5 Road User Charges and a Road Fund

5.1 Introduction

The fiscal (public revenue) system for roads and road transport comprises

- (i) transaction fees, designed to cover the costs of the administrative tasks, for example, the issue of vehicle registration plates and driver licenses;
- (ii) charges for publicly provided services to recover costs, including
 - road construction and maintenance,
 - traffic enforcement , and
 - administrative overheads;
- (iii) recovery of transport externality costs, for example, the public sector costs of road accidents;
- (iv) fines for traffic offenses; and
- (v) deterrent taxes to limit the purchase or use of certain vehicles (e.g., pollution emitters, luxury vehicles).

The most significant of these is user charges for cost recovery of road construction and maintenance. Road transport is often used as a basis for generating revenue for expenditure on other social programs, for example through import duties and excise on vehicles, parts and fuel, or through value-added or sales taxes. Pricing is often used in combination with regulation to achieve policy objectives, for example, prohibition of imports for vehicles considered to be polluting, unsafe, or excessive contributors to carbon dioxide emissions. Road pricing is used in congested urban areas to manage transport demand and the level of fuel taxation to limit the rate of growth in private vehicle use.

5.2 Cost Recovery Objective

For a low traffic network, such as East Timor, particularly where there is limited ability to pay, a full cost-recovery policy such as would normally be applied in an industrialized country will be difficult to implement. Full cost recovery requires the charges made on the road user to equal, over time, the costs of construction, rehabilitation, and maintenance of the road system. Less ambitious goals are

- (i) to recover only part of the capital expenditure, but all maintenance costs;
- (ii) to recover maintenance costs only, including periodic and routine maintenance; and
- (iii) to recover only routine maintenance costs.

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On the expenditure side, costs can be managed to some extent by limiting the extent of the road network that is maintained, by deferring maintenance from its optimal timing. although this leads to higher expenditure in the long term, or by funding some maintenance at lower costs from community resources rather than from the central Government. The lower the cost recovery from road users, the higher the requirement for the Government to fund the roads budget from other internal revenue, or from overseas grants or borrowings.

5.3 Revenue Sources

There are a limited number of revenue sources:

- (i) excise on gasoline and/or diesel fuel;
- (ii) annual vehicle license fees—above the base level required to cover administration costs;
- (iii) road tolls—used extensively in some countries but best suited to funding very expensive items of infrastructure, which benefit a limited group of road users (for example, bridge and tunnels);
- (iv) taxes on other consumable items, such as tires—used infrequently;
- (v) vehicle weight/distance taxes—which are conceptually attractive but require effort and technology to operate and enforce (used in some European countries and New Zealand); they are also used as supplementary taxes for very heavy vehicles; and
- (vi) vehicle import duty and sales tax—these taxes tend to be used more for general revenue collection and also to influence the mix of vehicles entering the market.

Road user revenues should be simple to collect, without high administrative overhead costs, be difficult to avoid, and be seen to be fair. In an environment such as East Timor, this generally leads to the conclusion that cost recovery can be achieved through a levy on fuel together with vehicle annual license fees.

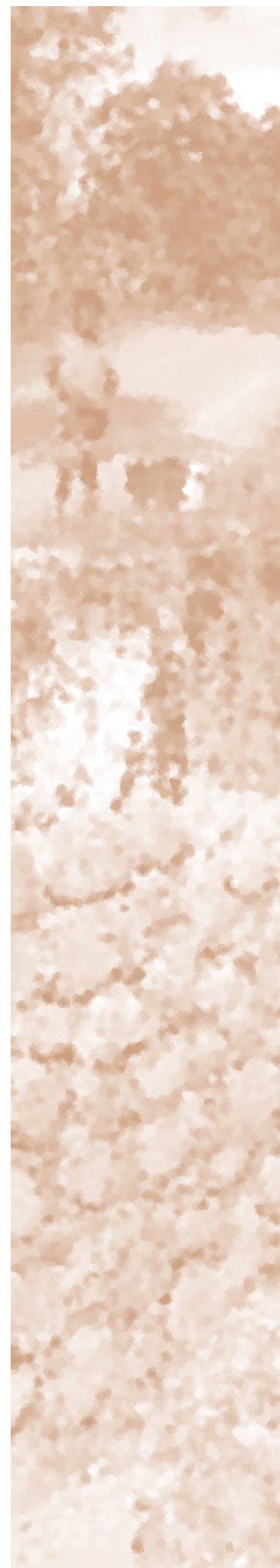
5.4 Structure of Charges

Road system costs can be broadly divided into two parts:

- (i) the provision of road space—the road reserve, formation, and a pavement sufficient to carry light vehicles; and
- (ii) the provision of structural capacity—ability to carry heavy vehicles by providing pavements of sufficient strength and durability and by building bridges to carry heavy loads.

In order to encourage an optimal allocation of traffic on the road system, the structure of user charges ideally should be such that light and heavy vehicles

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contribute in proportion to their cost responsibility. In practice this can be difficult to achieve, particularly when only partial cost recovery is possible. Generally, the charges that would be required on heavy vehicles to cover the marginal costs they impose on the road system are very high when the heavy vehicle fleet is small. Too high a charge leads to evasion and corruption of the system, and can be a disincentive to development. It is necessary to take a practical approach and apply fuel levies and heavy vehicle charges that are politically acceptable, and which do not lead to widespread evasion.

5.5 Levels of Charges

The technical assistance assessed cost recovery and road user charges, and came to a similar conclusion that vehicle annual licensing and fuel tax would be the primary contributors (see Table 5.1). An annual driving license fee was also suggested.

Table 5.1: Suggested Levels of Road User Charges

Source	Unit Rate	No. of Vehicles	Km/Vehicle	Annual Recovery (first year) (\$)
Fuel excise (gasoline)	\$0.05/liter			2,000,000
Vehicle licensing	\$25/vehicle	20,000	20,000	500,000
Driver licensing	\$25/vehicle			500,000
Total Recovery				3,000,000

These charges would raise \$7.7 million by 2010 based on expected GDP growth (which was overestimated in the Multi-Modal Plan (MMP)). Changes are suggested to this proposal as follows:

- (i) fuel excise levied on gasoline and diesel fuel;
- (ii) vehicle licensing graduated so that heavy vehicles pay on a fee scale related to their gross weight and axle combination, and light vehicles pay a flat annual fee, with motorcycles paying a lower flat fee; and
- (iii) driver licensing renewals are not normally done annually, and are not a suitable method for road cost recovery revenue collection; fees should be at a level to recover the costs of operating the driver licensing system, possibly a national road safety council could be funded as discussed elsewhere.

A re-estimate of revenues from user charges, based on a vehicle fleet of 25,000 of which half are motorcycles, and estimating vehicle annual travel from road traffic counts and road section lengths, gives the following:

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- (i) Estimated fuel usage 17 million liters (compared with 40 million in the MMP);
- (ii) Estimated fuel excise revenue at 5 cents/liter yields \$840,000;
- (iii) Annual license fee surcharge averaging \$25/vehicle/year but scaled to vehicle size (similar proportion to the existing fee scale) yields \$470,000; and
- (iv) Total revenue from these two sources is \$1,310,000 (compared with \$3,000,00 in the MMP).

This revenue for road maintenance compares with an annual requirement for routine maintenance of around \$5 million to cover all of the paved network compared with a requested appropriation of just over \$2 million. Periodic maintenance is entirely unfunded and in the order of \$10 million to cover the paved network. It can be seen that, short of much higher levels of user charges, only a small proportion of the road maintenance cost can be met from road user charges in the short term.

The level of fuel excise will ultimately be a political decision, but important to establish the principle of cost recovery, even if charging levels in the early years do not match road maintenance expenditures. An excise of 5 cents/liter is considerably lower than in developed countries and, even taking account of ability to pay, it should be possible to increase this progressively to a target of 15 or 20 cents/liter.

If the license fee for heavy vehicles were to be charged on the basis of road damage, then for a 3-axle rigid truck, a more appropriate charge would be \$150/1,000 km if run in one direction at legal maximum load. Annual utilization in East Timor is probably low, maybe no more than 15,000 km/year, which would attract a heavy vehicle levy of \$2,250/year. While this may seem high, the operating cost of a heavy truck would typically be of the order of \$1.00/km, so the road user charge would be 15% of the annual operating cost. Obviously a one-off charge of over \$2,000 would be very difficult for a small freight operator to meet, and where charges of this order are made, there is normally a strict regime for collection and enforcement with charges made on a pay-as-you-go basis for distance run, a system that would be difficult to sustain in East Timor, and so would lead to widespread evasion.

However, there should be scope to set heavy vehicle annual license fees at a level of say \$400 per year, with the option for purchase of half yearly licenses. This would increase the license fee revenue to about \$0.5 million/year.

A projected revenue stream over a 6-year period, assuming a rate of growth in the motor vehicle fleet proportional to GDP, and a progressive increase in the fuel excise over a 4-year period, is shown in Figure 5.1.

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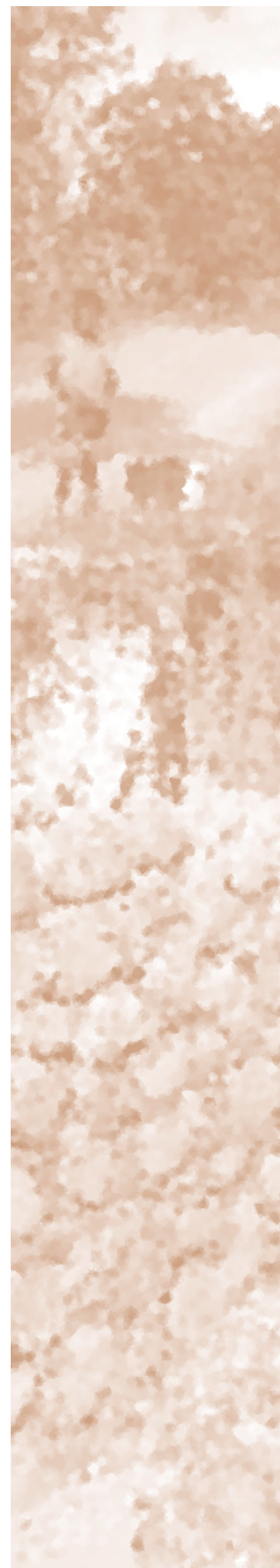


Figure 5.1: Projected Revenue from Fuel Excise and Vehicle Annual License Fee (\$m)

	2002/03	2003/04	2004/05	2005/06	2006/07	Total
Excise Revenue	0.84	1.67	2.64	3.69	3.88	12.72
Vehicle Fees	0.50	0.50	0.53	0.56	0.58	2.67
Total	1.34	2.18	3.17	4.25	4.46	15.40

5.6 Road Trust Fund

The establishment of a road trust fund to hold revenues generated from road users for later expenditure on road maintenance and operation is generally recommended by international funding agencies and works well in a number of countries.

The reason for a trust fund is to ensure that the revenues are expended on roads and road transport administration and are not diverted to other government expenditure. It also highlights the extent of road cost recovery, and provides the basis for setting long-term targets, such as removing dependence on external assistance.

The trust fund is normally administered by the Ministry of Finance as a separate account and authority to disburse funds follows a protocol established with the government agencies using the fund, in this case MOCT and MWPW.

All of the revenues from vehicle licensing, the road user charge component of fuel excise, and fines from traffic enforcement go into the fund. Allocations are made from the fund to cover government road and road transport expenditure, including administrative costs of the licensing system, on-road enforcement activities, road maintenance and construction, and sometimes also for promotion or subsidy of public transport.

6 Institutional and Legal Framework

6.1 Introduction

The ADB technical assistance project was undertaken during the period that the government institutions in East Timor were being established. Roads were at that time under the Department of Infrastructure, but separated in 2001 into the Department of Water and Public Works and the Ministry of Communications and Transport. Over the period the Government has been considering the degree of autonomy that it wishes to give the roads

administration, whether to adopt the model of a roads authority, or a more traditional government public works department, and the degree of outsourcing of engineering and other services. The technical assistance produced the following reports concerning the institutional framework, management systems, and legal structure for administering the road network:

- (i) A comparison of institutional structures for the sector, with the recommendation that there be one all-encompassing piece of legislation, with common principles applying across the sector, and that semi-autonomous organizations be set up to manage transport sector assets (this was generally followed for ports and airports but not for roads, which remains a government department).
- (ii) A draft *Transport Regulation*, covering all aspects of roads and road transport, together with Cabinet papers and schedule of directives detailing aspects of the regulations;
- (iii) Structure and operation of a road inventory and asset management system established under the EIRP by the PMU. (ROMAPS-ET: A Routine Maintenance Planning System for East Timor, M. Carr, October 2000; East Timor–Road Asset Management, A Guide to Inventory and Condition Assessment, June 2001); and
- (iv) Financial management for the transport sector institutions, under the EIRP project (Financial Management Specialist, Final Report, July 2001).

6.2 Legal Framework for Roads

Since the disestablishment of the Department of Infrastructure, MOCT has taken over the development of road and road transport legislation, and a basic Roads Law is being drafted. The drafting of the law has been carried out within the resources of MOCT, which has the benefit of the previous legal drafts made under the ADB technical assistance project. The draft legislation under this project is set out in *Division 3–Road Asset Management*, and covers:

- (i) road categories
- (ii) road declarations
- (iii) declaration of land for road reserves
- (iv) maximum widths of road reserves
- (v) register of legal roads
- (vi) requirement to efficiently manage road assets
- (vii) compulsory acquisition of land for roads (although all land is understood to be owned by the Government) and compensation; landholder rights
- (viii) roads administration may purchase or lease land
- (ix) powers to enter land for survey purposes, and for extraction of road making materials

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- (x) ability to require payment from land developers for costs imposed on the road
- (xi) responsibility for street lighting
- (xii) roads not to be obstructed and powers to remove obstructions
- (xiii) road reserves may be used for crops
- (xiv) requirements for issue of notices

While the recommended institutional model for roads administration was a roads authority, which has not been followed, the content of the legislation is not significantly affected. The legislative provisions are quite simple and straightforward, and require only to be implemented.

6.3 Institutional Structure and Human Resources

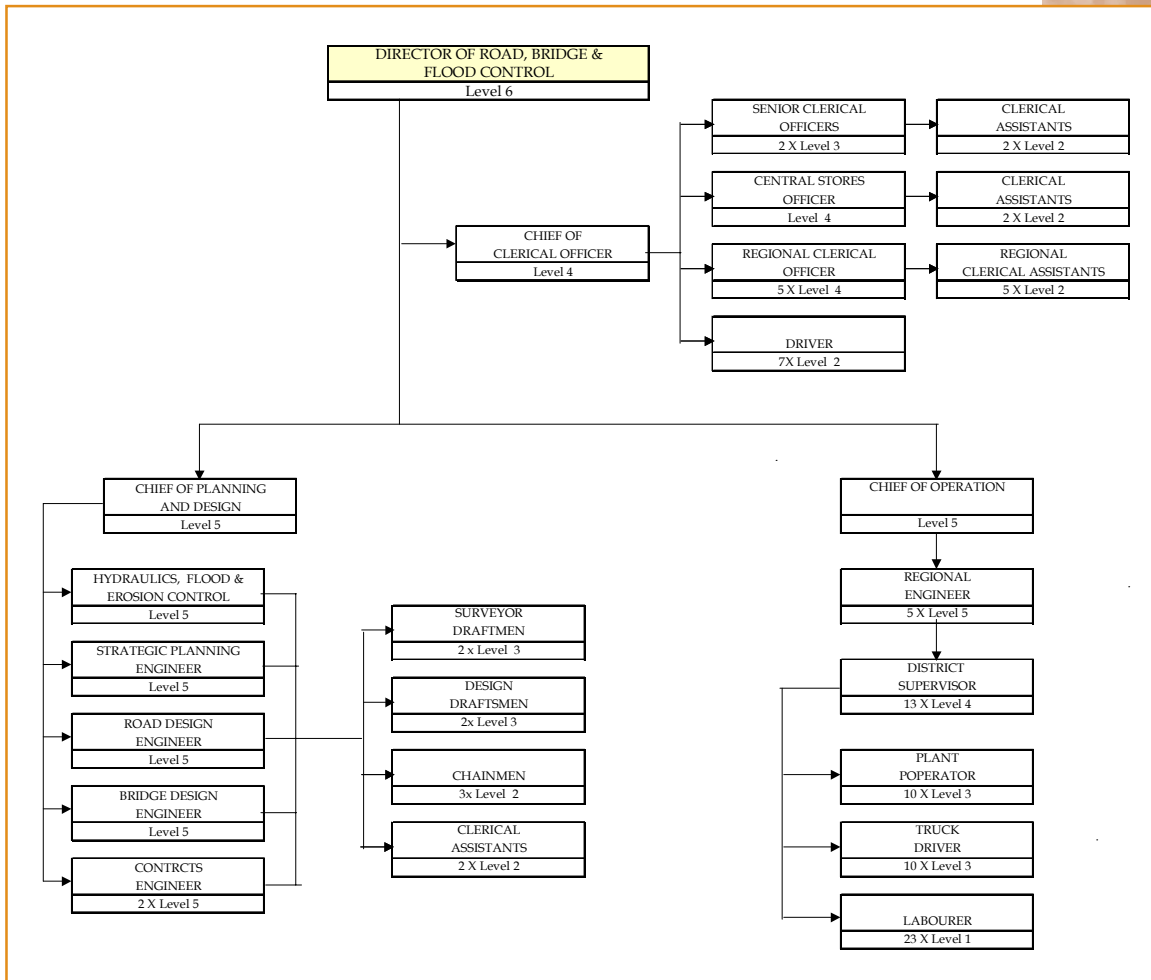
6.3.1 Roads Services Structure

The institutional structure of the roads administration has been under debate during the course of preparing this summary report. After reforming into MWPW, Roads Services has been effectively a division within the department although headed by a Chief of Roads rather than a director. A new structure has now been agreed within the department after general consultation that included inputs from the PMU and the writer. The new directorate will also include responsibilities for Flood Control, at the request of higher authorities within the Government. The new structure is shown in Figure 6.1. The new structure appears to be generally suitable to the intended future mode of operation. It will take some time for the new structure to bed down once it is implemented, and further structural change in the near future would not be helpful. However, there are a few points to bear in mind for the future:

- (i) the Level 5 professional staff will almost certainly require in-service and/or short or longer period external training; for this reason and also to provide some assurance of succession in the Department, it would be useful for there to be Level 4 trainees (recent graduates preferably) working within each section. However, as it is easier to hire than it is to fire in the public service, the structure should be allowed to operate for a few months before considering whether further support is needed. It may also be necessary to limit absences to attend training programs and concentrate on on-the-job training and remote learning (noting the new video-conferencing facility at the World Bank and ADB offices in East Timor).
- (ii) the number of plant and truck operators in the regions give the impression that the department is intending to carry out a significant amount of engineering works with its own forces. There is a

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Figure 6.1: New Structure for Directorate of Roads, Bridges and Flood Control



good basis of a private sector contracting industry developing in East Timor, which should be encouraged, whereas all experience with the Government's work in similar situations is that it tends to be less efficient and will place a continuing human resource cost on the department.

- (iii) under the new structure, international staff are in advisory roles rather than line positions, as was the case in the earlier stages of establishment of a roads administration. It is important that international advisers respect this role and resist becoming de facto managers because of skills and experience shortage among East Timorese staff; it is likewise important for the Government to ensure that the positions

are filled with conscientious staff who do not encourage the advisers to go beyond their role by lack of effort or deference. It is a difficult situation and requires special personal qualities from the international advisers as much as professional skills.

The present institutional structure will continue through to 20 May 2002, at which point several of the UNTAET staff positions will be discontinued, leaving a small number of advisory positions within the Ministry. The present organization of Road Services is similar in many respects to the new one, a main division between operations and planning/design. The four regional depots, with engineers and district supervisors, are basically unchanged. The new Level 5 positions have been filled, with the exception of the flood control position. Currently, at Level 5, there is a Strategic Planning Engineer, an Assets & Policy Manager, a Road Design Engineer, a Bridge Design Engineer, and two Contracts Engineers.

6.3.2 Human Resources

The critical shortage of trained and experienced technical and managerial staff throughout the East Timor public service is likely to be a more important constraint than the institutional structure. The Government in general, and Road Services is no exception, has been staffed over its formative period by international staff in line positions of responsibility. This includes the position of Director General of MWPW and, below the Chief of Roads, three positions filled by UNTAET staff.

The bulk of engineering expenditure has been carried out through the EIRP PMU, which pre-existed MWPW, and will continue to do so over the next year or more, and there is a division of management structures between that of the Roads Services and the PMU. Roads Services has concentrated its efforts on community based road maintenance of district roads, so the areas of work are quite separate. As the Roads Services and MWPW become more established, there is a natural desire to assume more control over road services provision and lessen dependence on the PMU. In this environment, coordination between the two groups becomes very important.

There are 143 approved staff positions in Road Services of which 97 are currently filled. The Contracts Office — the headquarters operations section — is staffed by one engineer with a degree qualification and a design background, but who is involved primarily in small contract management, supported by two administrative assistants. The Regional Engineers are supported by four international trainers/advisers, funded under EIRP-1, but this will reduce to one under EIRP-2, and will cease at the end of the project in about 18 months time.

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The Design Group is common to all branches of MWPW and is involved mainly in structural design, architectural drafting, and cost estimating. The main activity of this group in roads work is to review consultant's bridge designs.

Roads Services currently has three UNTAET advisers, one assisting with UNTAET works contracts, one responsible for capacity building, and one with district roads responsibilities. After May 2002, there is provision for one UN advisor in Roads Services. However, the situation is changing rapidly, and it is not clear what the number and responsibilities of the international advisers will be after May 20.

As more of the budget expenditure is transferred to CFET, the ability of the Roads Services/Directorate to manage the volume of work and the larger contracts that are involved will be heavily tested. Already there is a bottleneck in disbursing the routine maintenance expenditure, not through shortage of work to be done, but more the administrative capacity and the ability of village based contractors to perform. This contrasts with the much larger disbursement rates achieved by the PMU for the TFET-funded program.

The PMU provides advisory support to the Chief of Roads and to Road Services generally, and it will be important that this continues. Formal training is also included in the EIRP through the Northern Territory Transport and Works Department. Road Services also has to interface with, or at least remain familiar with, other aid programs in the roads sector other than the EIRP, including the JICA work on Dili-Aileu-Same road, the recently commenced World Bank community empowerment project, and UNPKF construction. Again, this consumes scarce resources.

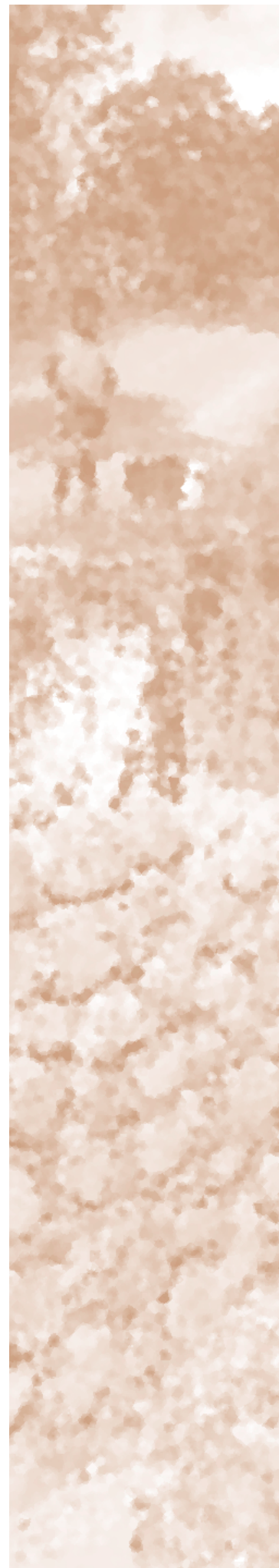
An ever-present threat to Roads Services is the potential for losing trained and qualified staff to the private sector, which, similarly to other countries at a similar level of development and with a limited government budget, arises from the relatively lower salaries in the public sector. As the private sector contracting and consulting industry develops, this risk will become greater. The disparity between payment of international and local staff is also a potential source of friction.

One specific training need is in the use of geographical information systems (GIS) in roads planning and design. An ArcView system has been installed in the division but the one staff member trained in its use has left. This again emphasizes the need for succession planning in the division, the need for at least two people to be experienced at each task (or outsource it), and a constant commitment to training and retraining.

6.4 Financial Management Systems

Under the EIRP, a specialist was engaged to recommend financial management systems and methods for the transport sector. The main inputs

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were to assist in the preparation of sector budgets, and in the training of the then Infrastructure Department staff in budgeting principles, and use of standard computer software to prepare budgets in their areas of responsibility. A number of the developmental areas of roads financial management accounting were mentioned but no recommendations were made, possibly due to insufficient time.

The Department is now required to use the government financial management/ accounting system “FreeBalance”. It does not have the autonomy to select a financial system designed for an agency whose primary tasks are to manage construction contracts and to financially manage the maintenance of the network. Systems that are suited to general government accounting, particularly where accounting is on a labor/materials/purchases system, are usually found not to have the flexibility required to also be adaptable to project cost accounting or the ready interfacing with road asset management systems. This can lead to parallel accounting systems being run in order to satisfy both the Government’s reporting needs and internal requirement, which is wasteful of resources and prone to error. This situation is not as likely where an authority model is used and the accounting system is separated from the remainder of government, or where a separate account such as a road fund is used.

A problem noted in the financial specialist’s report and which appears to still be present to some extent, is the delay in the financial procurement process through the Central Fiscal Authority (CFA), which can hold up engineering works. Most important is the ability to release funds quickly for urgent emergency repairs. TFET reportedly has had to intervene to cut through the CFET bottleneck on occasions. During the preparation of this report this problem was still reported to be occurring at the regional and district levels where payments for completion of community-based maintenance contracts now have to be disbursed through the District Administrator’s imprest account (this was a system established purposely to avoid the delays of processing through the CFA).

In the future, it may be desirable to review the financial management structure and systems but in the short term this would again be an undesirable additional restructuring burden for the Department, and the Government appears to be committed to the universal use of its preferred system. The time to address this again would be once agreement in principle is given to proceed with a road fund model which, it is noted, is included in the MOCT policy statements for the National Development Plan.

6.5 Road Asset Management System

Under the EIRP, a road maintenance management system, ROMAPS-ET, has recently been established and is being populated with inventory information for the national network. The inventory has been used as part of this review for obtaining section length and other data. All road sections have been entered

but surface condition, width, and drainage information are not yet complete or set at nominal values and these, and the unit costs built into the system, will need to be verified before the database can be put into use.

The principle of ROMAPS-ET is that, with a relatively simple data set and without having to measure road deficiencies in detail for each road section, the system will produce a sufficiently accurate estimate of the total quantities of maintenance effort and cost over the network. Section lengths are quite long, so much of the data are averages, often by qualitative judgment, over several kilometers of road. While the simplicity is desirable, it is not possible to obtain much detail on road condition at individual section level—the surface condition is described as good, fair or poor, but the nature of deficiencies and measured extent are not available. Without going into this in detail, the overall impression is that the database could usefully be more detailed in the condition rating methods without overly complicating the process.

6.6 Contracts Management and the Private Sector

The EIRP has established the normal procedures and systems for contract management, including contractor prequalification, into a 3-category system based on financial capacity. There is no shortage of bidders for work, there being 19 pre-qualified Class A contractors (all but 3 are international), 11 Class B (all but 3 are local), and a large number of Class C (mainly for community-based maintenance contracts). So far there are no truly local engineering consultants, although there are local offshoots of overseas consulting companies. Nor is there a contractors' federation, a consultants' association, or a local chapter of a professional engineering institution—all of these should be encouraged.

The EIRP has already instituted training of contractors in bid preparation, cost estimating and control, and contract procedures. However, from discussions with the PMU, it is clear that there is still a high degree of inexperience with, and lack of understanding of, the contractual process, which will take time to overcome.

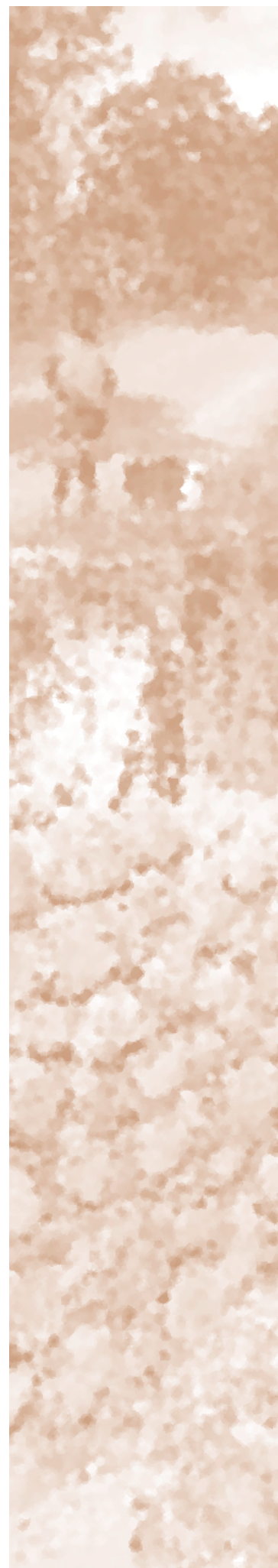
The Contracts Office within Road Services has a full set of standard bid and contract management documents for community-based maintenance and small contractors.

7 Action Plan

The following main recommendations are made for an action plan to maintain and develop the road infrastructure:

- (i) **Road Classification.** Confirm the national and district roads designation proposals made in this review, or agree on acceptable

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modifications and then proceed to declare the roads under legislation (see below).

- (ii) **Confirm Maintenance Priorities.** When the 2002/03 budget is ready, undertake maintenance only on the length of “core” road network that can be maintained to a minimum acceptable level; give first priority to routine and emergency maintenance; second priority to periodic maintenance; and third priority to upgrades or network extensions.
- (iii) **Short-Term Upgrading.** If funds permit, undertake short-term improvement works on the roads in the priorities specified in the Multimodal Transport Plan (see Section 4.3).
- (iv) **Long-Term Improvements.** Recognize that the capacity to widen and improve the alignment of roads will be limited; long-term improvements are likely to be justified on the basis of specific feasibility studies of sections with relatively poor standards in relation to their traffic and with the opportunity to upgrade at reasonable cost.
- (v) **Sources of Funds.** As there will be a shortfall in funds for maintenance and development of the network over the next 4 years, until Timor Sea Petroleum royalties increase, consider the use of concessionary multinational funding over the bridging period; secure assurance from higher authorities within government of a percentage of the CFET budget for roads appropriation—desirably 15%; also work with MOCT to institute a road fund (see below).
- (vi) **Traffic Surveys.** Develop the capability to implement a regular traffic counting and statistical weighing program; undertake an initial comprehensive set of surveys midyear (under technical assistance); use the results to undertake a review of the economic and social benefits of short-and long-term road investment, making use of the improved data now available (with technical assistance).

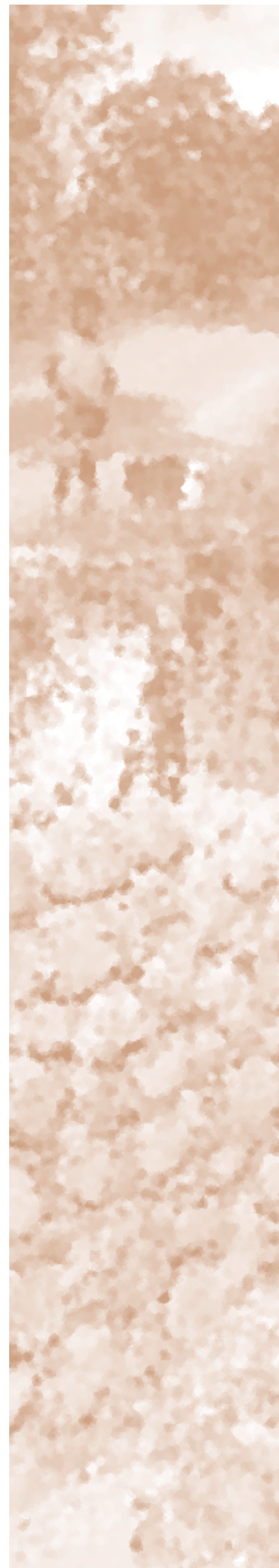
Policy, Institutional, and Legal Framework

- (i) **Legislation.** A basic law for roads has been drafted by MOCT; work with MOCT to expand the law into regulation and directives, making use of the legal drafts already produced under ADB technical assistance—timeframe over the next 6 months (with technical assistance).
- (ii) **Institutional Structure and Training.** Within the agreed new institutional structure for a Roads, Bridges and Flood Control Directorate, progressively work to fill approved staff positions with qualified and trained East Timorese; use international advisers and consultants wisely to assist but not operate the Department; consider recruitment of Level 4 understudies for key professional positions to

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ensure continuity and succession, and develop a policy of continuous training and retraining but without long periods of absence of key staff; endeavor to provide remuneration of key staff that is competitive with the East Timor private sector.

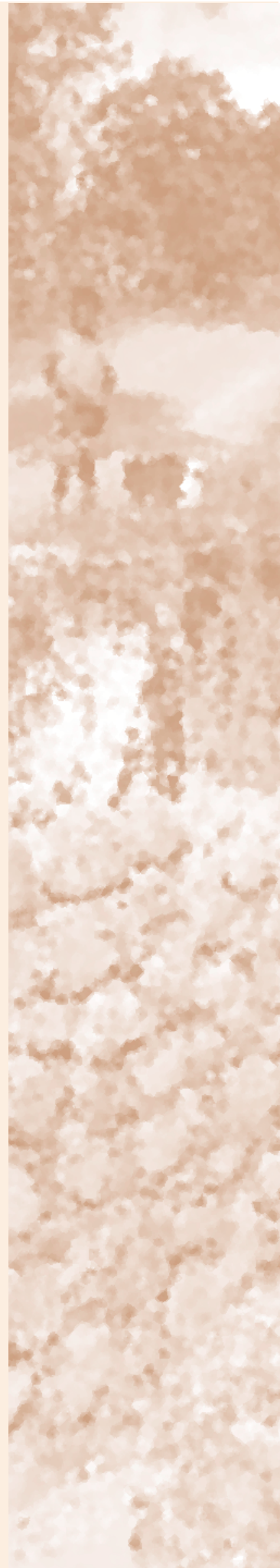
- (iii) **Road Fund.** Work with MOCT and the Ministry of Finance to establish a road fund for the dual purposes of securing medium term assurance of funds for part of the road maintenance needs and to provide improved flexibility in the financial management of the roads expenditures–timeframe over the next year (with technical assistance).
- (iv) **Road Asset Management System.** Extend to the district network and expand the capabilities of the system; transfer the system to the Department; provide a quality control system for data entry and ensure that all estimating processes within the software are validated against field observation (under EIRP).
- (v) **Construction Industry and Private Sector Development.** Continue the initiatives made within the TFET/EIRP project; encourage the formation of private sector professional organizations and business associations; limit the extent of work carried out by the regional depots with their own personnel and equipment to basic emergency response needs (continue EIRP support).



Part C

Transport Sector Master Plan

- **Road Transport**
- **Ports and Shipping**
- **Airports and Aviation**



1. Introduction

1.1 Background

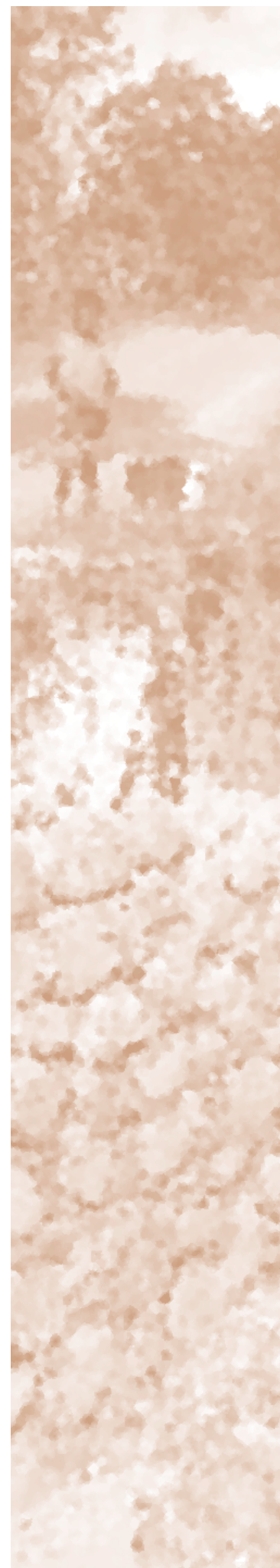
East Timor has an extensive paved network of rural main and district roads and secondary gravel and earth roads. There is a well-developed urban street and traffic system in Dili and smaller urban road networks in district capitals. The traffic control system in Dili was destroyed during 1999. Commercial road freight and passenger transport services are predominantly owner operated and are largely unregulated. Public passenger transport consists mainly of minibuses and, in Dili, taxi services. UN vehicles form a significant but reducing component of the traffic flow. Rural traffic volumes are low, except on the north coast road between Liquica, Tibar, Dili, and Manatuto.

The only international airport is at Comoro, a few kilometers west of Dili, capable of handling B737 size aircraft. There is no domestic airline or domestic scheduled air traffic, apart from UN operations and some private flying. An ex-military aerodrome at Baucau has a runway long enough for B747s, but has no immediate commercial potential. The third airport is at Suai and has some strategic significance. Internal distances are relatively short and this, together with low demand, limits the scope for a domestic air service.

The sole port of entry is Dili, the port being located close to the central area. Dili was a coastal port under the Indonesian administration but has been rehabilitated and expanded under multilateral and bilateral funding to accommodate limited size container and break-bulk international shipping. There are a number of other small coastal wharves, jetties, ramps and beach landings that have been used in the past to support coastal distribution by landing barge, local fishing, and military uses. The port of Oecusse is important as a ferry terminal from Dili, in the absence of road transit access through Indonesian territory, and the islands of Atauro and Jaco are also reliant on small ferry access.

East Timor has the legacy from the Indonesian period of an extensive, though lightly constructed and somewhat narrow, road network of 5,000 kilometers (km) of main and secondary roads, of which half are bitumen surface. The roads have had little to no maintenance since 1997, and the combined effects of this, the passage of military vehicles, and one bad year of flooding have caused some damage. The Emergency Infrastructure Rehabilitation project (EIRP) funded under the Trust Fund for East Timor (TFET), together with bilateral assistance from the Government of Japan and the United Nations Peace Keeping Forces (UNPKF) efforts, has gone some way to stabilizing the condition of the roads, such that it is timely to consider a longer-term plan. The focus of this work has been mainly at restoring road drainage structures together with short lengths of resurfacing at washouts and areas of land instability. A regional maintenance

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capability is being developed through four regional depots and, centrally, a road asset management system is being progressively implemented.

1.2 Issues

There are many issues to be worked on, some of an engineering nature, others related to the institutions administering the road network, the law governing roads, capacity building of organizations and human resources and, in particular, funding constraints. Some of these are listed below:

- (i) **Legal Issues – Development of the Legal Framework and Regulations:**
 - legal declaration and classification of roads
 - vehicle registration, roadworthiness; driver training and licensing
 - road traffic code
 - commercial road transport economic and safety regulation
 - law for air transport
 - law for ports and shipping
 - legal basis for administrative and user charge
- (ii) **Revenues and Cost Recovery**
 - rationale and setting of road user charges
 - establishment and administration of a road fund
 - port charges and financial management
 - airport charges and financial management
 - franchise scheme for Oecusse ferry
- (iii) **Urban Traffic Management (Dili)**
 - intersection traffic controls damaged; inadequate markings and signage;
 - general requirement for traffic management
 - some narrow streets with parking/loading problems
 - port access near center of town, some traffic conflicts
 - one unofficial bus area requiring reconstruction; need bus terminal facilities in up to 4 areas
- (iv) **Institutional Structure**
 - Filling, training and retention of key technical/professional staff positions with Timorese
 - Interface and cooperation with Ministry of Water and Public Works (MWPW), Civic Police (CivPol) and others for road safety, legal administration of roads, and vehicle load control
 - Self-administering/financing agencies – ports, airports

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2. Sector Profile

2.1 Road Transport

2.1.1 Road Traffic

Traffic volumes outside of Dili, excluding motorcycles, which form up to 50% of the traffic flow on some routes, vary from 1,000 vehicles/day on the Dili to Tibar section down to 20 vehicles/day on the lower volume main roads. Heavy vehicles form about 5% of this traffic volume on the coastal routes east of Dili to Baucau, and up to 20% on the Batugade to Dili route. The roads across the island carry few heavy vehicles. Buses contribute up to 45% of the traffic on some routes.

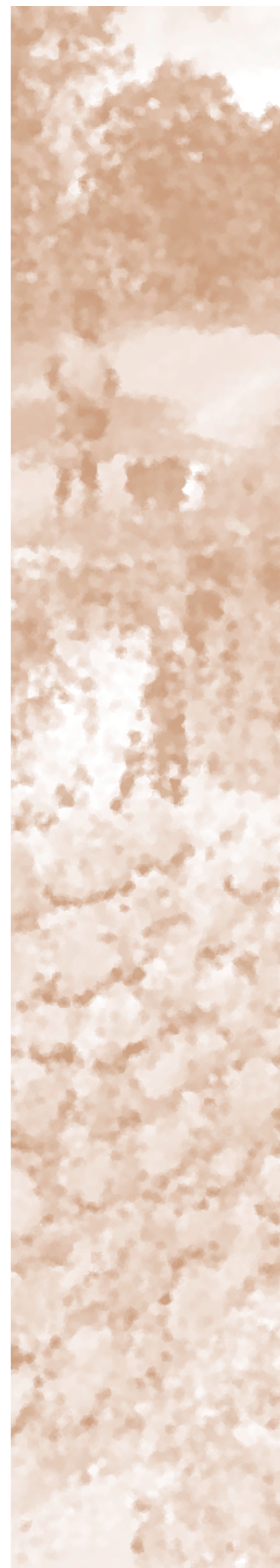
2.1.2 Public Transport Services

Public passenger transport is provided by buses and taxis. Both are mainly owner-driver operation, the buses being mainly small van-body vehicles, with 9–15 seats and, out of town, light trucks with passenger seating. Buses operate within the urban area and are the main form of passenger transport in the rural areas. So far, there are no bus cooperatives or bus operators association. Bus routes and fares are unregulated. There is an informal bus terminal by the market at Taibese close to the Ministry of Communication and Transport (MOCT) offices.

2.1.3 Road Freight Transport

Commercial road freight outside of Dili is mainly carried by 2-axle vehicles, either pick-ups or small trucks. Heavier 3-axle and larger vehicles operate on the north coast road. UN traffic comprised about 30% of total road freight on the national road network at the time of the traffic surveys. Movements of containers are predominantly local to Dili and are direct movements between the port and consignee or freight forwarder's yard where they are deconsolidated. The principal export, coffee, is grown in the highland areas inland from Dili and cherry or green bean is carried in a pick-up or small truck to the coffee factory for processing. In general, apart from UN operations, movement of heavy axle vehicles appears to be small and there is no obvious overloading. There is no road carrier association at the present time.

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2.2 Ports and Shipping

2.2.1 Dili Port

Dili was formally a coastal port but is now the main and only international port of entry to East Timor. Built on the foreshore close to the center of town, the port is constrained in depth of port land behind the quayside by the main road. The layout of buildings and cargo sheds is more suited to its previous function of a coastal wharf handling mainly general cargo rather than for international container shipping. Work by the UNPKF, then under the EIRP and bilateral aid has been aimed at repairs and adaptation of the port to handling increased volumes of container cargo.

The wharf face is 300 meters (m) long and 20 m wide and can accommodate three small or two larger vessels at one time, with draft up to 7.2 m, the third berth having been completed under the EIRP. Restoration of the wharf rubber fendering has been carried out under Japan bilateral aid. An inspection of the underside of the wharf has indicated the need for some remedial strengthening works.

A barge landing ramp area at the southeast end has been repaired, and a break in the seawall at the western end is used as a beach landing by smaller landing barges. A slipway has also been completed under the EIRP.

Covered storage consists of a trans-shipment shed immediately behind the wharf, 56 m x 21 m, and four warehouses (two at 20 m x 40 m and two at 15.3 m x 37 m), all with concrete floors. The eastern open yard has been extended under the EIRP and the surface leveled and compacted; the surface is to be paved with concrete blocks under a current contract. The western yard still requires surface leveling and paving. The port perimeter is fenced by a 2.5m steel railing.

Container storage was summarized in the Multi-Modal Plan (MMP) at 15,575 square meters (sq m) made up of 9,000 sq m in the Eastern Yard (225 m x 40 m), 4,590 sq m in the Western Yard and hardstand, and with a further 3,000 sq m available through a western extension.

The sea approaches to Dili port involve navigation through one of two narrow passages and the navigation aids have been restored to a high standard under Japanese grant aid.

There are no shore-side cranes, so all cargo transfer is by LoLo geared vessels and a small proportion of roll on-roll off (RoRo). All stevedoring is undertaken under private contract between the shipping operator and stevedoring companies.

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2.2.2 Other Ports

Hera jetty, 14 km east of Dili on the eastern side of the lagoon, was constructed in 1990 for fishing use, and is 80 m long with a 30 m width L-shaped head, reinforced concrete deck on steel piles. Fendering, bollards, and navigation aids are all deteriorated, as have the sea defense works protecting the boat harbor. The wharf is leased to a private operator (Curtain Bros) until at least mid-2002 who provides support to the UNPKF, and as part of the lease agreement has undertaken some repairs to the wharf facilities: water supply, paving, reproofing and refurbishment of buildings, fencing, and ice-plant. The western side of the lagoon at Hera, where there is deeper water, has been suggested as a possible site for a future relief port to Dili to handle container shipping, should demand outstrip the capacity of Dili wharf.

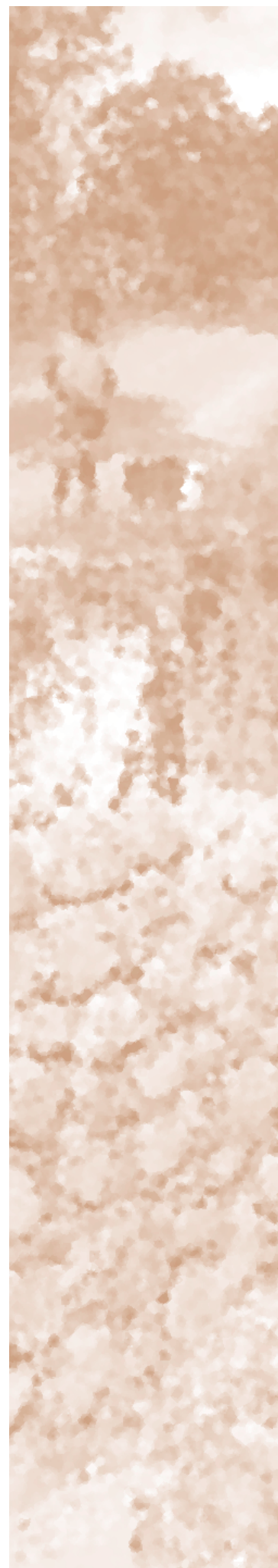
Tibar wharf, 12 km west of Dili, has a concrete jetty with timber deck, and has also been suggested as a possible future container port site, but the costs and environmental acceptability of clearing a passage through the bay are likely to be too high.

Com is located 70 km east of Baucau. There is an 80 m length T-head jetty linked by an L-shaped causeway to the road. There are no storage or handling facilities. Nav aids exist but are not operational. The deepwater approaches would allow relatively large vessels to berth, although there is no obvious anchorage. With no nearby center of population or other export-based development, the immediate uses for Com port are limited. It has been suggested for private leasing as a support to the petroleum industry, but the lack of shore infrastructure and poor road connection to Dili does not make it an attractive prospect for development.

Caravela is a solid concrete pier 100 m x 9 m, located on the north coast midway between Manatuto and Baucau and built as a RoRo terminal to serve the Indonesian transmigration program. The water depth is shallow and the fendering on the two mooring dolphins has deteriorated. An adjustable ramp at the landing point is not operational. Shore facilities are limited to an administration building and roadway. The wharf would only have a future if a coastal landing barge service were to be introduced.

Oecussi is currently served by a 15 m wide concrete landing yard, located close to the town center. An unpaved open storage area of 100 m x 60 m is used for all forms of cargo. There are no passenger facilities for the passenger ferry service when it is reinstated. The original wharf at Oecussi, not currently in use, is a T-pier 50 m long x 8 m wide, linked to a paved open storage area (50 m x 40 m) by a 4.5 m wide concrete roadway. When last inspected, the wharf was reported to be structurally sound with good fendering. There is no shore-based cargo handling equipment. Buildings include a port control room and storage buildings, all of which are damaged.

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Atauro island is served by an 80 m long concrete jetty near Beloi, suitable only for small boats, and dry at low tide, although there appears to be scope for extending the jetty into deeper water and berthing larger vessels.

There are another ten or so beach landings around the coastline, most of which have been used at various times by the UNPKF.

2.2.3 International Shipping

Dili is served by liner services from Australia (Perkins Shipping) and Singapore (Swire Pacific) on weekly or fortnightly rotation carrying container and breakbulk cargo. Direct shipping services operate to Darwin, Malaysia (Kota Kinabalu, Sabah), Singapore, and Indonesia (Surabaya). Small coastal vessels also operate between Indonesian ports and Dili, carrying break-bulk cargo. Trade has been heavily weighted towards imports over the restoration period.

2.2.4 Coastal Shipping

Apart from the UNPKF, there is no coastal distribution of cargo from Dili to other parts of East Timor by sea. Any service that is set up would most likely be by landing barge due to the lack of wharf and jetty facilities at coastal ports. However, unless transport by road is restricted, either by the condition of the roads, or by limitations on heavy vehicle loads using the road system, then the commercial viability of a landing barge service would be in doubt.

2.2.5 Oecussi and Atauro Passenger Ferries

A combined cargo/passenger ferry operated between Dili and Oecussi from 2000 up to the middle of 2001, but the passenger service has been discontinued on safety grounds. Passengers were carried free of charge, as they also have been on the UN air service to Oecussi. MOCT has advertised a contract for a new passenger ferry service to operate over the short term, probably for 2 years, until such time as road transit can be arranged with Indonesia. In the event that an accommodation is not reached with Indonesia, then cargo and passenger ferry services would continue longer term, possibly as part of a more general shipping service serving the Timor coast to Kupang, if cabotage arrangements are made.

Atauro island is served informally by small boats but has no regular ferry service and no maritime safety oversight. Attempts to establish regular services over the past 2 years have depended on international volunteers.

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2.3 Airports and Aviation

2.3.1 Comoro Airport

The international airport at Comoro has a 1,850 m by 30 m runway, ICAO Class 3C, sufficient for B737 size aircraft, and generally in good condition, although no physical measurements of pavement strength have been made. Emergency maintenance, carried out in April 2000, included crack sealing and surface treatment at the 26 end. The pavement was last resurfaced in 1982. There is a 185 m by 87 m apron and apron taxiway. The UN has also constructed temporary standing for its aircraft. Navigation aids and ground guidance systems have all been rehabilitated or renewed, including PAPI, VOR/DME, and NDB. A new lobby area has been constructed in the terminal, with baggage conveyor, and new counters. The existing fire control and rescue building and the airside road have been rehabilitated and 6 km of perimeter fencing erected.

2.3.2 Baucau Airport

Baucau is an ex-Indonesian military aerodrome, originally constructed by Japan, with a 2,520 m by 60 m Cat 4F runway, capable of handling B747 aircraft at reduced takeoff weight but has no other physical limitations. There is one taxiway and a 110 m square apron. The asphalt pavement is at least 30 years old and, although crack sealing has been carried out by UNTAET, there has been no physical testing or long-term maintenance plan and costing made. The facilities are not designed for civilian use and there is no passenger terminal, fencing or fuelling facility. From May 2001 Baucau has been managed by PAE and used by the UN under a contract that expires on 1 June 2002. Part of the airfield is leased to Philips Petroleum for support to the Timor Sea petroleum development, and the lease also requires the company to perform runway maintenance.

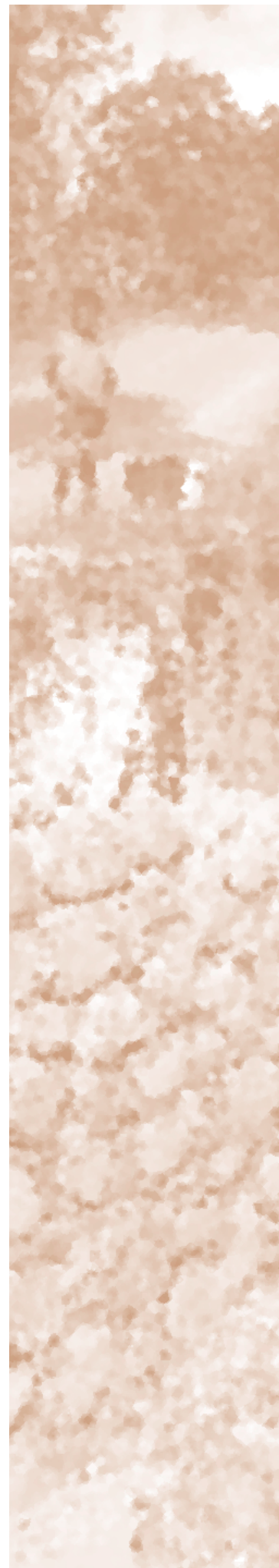
2.3.4 Suai Airport

Suai airport has a 1,050 m by 30 m runway, suitable for small aircraft, and has been used for the past 2 years by the UN to support its peacekeeping operations. There is a village close by the airport that is unfenced.

2.3.5 Other Airports

There are six other airports in East Timor but only Oecussi has any future potential. Commercial services operated to Oecussi for a short period but were unsuccessful. It is currently used only for UN flights. The airport has a gravel

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runway and access road and is fenced. Future use is probably restricted to medical evacuations and charter operation.

2.3.5 Air Services

International scheduled services are operated four times a day between Dili and Darwin by Air North, using Embraer Brasilia 120 30-seater aircraft, and once daily by Merpati of Indonesia between Dili and Denpasar using F100 or similar aircraft.

There are no schedule domestic air services or air carriers, internal air travel being handled primarily by the UN using fixed wing and helicopter.

2.3.6 Future Prospects

The short internal distances and developed state of the road network limit the market for domestic aviation, certainly in the short term. Development of tourism in future may create some demand for air travel to the east of the island, and could possibly be served by an extension of international flights to land at both Dili and Baucau. In the interim, while the economy and tourism develop, the intention is to try and maintain the assets at Baucau from lease conditions and revenue. Suai has some strategic importance, due to its border location and relative remoteness, but is unlikely to support other than charter services. Again, a policy of maintaining the asset at least cost against a future need.

2.4 Institutional Structure

MOCT is the lead government agency for road transport regulation, maritime, and air transport. Following recommendations made during the course of TA 3401-ETM, the Government has moved towards separation of the regulatory policy functions in the transport sector from delivery of transport services. This is a pattern of institutional development that is now commonly followed worldwide. The administration of the ports and civil aviation has been placed under two semi-autonomous authorities, under chief executives who report directly to MOCT. The ports administration is the more self-sufficient and has the greater separation between maritime policy, which remains within MOCT and port management. In the case of aviation, the management of the airports have been kept together with air traffic services and regulatory functions are within the Directorate of Civil Aviation (DCA). This is a pragmatic decision based on the relatively small size of the aviation sector in East Timor.

Both the port and airport are designed to be self-funding in relation to maintenance needs, and the ports should also be capable of self-funding capital

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development. With the limited air traffic, funding of capital works from airport fees is unlikely to be attainable by DCA. Road transport is entirely in private hands, and the Government's function is entirely regulatory, with the policy and administration within the Land Transport directorate of MOTC while on-road enforcement is the responsibility of the Civil Police.

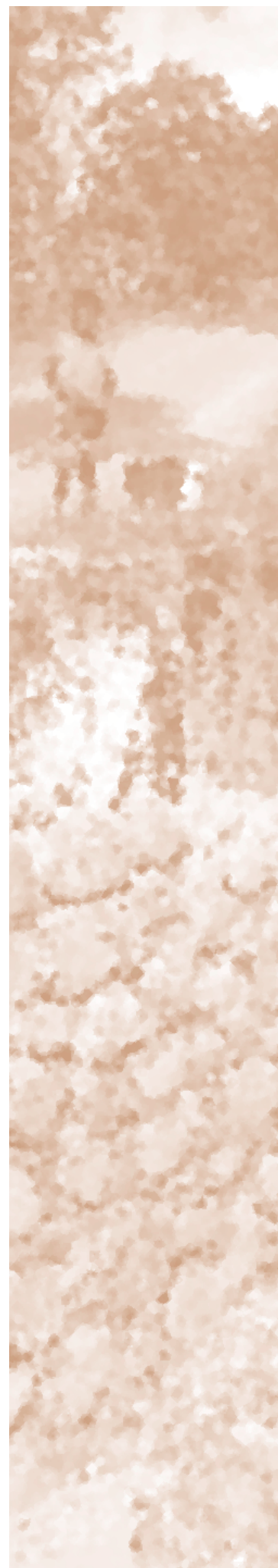
The administrative functions of road vehicle and driver registration, licensing and inspection have been centralized to the Motor Vehicle Office (MVO), located at Comoro, which forms a self-contained business unit within MOCT and receives revenues that more than meet its operational costs. In future part of these revenues would desirably go towards a consolidated road fund.

At present, there is an absence of district level administration for the transport sector. In the case of maritime and aviation, there is relatively little need for staff to be located outside of Dili. For road transport, there is a need for regional or district level administrative capacity for MVO, partly through regional units of MVO and/or by agency services provided through a suitably widespread network such as required for post, telecommunications, or banking. Enforcement activity also needs to be dispersed through regional and district policing units.

The private sector plays the lead role in transport services operations, there being no government owned or operated freight, passenger transport, shipping or aviation. Desirably, the Government should not become involved in the direct provision of transport services except in special circumstances, generally driven by social policy. One example of this is the Oecussi-Dili ferry service where a noncommercial operation has to be sustained to meet humanitarian needs. However, there is a role for the Government in encouraging the orderly development of the private sector, as well as its role in setting a favorable regulatory environment that protects the interests of transport users and ensures safety and honest dealing by transport providers. It is also desirable that industry associations be formed so that a dialog can be opened and maintained between Government and industry; for example bus, taxi and road freight operators' associations. A degree of organization and aggregation of the transport industry into cooperatives or companies is desirable so that services to the public can be organized on a larger scale than is possible with unorganized owner-operators.

East Timor does not have an industrial or manufacturing base, so all transport equipment is imported. The Government therefore has the opportunity to influence the development of the industry through its border regulations. Internally, the support activities to transport, such as vehicle maintenance and repair, wholesaling and retailing of parts and consumables, vehicle and plant hire/rental can be expected to develop without any government intervention. Training is desirable to assist this process and to provide skilled work openings for East Timorese in automotive and allied trades.

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2.5 Transport Law and Enforcement

As part of ADB technical assistance, a complete draft of a transport law was prepared and submitted to the Government in 2000 (Recommendations for the Transport Master Plan, Appendix A – Transport Sector Legislation and Implementation Strategy). The legal framework was for a single act establishing legal principles applicable over all transport modes, with subsidiary legislation governing the various modes and government authorities operating in the transport sector. Over the transitional period, UNTAET has issued regulations to frame the basic regulation for motor vehicle registration, and under ETTA a basic legal framework of transport law is being progressively developed and submitted to the Government. Enacted legislation and law in drafting are as follows:

2.5.1 UNTAET

Regulation 2001/06, On the Registration of Motor Vehicles in East Timor (June 2001) – which established the basic function and powers of the Motor Vehicle Office to register vehicles, issue license plates, and authorize vehicle inspections.

Regulation 2001/08, On the Establishment of a Regime Governing Road Traffic in East Timor (June 2001) – requiring a driver's license, establishing the duties of drivers, empowering Police in relation to road traffic, allowing prosecution for driving under the influence of alcohol or drugs, provisions for parking and removal of vehicles, installation of traffic control devices, traffic infringements and offenses.

2.5.2 MOCT Legislative Program

A law covering the transport sector is intended to be in place by 20 May 2002 dealing with

(i) Land Transport

- governing the commercial carriage of goods and passengers by road
- establishing vehicle weight and dimension control, and vehicle construction and use
- a code for driving on the road (Road Code)

(ii) Maritime Transport

- establishment of the ports as a public administering institution
- basic law for governing port operation and port tariffs
- carriage of goods by sea, and vessel chartering
- regulation of small coastal vessels (those not covered by SOLAS)

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(iii) **Air Transport**

- basic law for civil aviation

Another law is programmed for completion in late 2002 covering

(i) **Land Transport**

- law governing transit traffic
- register of motor vehicles
- fiscal system for roads and road users

(ii) **Maritime Transport**

- maritime commercial law
- establishment of an East Timor Register of Shipping

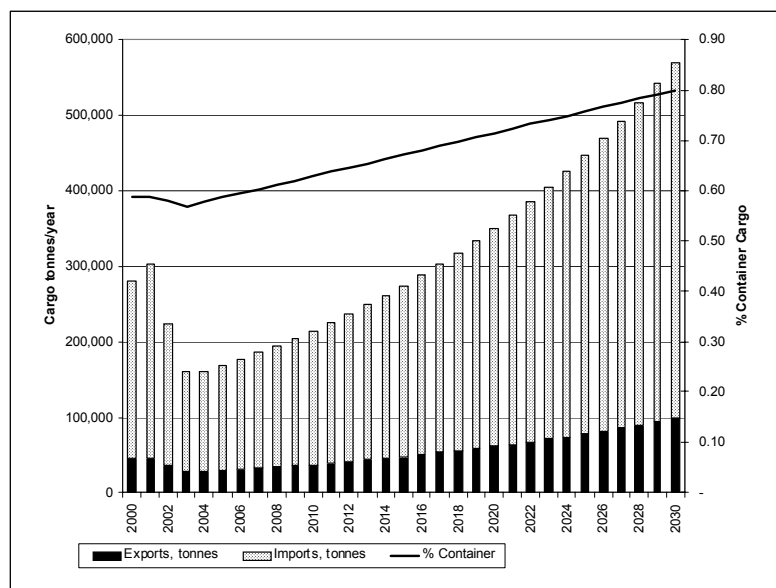
3. Ports and Shipping

3.1 Transport Demand

3.1.1 International Shipping

Projections of cargo tonnages through the Port of Dili have been made based upon short-term forecasts of the components of import and export trade and, beyond 2004 are based on GDP growth (Figure 3.1). During the restoration period, trade through the port has been boosted by the presence of international personnel and the materials imported to support the reconstruction efforts. In

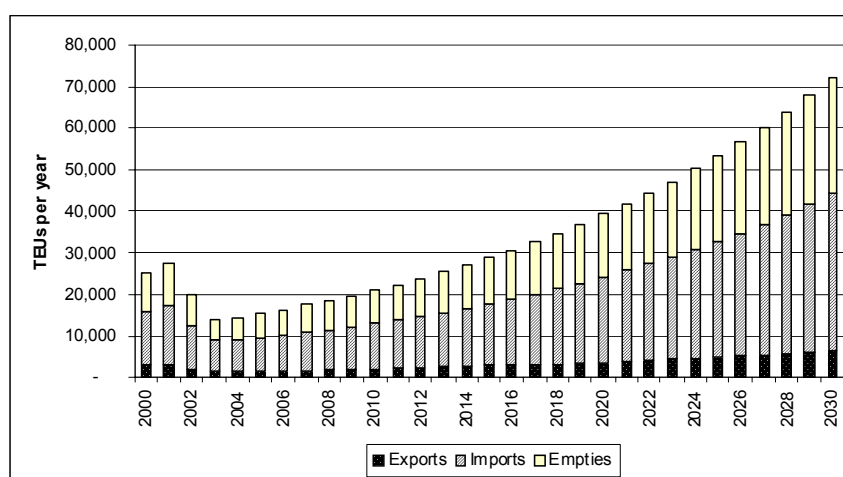
Figure 3.1: Projection of International Cargo through Dili Port



the short term, there is expected to be a decline in cargo volumes due to the completion of the emergency restoration efforts and withdrawal of international personnel. In the longer term this will be made up by import and export trade growth. However, it is expected to be some years before the port is called on to handle cargo volumes greater than that in 2000–2001.

The division between container and break-bulk cargo was estimated to be 60% in 2000 and is assumed to increase over time. Empty containers are assumed to equal the balance between imports and exports with a 10% reduction factor to allow for losses. On this basis container numbers through the port are projected as shown in Figure 3.2.

Figure 3.2: Projected Container Throughput, Dili Port



There is expected to be a continuing imbalance of containers requiring a flow of empty export containers. As with total cargo, container volumes are not expected to return to 2001 levels for around 10 years. The methods of cargo and container volume projection have necessarily been fairly coarse, and based on the level of information available at the time of the study, but should be sufficient to establish in general terms, whether there is an immediate need to consider port expansion, which does not appear to be the case.¹

3.1.2 Coastal Cargo Potential

At present the coastal landing points are not used for commercial freight or passenger transport, although there once used to be cargo distribution by

¹ Several inconsistencies are present in the information sources and port statistics and merchandise trade data for 2001 that required confirmation.

coastal shipping from Dili. The south coast ports are only serviceable by landing barge in good weather. Some coastal distribution has been carried out by United Nations Transitional Administrator in East Timor (UNTAET) and NGOs to support peacekeeping and relief operations. The East Timor Shipping and Supply Company (ETSS) has provided barge services to these agencies under charter.

Studies have estimated the potential cargo demand for distribution within East Timor on the basis of district populations (for imports) and export agricultural production, with an assumed modal split between road and coastal shipping. The conclusion is that there is sufficient potential cargo to support a weekly coastal landing barge service. However, the costs of barging are not competitive at distances under 800 km and, for the south coast, road has a marked distance and cost advantage. Added to this there are additional costs of cargo transfer at the wharf or landing, risks of damage, longer transit times, and the costs of local access journeys to the landing point which will be made by road in most cases. Overall, the chances of coastal barge competing where there is reasonable road access are small. Coastal distribution would compete only in cases where the road was closed or there was some other restriction on goods carriage. A limit on axle loads and truck size for traffic crossing from north to south of the island would increase road transport costs but, as most goods are carried on small trucks now, the effect would probably not be enough to influence the mode of transport.

3.2 Port and Shipping Investment

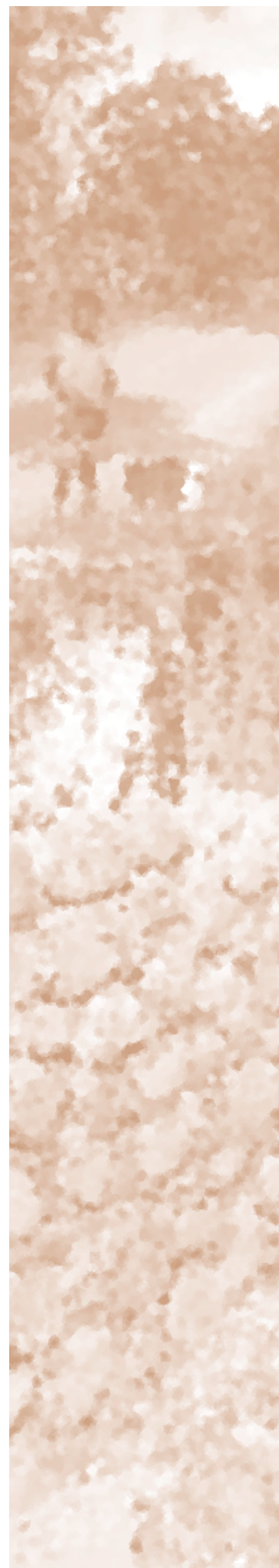
3.2.1 Dili Port

There has been ongoing work to rehabilitate Dili port and to reconfigure it from a coastal port accepting break bulk cargo to an international port handling primarily container cargo. A program of short-term work is underway, funded under the EIRP from TFET and from bilateral assistance from Japan. This program comprises (excluding completed works)

- (i) concrete block paving of the eastern container yard (EIRP);
- (ii) construction of a reinforced concrete block perimeter wall in the eastern area (currently suspended pending consideration of objections to this construction) (EIRP); and
- (iii) paving of the western container yard (Japan funding).

Cargo forecasts do not indicate any need to expand port facilities at Dili in the short to medium term, and any further work should concentrate on improvements that increase the efficiency of ship berthing and cargo handling operations, the general working environment, and road access into the port. Such improvements should be shown to generate cost savings that can be funded

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from port revenues and that are economically justified before approval. Items requiring further investment have been identified by the port management and under the EIRP as

- (i) repairs to the eastern wharf structure,
- (ii) provision of a tugboat under a concession tender,
- (iii) cargo handling equipment (forklifts) to be owned by the port administration as a reserve so as not to be completely dependent on overseas private companies in future,
- (iv) improvements to port services—internal telephone, IT and power distribution, ship/shore communications, and
- (v) port security and fire-fighting improvements.

Costs and funding sources for the above have not been identified. However, apart from the civil engineering works that may require funding assistance, the remaining costs should be met from port revenues.

3.2.2 Coastal Transport Infrastructure

Apart from the obvious needs of Oecussi, Atauro, and possibly Jaco (for which there is no data), which are all effectively islands, the demand for distribution of goods by coastal barge service is unproven. However, the costs of restoring the secondary ports and beach landings to an operational condition is modest, although some administrative presence would be required where buildings are restored or rebuilt. The transport investment plan does not include wharves that are to be developed for fishing or defense purposes.

The development requirements and costs are shown below:

Table 3.1: Capital Investment in Coastal Transport Infrastructure

Secondary Port	Works	Cost
Island Ports and Oecussi Enclave		
Oecussi	Surfacing, passenger facilities, storage, etc.	92,000
Atauro (Beloi)	Rehabilitation of jetty	60,000
Subtotal		152,000
Coastal Secondary Ports		
Caravela	Surfacing and minor works	68,000
Com	Refurbishment of buildings and fence	15,000
Laga	Storage sheds and apron surfacing	63,000
Subtotal		146,000
Others		
Coastal NavAids	Needs to be defined	not costed
Beach landings		290,000

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3.2.3 Oecussi and Atauro Ferries

An evaluation of a replacement passenger ferry service to Oecussi has been made for MOCT by a firm of German ferry service operators. Conditions of contract for a ferry franchise scheme were earlier proposed in the Ports and Shipping component of TA 3401-ETM. The recommended vessel is a combined Roll on-Roll off/passenger ferry carrying 100 passengers and 200 tons of cargo, which would operate under a subsidized franchise arrangement for 2 years at a cost of \$342,500 per year. A further \$350,000 of capital investment would be required for floating pontoons, ramp and crane at each port. In the event that transit access by road to Oecussi can be agreed with Indonesia, then the Oecussi ferry may become largely redundant. If not, then a more permanent arrangement should be investigated, possibly involving vessel purchase or by a continuing competitive franchise scheme. The opportunity of creating Oecussi as a port of entry and extending the service to Kupang could also be contemplated. This would open more commercial opportunities and could remove part or all of the need for continuing subsidy of the Oecussi service.

In the case of Atauro, a small capacity vessel operating four times a week, carrying 10 passengers and accompanied goods is required. It is possible that such a service could operate unsubsidized, or at a small subsidy, and the main barrier appears to be capital to acquire a suitable vessel (about \$20,000). Oversight by MOCT is also required to ensure safe operation, which is a necessity for all small coastal shipping.

4. Civil Aviation

4.1 Air Transport Demand

The projected demand for international air transport (excluding UN services) is shown Figure 4.1. The projections are based on air traffic growing at a rate 5% above the growth rate in GDP, which is a conservative estimate compared with worldwide trends that show rates double that of GDP. The high rates of growth in air travel are based on a reducing real cost of travel and in airfares. While costs will reduce over time as more efficient aircraft are introduced and through economies of scale as passenger numbers rise, the effect of these factors on sectors in East Timor will be less due to limited competition, and small volumes. The result is a modest rate of growth of 5% per annum in the short term, rising to 10% per annum in the medium term.

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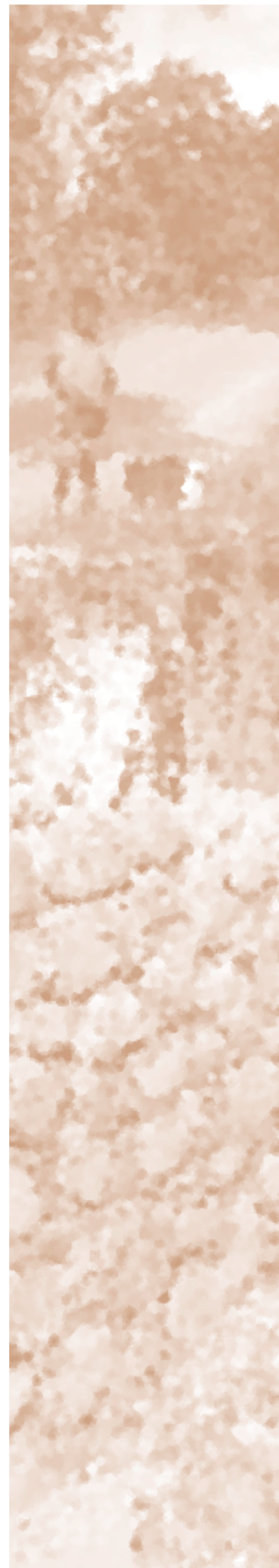
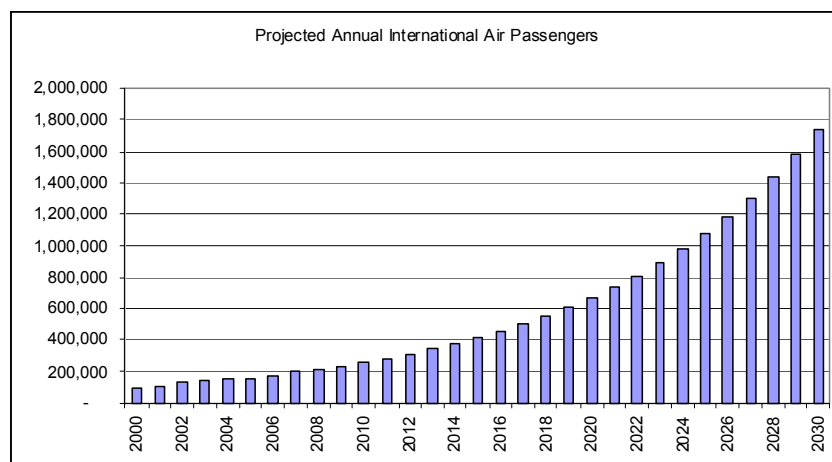


Figure 4.1: Projected Air Passengers through Comoro International Airport



4.2 Comoro Airport

There are 10 movements of scheduled flights daily at Comoro, plus a number of UN flights that will phase out over the short term. If Air North operated larger aircraft the number of movements could reduce to 4–6 per day. There are no evident problems with capacity at Comoro for the foreseeable future, and investment will focus more on maintenance of the infrastructure and on any residual investment required to bring the airport to international standard. While there is no immediate need to consider a runway extension this is precluded by the river at one end and the sea at the other. There is no strength data on the runway and, although the pavement appears to be in reasonable condition and fit for the air traffic using Dili over the medium term, strength testing and an engineering inspection would confirm the condition and allow a long-term maintenance plan to be developed.

4.3 Other Airports

The strategy for other airports, for which there is little or no commercial demand, should be to maintain significant assets that may have use in the long term, as far as practicable through lease arrangements such as that planned for Baucau. Suai and Oecussi should probably be retained for security and back-up use, but basic maintenance may need to be met from funding other than the DCA.

4.4 Airspace Management

There is an opportunity to create a Flight Information Region (FIR) for the upper airspace (over 22,000 ft) of East Timor, the incentive for which is primarily to obtain revenues from provision of air navigation information to over-flying aircraft. This has been identified as an objective in the National Development Plan. Currently, upper airspace is controlled under a trilateral agreement between Australia, Indonesia, and UNTAET. While politically attractive, the creation of an additional FIR in this region may not be a sensible operational decision, and would attract only limited revenue. Improvement to radio coverage of the lower airspace is desirable; currently, the Dili control tower has a range of only 35 nautical miles (nm), which should be improved to 80 nm and cover all of the country.

5. Land Transport

5.1 Introduction

Road transport demand and road investment planning are discussed in Part B of the Master Plan. This section deals with economic and safety regulation of road transport. Important regulatory issues in East Timor are

- (i) heavy vehicle load control,
- (ii) public transport regulation,
- (iii) road safety,
- (iv) fiscal provisions for roads and road transport, and
- (v) vehicle importation and vehicle construction and use.

5.2 Heavy Vehicle Control

5.2.1 Heavy Vehicle Weights and Dimensions

Vehicle maximum width and height is fairly standard around the world. Maximum vehicle length varies considerably and is related to mass limits as well as road geometric capacity. The suggested maximum weights and dimensions of heavy vehicles in East Timor are:

Dimensions - legal maximum width (2.5 m) and height (4.25 m) are common international requirements; overall length and length of vehicles in an articulated combination varies and is related to allowable axle configurations and the geometric and load capacity of the network; a maximum length of 19 meters is probably suitable for East Timor.

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Suggested gross mass limits for vehicle and combinations:

- 2-axle truck with twin rear tires 12 tons
- 3-axle rigid truck, 22.5 tons
- larger vehicle combinations, 39 tons

Individual axle loads

- single tired steering axle, 5.4 tons
- twin tired rear axle, 8.2 tons
- tandem rear axle set (twin or large single-tired), 15.0 tons
- tri-axle set (twin or large single-tired), 17.5 tons

A number of other dimensions may be specified such as turning circle, overhangs, and ground clearance. Also the technical specification of permissible vehicle combinations, the spacing of axle combinations, tires and suspension, and the axle and gross mass limits can become quite complex.

The legal framework should also allow for permitting of over-dimension vehicles used on specified journeys on set routes, subject to conditions. Permitting of overweight vehicles *may* also be considered provided maximum axle loads are not exceeded and an engineer's check on the capacity of bridge structures is obtained.

5.2.2 Route Weight Restrictions

The damaging effect of a heavy axle increases approximately by the fourth power of the axle weight. The most damaging vehicles are often single rear axle vehicles where the suspension has been strengthened or originally designed to carry heavy loads, such as construction aggregate. A load of 14 tons on a rear axle is possible, and is $(14/8.2)^4 = 8.5$ standard axles. A medium truck carrying 5 tons on the rear axle would exert only 0.2 of a standard axle, or 1/50 of the damaging effect.

Where the pavement surface is very weak, the passage of even a few heavy axles can cause shear failure in the surface and costly damage. Observation of the road network, much of which has received no pavement maintenance since 1997, shows that some parts have withstood the passage of heavy military and supply vehicles with relatively little damage. These roads are mainly on the north coast, on the flatter sections. The road along the north coast and west coast between Maliana and Baucau carries more heavy traffic than other parts of the network and connects the main economic centers of the country. Other roads, particularly those crossing the island north to south, are more subject to water damage and land instability, and include sections where the paved surface has been lost or is in danger of being lost. A weight restriction could be considered for these roads to ensure that heavy loads do not compound road

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maintenance problems. This weight restriction could be 5 tons on a rear axle, which would allow medium size trucks carrying coffee or general goods, and small buses of 9–15 seats.

5.2.3 Enforcement

Enforcement of axle weight regulations is usually carried out by the Civil Police or by a special unit of the transport department. Giving this responsibility to the Police is the better solution, as they can use their powers to stop, detain, and penalize operators who infringe the regulations. If the task is given to the Transport Department, then either they must be accompanied by a Police officer, which is wasteful of resources, or be given some Police powers, which is generally regarded as unsatisfactory.

A special unit within the Police force may be considered, as detection and prosecution of loading offenses requires the use of specialist measuring equipment, such as portable wheel or axle load scales, or the operation of fixed weigh-pits at strategic locations on the road network (e.g., main road before Comoro airport). Often, a combination of fixed weigh-pits and portable scales is used as drivers are aware of the location and manning patterns at fixed weigh-sites. As many of the heavy loads will pass into or out of the wharf, a weighbridge may be considered near the port gates, if space allows. Such a weighbridge can also be useful for commercial weighing purposes.

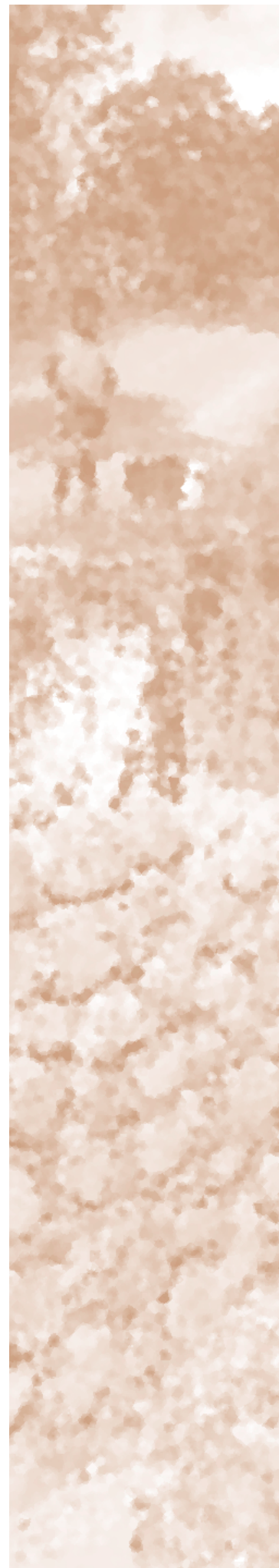
5.2.4 Exemptions

The power to permit exemptions may be included, although care should be taken in case this leads to mass avoidance of the rules. Exemptions may be made for individual vehicles on a time and/or route basis, or for single journeys. Overweight permits should be limited to maximum gross combination weight if possible, and not be given for overweight axles or axle combinations. Over-dimension exemptions can be permitted provided that there are escort vehicles, and that the route does not have height or width restrictions that make passage impossible. Fees for overweight and over-dimension permits should recover administrative costs and also the cost of the overloading on the road. The cost should be on a distance and gross weight scale, for a particular axle configuration.

5.2.5 Heavy Vehicle Fees

Heavy vehicle fees are an important source of revenue to help recover the maintenance costs imposed by heavy vehicle axles. Scales of heavy vehicle fees based on vehicle axle configuration and maximum licensed weight can be

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included in regulations. Heavy vehicle fees are normally charged on an annual basis, maybe with the option to buy a license every quarter or semi-annually.

5.2.6 Legislation

The power to set maximum vehicle weights and dimension should be part of the Act governing road transport. The limits may be incorporated directly in the Act or be subsidiary regulations. Penalties are normally charged at a higher level than the fee for legal operation—a penalty of two or three times the normal fee is typical. As the penalties can be considerable, instant fines will not be practical, and a ticketing and payment system will be required. Care must be taken in the legislation with definitions of motor vehicle, heavy vehicle, truck, etc.

5.2.7 Axle Load Surveys

A series of axle load surveys would be desirable to determine the profile of axle loading on the roads for road design purposes, and to help in deciding where load restrictions on route might be applied and weighing points sited. This could be done under technical assistance, as could the training of Police enforcement staff.

5.3 Public Transport Regulation

5.3.1 Regulation of Services and Fares

The market is already providing passenger services without any government regulation or financial support. It is recommended that service and price regulation be kept to a minimum consistent with the operation of a safe and sustainable transport service.

Regulation is needed to ensure:

- (i) vehicles are safe for passengers to use—body construction is adequate, and safety features such as brakes and steering are properly maintained; however, care is needed not to over-specify safety requirements or this will drive up costs;
- (ii) the bus drivers are trained to a sufficient level, which will be above that for driving a private vehicle;
- (iii) the bus drivers and operators are of good character (a character reference may be needed) and are not likely to defraud or injure passengers in their care;
- (iv) drivers do not drive while tired (maximum driving hours) or under the influence of alcohol or drugs;

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- (v) without being too strict, that the operator has sufficient financial capacity and business training to operate a bus service reliably, so that passengers can have confidence that the service will be available; and
- (vi) passengers know how much it will cost to travel; the fares are advertised and remain the same over a period of time. A fare staging system may be useful so that it is clear what fares are charged for any particular journey.

Any further regulation, such as licensing bus operators to routes, or applying price control over fares, will start to detract from the advantages of a free market operation. Once an authority specifies routes and the number of services that can operate on them, it becomes difficult to know whether the service is well tuned to the pattern of travel demand. On the other hand, an organized route system makes it easier for passengers to understand.

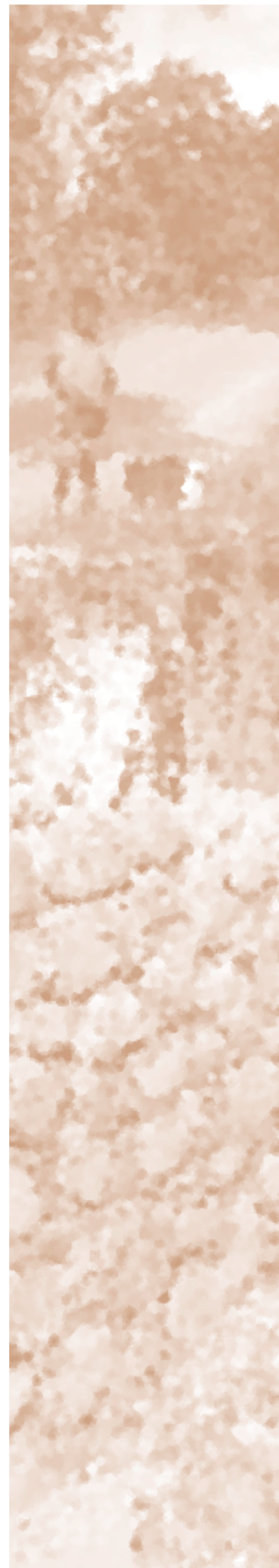
5.3.2 Public or Private Operation and Subsidy

Many urban bus services overseas are operated by a public authority, such as a city council or a separate transit authority. This allows the public authority to control all of the bus routing, schedules and fares, and to serve noncommercial routes and times of day, where it is seen to be socially desirable to do so. Where urban congestion is a problem, bus fares are kept low to encourage people to use public transport instead of cars. Public operation of buses comes at a cost. Almost all such services require a large degree of financial subsidy. Taking on more public cost is probably not in East Timor's interests in the medium term. Also, private operation offers business and employment opportunities to the private sector, at a reasonably low entry cost. Where services are operated by private bus owners, either owner/drivers, cooperatives or bus companies, there will be some times of day and some routes that it is not financially worthwhile to operate. It is possible to buy additional service coverage by a competitive tendering system, where operators bid how much they would require in subsidy to run the service. Again, this involves some public expenditure, although a lesser amount, and is probably not a good idea in the immediate future for East Timor.

There are few examples of a completely private nonsubsidized bus operation, which also operate with route licensing and tariff control. Problems with exercising route and tariff control are

- (i) reluctance of the Government to allow justified tariff increases;
- (ii) illegal competition from unregulated operators and taxis (operating as shared ride vehicles);

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- (iii) low quality of the buses, as the operators are not able to make enough revenue from fares to upgrade their fleets; and
- (iv) a lot of public administrative effort is required to run the system for approving and monitoring routes and tariffs.

5.3.3 Competitive Franchising Systems

While vehicle construction and use and driver licensing can be regulated through general legislation, development of organized public transport services may benefit from the introduction of a competitive franchising system. While such a system can involve public subsidy to operate noncommercial services, this need not necessarily be the case. The competitive tendering can be on the basis of the service qualities offered. In order to meet the requirements of service frequency, time-tableing, vehicles and driver backup, financial capacity and business sustainability, etc., individual owner/operators will form themselves into bus operator associations, cooperatives or companies, enabling them to compete for franchised services. Bus operator associations should be registered with the administering authority, in this case MOCT. There is a danger if bus operator associations are granted exclusive rights, either to market entry or to use of facilities (such as bus terminals) as these can then be manipulated for the advantage of the operators, the employees (where there is a strong labor union presence), or other interests. There can be problems where politicians own bus or taxi enterprises and are in a position to influence the administering authority. In some countries criminal elements have taken over bus associations or demanded payment from them.

Introduction of a franchising system will give exclusivity of operation on a particular route to one or more operators who, in return, must meet the service obligations in their tender bid. This requires monitoring capability on the part of the administering authority. Franchising also locks in the supply of transport on each route which can be difficult for the authority to correctly estimate, with the result that demand is unsatisfied on some routes while others are oversupplied, and the design of routes may also be sub-optimal. There is a need for the authority to be responsive to the operator's views on passenger demand patterns, to consider alternative bids, and to periodically carry out passenger surveys to assess whether the market is being effectively served.

As with any quantity licensing system, the franchisee is being granted the exclusive right to a commercial opportunity and this sets up the motivation for corruption of the tendering process. The tendering authority must be seen to act in a way that is transparent and fair in awarding tenders. The evaluation system must be clear and public, and able to be legally challenged. Evaluation criteria for service franchises may include

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- (i) fares to be charged, and discounts offered;
- (ii) proposed operating schedule and coverage;
- (iii) type and condition of vehicles to be run;
- (iv) backup facilities for breakdowns, maintenance, and repair;
- (v) driver qualifications, experience, and methods for checking on health and competence; and
- (vi) availability of passenger insurance.

Marks would be awarded for each point of evaluation and the highest marked bidder awarded the service. The term of franchise should be sufficient to be commercially attractive, but not so long as to lock operators and the authority into unsatisfactory arrangements. Initially a short trial period of 6 months may be appropriate, eventually extending to 2–3-year service contracts. Packaging of the franchises is a challenge, whether single or multiple routes and whether bidders can offer discounts for being awarded more than one tender. There is the prospect of a single large operator capturing the majority, or all, of the market and driving out competition. Normally, franchising systems are operated for urban bus services, with longer distance services allowed to operate unregulated. Difficulties can arise when bus franchises face competition from taxi operators who, by their nature, are licensed to provide point-to-point services. Particularly when operated as a shared taxi service, taxis may compete against bus services. The type of vehicle operated may be similar if small minibuses are being used on the franchised service and similar vehicles as taxis, so the cost structure may be similar.

5.3.4 Alternative to Franchising

It needs to be judged whether MOCT is able to administer a bus service franchising system for Dili. The alternative, and one that is administratively less complex and cheaper, is to require certain minimum standards of bus operators, but otherwise allow an open market for service competition. In this case, licensing of operators would cover the following requirements:

- (i) standard of vehicles—mainly in regard to passenger safety;
- (ii) competence, health, and good character of drivers;
- (iii) advertisement of fares, routes, and service coverage (operating hours and days of the week);
- (iv) requirement to use designated bus stops, terminals and layover areas (a charge can be made for use of public bus terminals);
- (v) route destination and/or number shown on the vehicle; and
- (vi) issue of tickets and contract obligations to the passenger.

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Such a system would provide advantages of a more organized bus service without the administrative load required from a franchising system.

5.3.5 Promoting Public Transport Use

The main users of urban public transport tend to be workers. The best form of promotion is the availability of cheap, reliable, safe services that go at the times and to the places that people want. Public transport use can be promoted in various ways:

- (i) good advertising of the services, and a central point where information can be obtained by phone or drop-in;
- (ii) some countries, such as Brazil, have legally required employers in cities to give transport tickets as part of the employees' remuneration; however, this has caused distortions in transport pricing and is onerous on smaller companies;
- (iii) bus priority on the road—only useful in congested cities, where special traffic controls for buses give them preferential rights over other traffic (bus lanes, signal pre-emption); and
- (iv) public transport fare subsidies for children and elderly—more of a social policy and requires some commitment from operators or regulation of fares if not to be inflationary.

5.4 Road Safety

Road accidents are globally forecast to rise from the 9th highest cause of disease and injury to the 3rd highest by year 2020. Road accident rates are generally much higher in developing than in industrialized countries, despite lower levels of motorization. Road accidents are a burden on the economy through lost production and medical treatment as well as a source of personal distress to the victims and their families. Consequently, the development of an appropriate road safety program will be an important element of East Timor's transport policy.

5.4.1 Components of a Road Safety Program

Important components of a road safety program are

- (i) an appropriate administrative structure;
- (ii) sources of funding ;
- (iii) a national Road Safety Plan that embodies the goals, objectives and targets;
- (iv) safety-related legislation for vehicles, drivers and traffic;
- (v) on-road enforcement;

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- (vi) emergency services attendance;
- (vii) an accident reporting, recording, and analysis system;
- (viii) road design, crash site investigation, and remedial measures (accident black spots);
- (ix) community-wide programs (e.g. seat belt wearing); and
- (x) road safety education and publicity.

In general, when road safety projects are evaluated using cost-benefit analysis, they give very high rates of return compared with other road investments. The economic benefits arise from (i) reduced crash scene attendance costs (Police, ambulance, etc.), (ii) savings in hospitalization costs and follow-up medical costs, (iii) savings in lost output from workers who suffer accidents, and (iv) the nonmonetary losses—pain, grief and suffering of the victim and family. For safety projects to be given their correct weighting in transport investment, a consensus should be reached on an appropriate social cost valuation of road injuries and fatalities. Some comparative research against other countries will enable a set of values to be determined. It has been found overseas that adding the social costs of “pain, grief, and suffering” to cost-benefit analysis gives an accident cost several times larger than the recognition of monetized costs alone.

5.4.2 Administrative Structure

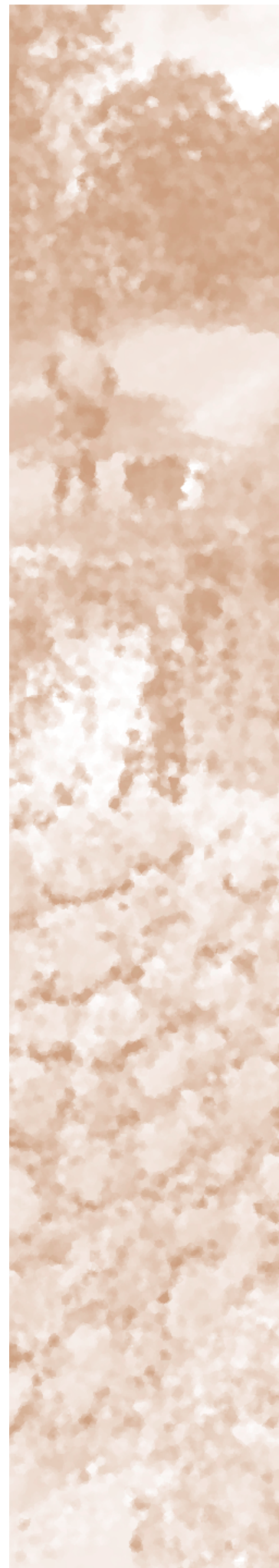
An appropriate administrative structure is required to operate the road safety program. This normally involves

- (i) a government transport agency—either a ministry of transport or a separate authority tasked with road safety as its primary focus; in East Timor, MOCT is the responsible agency;
- (ii) a government works agency—responsible for instituting safe road and traffic design;
- (iii) the civil police or a separate traffic police responsible for on-road enforcement; and
- (iv) a National Road Safety Council, involving government, road transport, and user interests and community groups (discussed below).

Larger countries have moved to the model of separate transport safety authorities, often one each for land, sea, and air transport. These operate as independent or subsidiary agencies to the national transport agency. In a small economy, there is no scope for multiple authorities, and the primary road safety responsibility is likely to remain within the Land Transport division of MOCT supported by other government agencies.

On-road enforcement can be by the Civil Police at a national level, or delegated to district level policing units. Alternatively, some countries operate

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a separate traffic police, either as part of the transport department or as a separate unit within the police force. This separation helps to avoid the road safety activities becoming secondary to criminal investigation, but can lead to a two-tier police service with the traffic police having a lower status and sometimes fewer powers than the remainder of the force.

5.4.3 National Road Safety Council

Establishment of a national road safety council or committee (NRSC) is a useful way of coordinating the road safety efforts of the various central government agencies, of the transport industry and the wider community. Representation on the NRSC will normally include (where they exist)

- (i) Director General of Transport and/or Director of Land Transport,
- (ii) National Police—head of traffic enforcement branch,
- (iii) Ministry of Justice,
- (iv) Ministry of Finance,
- (v) Director of Roads from the public works agency,
- (vi) Defence Force (Transport Division),
- (vii) Ministry of Health,
- (viii) Red Cross/Crescent, St. John's Ambulance or similar,
- (ix) Ministry of Education,
- (x) Local Government Association,
- (xi) Insurance Companies (Insurance Council where this exists),
- (xii) National radio and television,
- (xiii) Bus and Freight Transport Operators Associations, and
- (xiv) Private Motorists Association.

The length of this list demonstrates that road safety is a concern that involves many different agencies of differing viewpoints and interests, and why a coordinating body is needed. The NRSC is supported by district road safety committees that include local government and representation from other district level counterparts to the national level agencies. The NRSC will

- (i) define the goals, objectives, and priorities of road safety work in the country , including national road safety targets;
- (ii) coordinate the work of all organizations involved in road safety and to share and disseminate information;
- (iii) help procure finance for road safety programs and to control and monitor its use; and
- (iv) monitor and evaluate the effectiveness of programs and strategies and report annually to the Government.

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The NRSC will require a secretariat to support its deliberations, and these can either be seconded on a part-or full-time basis from staff of the contributing government organizations, or be permanent appointments. A staff of three or four professionals is ideally required in the areas of

- (i) executive director—public presentation and organizational ability;
- (ii) policing specialist—driver training and roadside enforcement skills;
- (iii) transport specialist—regulatory knowledge, driver psychology and motivation, statistical analysis ability;
- (iv) education specialist—primary level teacher with curriculum development experience; and
- (v) health specialist—emergency services planning, health promotion, and education.

5.4.4 Funding

This structure requires funding. Potential sources are

- (i) a levy applied either on annual vehicle licensing or on compulsory third party vehicle insurance;
- (ii) where a road fund has been established, a portion of the user charges are directed to funding safety enforcement, research, and education;
- (iii) incorporation of road safety in the school curriculum; and
- (iv) supplementary fund raising at a community level.

5.4.5 Safety Related Legislation

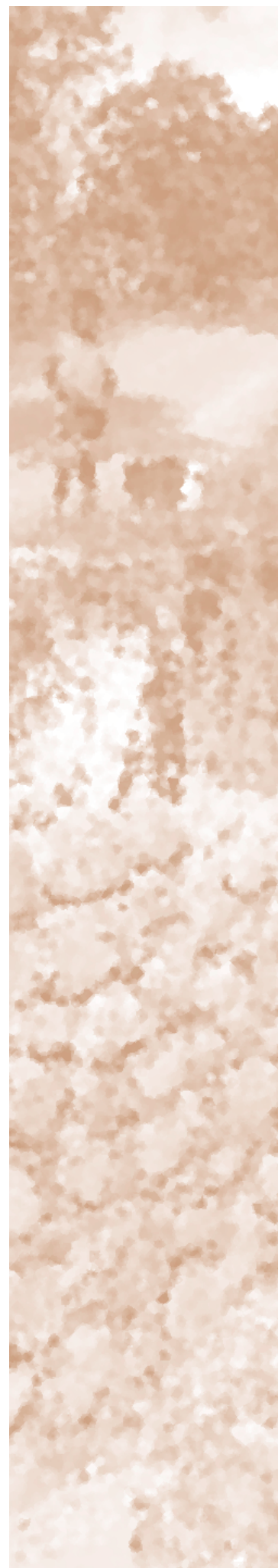
Legislation for road safety includes

- (i) road traffic rules—governing general driving behavior and for the obedience of traffic signs, markings, control devices and the directions of authorized officers such as the police; and an accompanying system of penalties for infringements and offenses;
- (ii) driver licensing rules—age and health requirements; training and examination;
- (iii) vehicle design and use rules—features of vehicle design and additions or modifications to vehicles; loads on vehicles; and
- (iv) transport service rules—special safety-related requirements for vehicles engaged in public passenger and goods services.

5.4.6 On-Road Enforcement

The main requirements for on-road enforcement are (i) police or traffic officers who are well trained in the law and how to apply it in practical

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situations; and (ii) basic equipment to enable the officers to carry out their tasks—patrol cars, speed detection equipment, breath alcohol meters.

5.4.7 Emergency Services Attendance

The survival outcome of road accidents depends upon the speed and competence of emergency assistance. However, emergency services can be costly to provide and there are practical limits. Needed resources include

- (i) first aid administered by the public—requires training in basic first aid as community-wide education and voluntary service participation;
- (ii) communications to emergency services—(111, 911, 999 systems);
- (iii) first aid administered by Police when the first to arrive—requires training and first aid equipment;
- (iv) ambulance services with trained personnel—either as community-supported or government-supported services; can be road vehicles or helicopter ; and
- (v) road trauma treatment available at hospitals—requires highly trained staff and well-equipped hospital.

In practice, East Timor will need to build up its capability to respond to road accident trauma in line with economic growth and the satisfaction of other social and community objectives. Medical services have an insatiable appetite for funds, and there will be limits on what degree of emergency service backup can be provided.

5.4.8 Accident Recording, Reporting, and Analysis System

An accident database provides a useful tool for monitoring the achievement of a road safety program. Without such a tool, it is impossible to compare the safety performance of the country against others and measure progress internationally. The essential elements of an accident recording, reporting and analysis system are

- (i) a legal obligation to report accidents—part of the traffic code;
- (ii) police or traffic officers available to attend accident scenes—a resource issue;
- (iii) identification system for accident location—important and often overlooked;
- (iv) police training in accident recording and reporting—a training and resource issue;
- (v) accident database software and hardware—many systems in use, can be customized to country requirements; requires trained staff and backup systems support; and

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- (vi) standard periodic reporting and ability to generate customized reports
—trained staff resources required

Problems encountered with accident reporting and analysis systems include

- (i) uneven reporting—the most serious crashes involving death will almost always be reported in any competent system; serious injury leading to hospitalization will be partially reported; minor injuries and property damage will have low reporting rates. Some estimate is generally required of the scale of under-reporting;
- (ii) police officer coverage—can be uneven, and is usually better in town and close to the base of operations;
- (iii) maintenance of the data inputs, quality checking, security of the database and reporting—this can be a task which becomes neglected if the agency does not give it priority and staff lose motivation.

5.4.9 Road Design

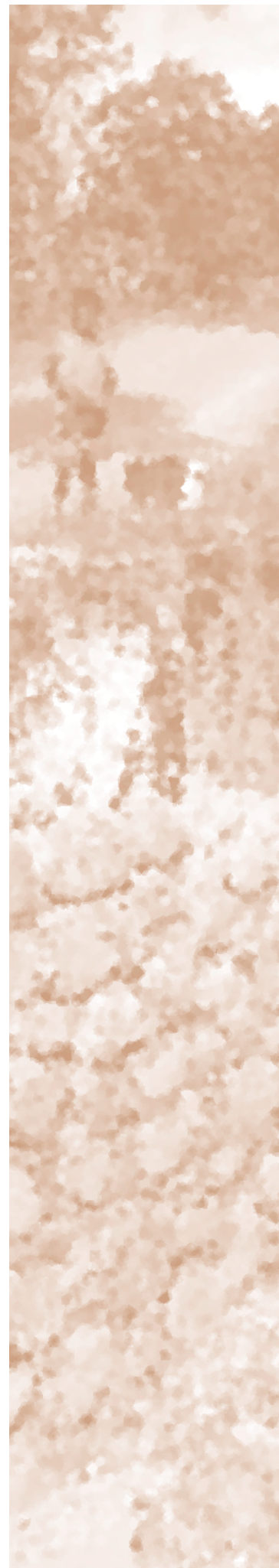
The accident database provides the ability to identify “black spot” sites—locations on the road or lengths of road where the accident rate is much higher than average and where some road design or traffic control changes may be needed. There are also general principles of safe road and traffic design that can be incorporated into practice without the need for any analysis of accident histories. Accident black spot analysis and safety design are part of the responsibility of the Roads administration within MWPW. Road design may be carried out by engineers within the Ministry or by consultants but, in either case, there is benefit in providing training in design theory and practice, and in carrying out an independent “safety audit” for all road designs that may have safety implications.

5.4.10 Community-Wide Programs

Community-wide programs, often called “mass action”, are those targeted at drivers and vehicles generally rather than at specific features of road design or at black spots. They can involve

- (i) vehicle design rules—legal requirement for safety features in the vehicle design or as additions, such as crash resistance, airbags and seat belts; when specifying design rules care is required not to over-specify the requirements beyond the capability of the transport agency and customs to enforce, and to a level that burdens the country with excess cost; and

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- (ii) vehicle use and traffic rules—requirement to wear seat belts when fitted; speed restrictions.

5.4.11 Road Safety Education and Publicity

Road safety education is an integral part of a road safety program. Education begins in primary school with basic road awareness for pedestrians and cyclists and continues in secondary education to prepare those reaching the minimum driving age. For the adult population, various forms of road safety publicity and campaigns may be needed to address observed problems, including

- (i) Defining the problem—crash data analysis, attitude and knowledge surveys;
- (ii) Planning of the campaign—target the behaviors to be changed and the audience, consider motivating factors, determine the message, select media;
- (iii) Timing of the campaign—short and at suitable time of year; and
- (iv) Evaluating the results and ongoing monitoring.

5.5 Fiscal Provisions for Road Transport

5.5.1 Introduction

The fiscal (public revenue) system for roads and road transport comprises

- (i) transaction fees, designed to cover the costs of the administrative tasks, for example the issue of vehicle registration plates and driver's licenses;
- (ii) charges for publicly provided services to recover costs, including
 - road construction and maintenance,
 - traffic enforcement, and
 - administrative overheads;
- (iii) recovery of transport externality costs, for example the public sector costs of road accidents;
- (iv) fines for traffic offenses; and
- (v) deterrent taxes to limit the purchase or use of certain vehicles (e.g., pollution emitters, luxury vehicles).

The most significant of these is user charges for cost recovery of road construction and maintenance. Road transport is often used as a basis for generating revenue for expenditure on other social programs, for example through import duties and excise on vehicles, parts and fuel, or through value-added or sales taxes.

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Pricing is often used in combination with regulation to achieve policy objectives. For example prohibition of imports for vehicles considered to be polluting, unsafe or excessive contributors to carbon dioxide emissions. Road pricing and the level of fuel taxation are used in congested urban areas in the United Kingdom to manage transport demand.

5.5.2 Cost Recovery Objective

For a low traffic network, such as East Timor, particularly where there is limited ability to pay, a full cost-recovery policy such as would normally be applied in an industrialized country will be difficult to implement. Full cost recovery requires the charges made on the road user to equal, over time, the costs of construction, rehabilitation, and maintenance of the road system. More appropriate goals are

- (i) to recover only part of the capital expenditure, but all maintenance costs;
- (ii) to recover maintenance costs only, including periodic and routine maintenance; and
- (iii) to recover only routine maintenance costs.

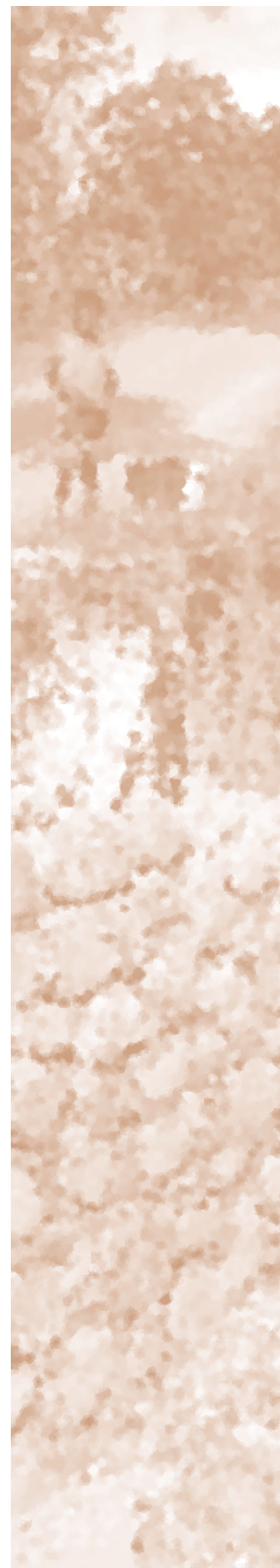
On the expenditure side, costs can be managed to some extent by limiting the extent of the road network that is maintained, by deferring maintenance from its optimal timing—although this leads to higher expenditure in the long term, or by funding some maintenance at lower costs from community resources rather than from central Government. The lower the cost recovery from road users, the higher the requirement for government to fund the roads budget from other internal revenue, or from overseas grants or borrowings.

5.5.3 Revenue Sources

There are a limited number of revenue sources:

- (i) excise on gasoline and/or diesel fuel;
- (ii) annual vehicle license fees—above the base level required to cover administration costs;
- (iii) road tolls—used extensively in some countries but best suited to funding very expensive items of infrastructure which benefit a limited group of road users (for example bridge and tunnels);
- (iv) taxes on other consumable items, such as tires—used infrequently;
- (v) vehicle weight/distance taxes—which are conceptually attractive but require effort and technology to operate and enforce (used in some European countries and New Zealand); they are also used as supplementary taxes for very heavy vehicles; and

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- (vi) vehicle import duty and sales tax—these taxes tend to be used more for general revenue collection and also to influence the mix of vehicles entering the market.

Road user revenues should be simple to collect, without high administrative overhead costs, be difficult to avoid, and be seen to be fair. In an environment such as East Timor, this generally leads to the conclusion that cost recovery be through a levy on fuel together with vehicle annual license fees.

5.5.4 Structure of Charges

Road system costs can be broadly divided into two parts:

- (i) the provision of road space—the road reserve, formation and a pavement sufficient to carry light vehicles; and
- (ii) the provision of structural capacity—ability to carry heavy vehicles by providing a pavement of sufficient strength and durability and by building bridges to carry heavy loads.

In order to encourage an optimal allocation of traffic on the road system, the structure of user charges ideally should be such that light and heavy vehicles contribute in proportion to their cost responsibility. In practice, however, this can be difficult to achieve, particularly when only partial cost recovery is possible. Generally, the charges that would be required on heavy vehicles to cover the marginal costs they impose on the road system are very high when the heavy vehicle fleet is small. Too high a charge leads to evasion and corruption of the system, and can be a disincentive to development.

It is necessary to take a practical approach and apply fuel levies and heavy vehicle charges that are politically acceptable, and which do not lead to widespread evasion.

5.5.5 Levels of Charges

An estimate of revenues from user charges, based on a vehicle fleet of 25,000 of which half are motorcycles, and estimating vehicle annual travel from road traffic counts and road section lengths, give the following:

- (i) Estimated fuel usage 17 million liters (compared with 40 million in the MMP);
- (ii) Estimated fuel excise revenue at 5 cents/liter yields \$840,000;
- (iii) Annual license fee surcharge averaging \$25/vehicle/year but scaled to vehicle size (similar proportion to the existing fee scale) yields \$470,000;

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- (iv) Total revenue from these two sources is \$1,310,000 (compared with \$3,000,000 in the MMP);
- (v) This revenue to road maintenance compares with an annual requirement for routine maintenance of around \$5 million compared with a requested appropriation of just over \$2 million. Periodic maintenance is entirely unfunded and in the order of \$9 million annually in the long term;
- (vi) It can be seen that, short of much higher levels of user charges, only a small proportion of the road maintenance cost can be met from road user charges in the short term;
- (vii) The level of fuel excise will ultimately be a political decision but important to establish the principle of cost recovery, even if charging levels in the early years do not match road maintenance expenditures.

5.5.6 Road Trust Fund

The establishment of a road trust fund to hold revenues generated from road users for later expenditure on road maintenance and operation is generally recommended by international funding agencies and works well in a number of countries.

The reason for a trust fund is to ensure that the revenues are expended on roads and road transport administration and are not diverted to other government expenditure. It also highlights the extent of road cost recovery, and provides the basis for setting long-term targets, such as removing dependence on external assistance.

The trust fund is normally administered by the Ministry of Finance as a separate account and authority to disburse funds follows a protocol established with the government agencies using the fund, in this case MOCT and MWPW.

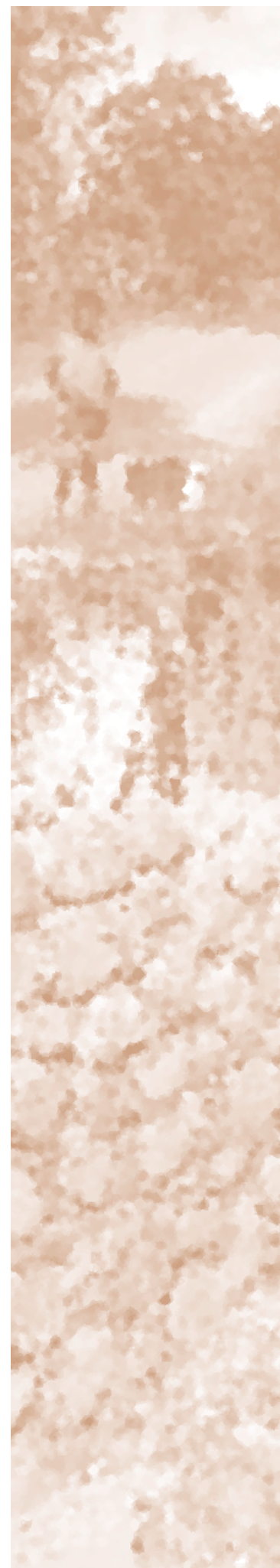
5.6 Vehicle Importation Policies

5.6.1 Introduction

Controls on vehicle importation can take the form of graduated import duty and sales tax to differentiate by size and design features or country of origin, prohibition or import quotas on certain classes of vehicle—fuel type, age, weight, emission controls, safety features, etc., and limiting who is permitted to import—e.g., licensed importers, persons returning with vehicles used overseas. The main issues in East Timor are

- (i) whether to restrict the import of old used vehicles (Japan in particular has emission regulations and progressive annual licensing fees with age that encourage vehicles to be retired early); and

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- (ii) whether to restrict heavy vehicles with axle combinations and gross weight that will overstress road pavements.

5.6.2 Legal Requirements for Vehicle Design

Vehicle construction requirements should be targeted at safety, and are most important for passenger service vehicles (buses). Vehicle design rules are being harmonized around the world. For example the Australian Design Rules (ADRs) are being aligned to United Nations Economic Commission for Europe (UN ECE) standards (WP29 World Forum for Harmonization of Vehicle Regulations). Rather than detail the complexity of a design rule for East Timor, a more pragmatic course of action may be to adopt recognized standards used in the region or internationally such as ADRs or UN ECE standards, but consider relaxation of some provisions if these appear to add unreasonably to costs. As all vehicles are likely to be imported, they will in most cases comply with a recognized vehicle design standard in force in the country of origin at the time of manufacture. Consideration also needs to be given to the capacity of the administration to monitor compliance of vehicle design standards.

5.6.3 Used Light Vehicles

Many countries in the Asia and the Pacific permit the import of used vehicles. Some do not, such as Australia, although the motivation may be as much to protect domestic vehicle assembly industries as concern with environmental or safety features. The argument for freedom to import older vehicles is that this reduces the cost of vehicle ownership, which could be important, say, to a village who cooperates to buy a pick-up truck for general use. The argument against it is that older used technology is generally less fuel efficient, more polluting and less safe. While old diesel vehicles can be high emitters of visible smoke, and diesel mechanics are usually fewer than gasoline, both gasoline and diesel engines emit toxic fumes. In Japan, emission controls on diesel vehicles on the domestic market tightened in the mid-1990s, being brought up to near European levels of control at that time. It is sometimes possible to remove some emission control equipment, such as catalytic converters on exports, for catalytic converters to be poisoned and nonfunctional.

The level of motorization in East Timor and the population density are both quite low. The climate is apparently not susceptible to temperature inversion and the larger towns are on the coasts so get some natural flushing of the air from sea and land breezes. Health effects are unlikely to be on the scale of Mexico City.

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Two-stroke engines are also more polluting than four stroke (motorcycles can be the biggest polluters), so four-stroke engine cars could also be prohibited, although these are likely to be a very minor import in any case. Countries also control used imports for safety reasons, such as fitting of seat belts, airbags, and side intrusion protection. Overall, it is hard for a country with limited resource to police the technologies being imported, and a limitation on age would be easier to verify (although documentation can still be falsified).

It may be that a compromise of limiting imports of used motor vehicles to say 6 years old, would be a suitable compromise, allowing access to the lower cost used market, but excluding very old vehicles. Limits by kilometers driven is not possible because odometers can be easily rewound. Also the import of vehicles that have been severely crash damaged should be prevented (e.g., where two crashed vehicles have been cut and welded together). Again, this would require someone with sufficient knowledge to be able to identify. It should also be a requirement that vehicles are accompanied by official documentation from their country of origin, either the original registration papers or a suitable alternative, that verifies that the vehicle is legally exported and is of the age shown.

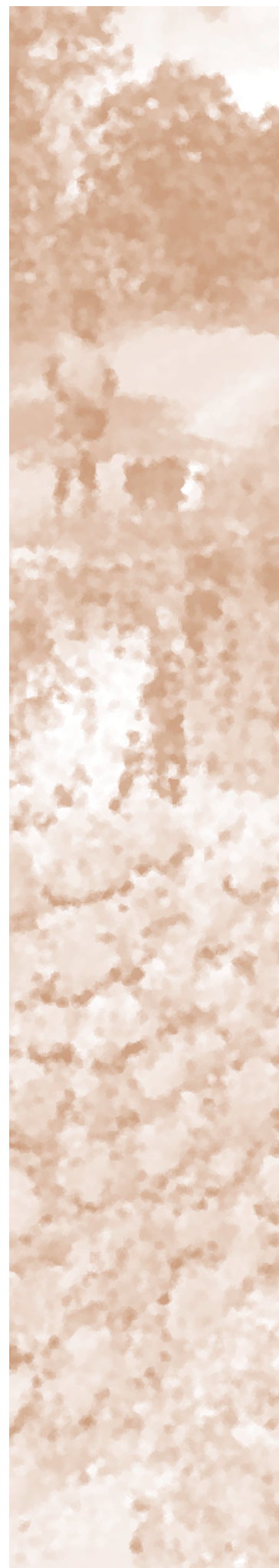
5.6.4 Heavy Vehicle Chassis

Placing limits on heavy vehicle chassis imports could be considered as one way of controlling vehicle overloads. However, there are a number of difficulties:

- (i) on-road mass depends as much on vehicle combinations - trailers, semi-trailers as it does on individual vehicle masses;
- (ii) large trucks often have a higher manufacturer's rated gross weight than can legally be used on the road—actual usage does not necessarily make full use of the vehicle load capacity and some truck operators prefer to operate vehicles with higher power/weight ratio as they find maintenance costs are less and performance is better, outweighing the higher vehicle cost;
- (iii) trailers can be assembled locally, and vehicle suspensions modified, once a basic machine shop and auto-mechanic capability has been established, so import controls will not be altogether effective;
- (iv) import control requires some technical knowledge to enforce; and
- (v) there is already a pool of vehicles from UNPKF and UNTAET, some of which are likely to remain in East Timor.

For these various reasons, emphasis should be placed on roadside vehicle weighing and on-road enforcement of weight limits, rather than on import controls.

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6. Action Plan

6.1 National Development Plan

The National Development Plan promotes national and sector visions for 2020, and a program of action for the period 2002–2006. The Transport Master Plan has been an input into the NDP and the recommendations of both are broadly consistent and are set out below. The NDP process has identified a sector vision, goals, guiding principles, key performance indicators, policies and strategies, and programs and projects. These are set out below.

6.2 Sector Vision

The overall vision of MOCT for the three transport modes is as follows:

(i) Land Transport

- To put in place an integrated system of road infrastructure and road transport services that supports the sustainable development of East Timor and favors the more disadvantaged social groups.

(ii) Civil Aviation

- To attain excellence in all aeronautical services, through membership in International Civil Aviation Organization (ICAO) and attainment of relevant to ICAO standards, for the airports and air services;
- To provide scientific knowledge to a continuous high level to staff in the sector, in order to be able to provide safe and high quality services, equal to the best airports in the region; and
- To make the air services of East Timor synonymous with safety and quality.

(iii) Sea Transport

- To develop a national maritime transport and port system to create conditions for economic development and sustainability for external commerce.

6.3 Goals

- to develop infrastructure and services for land, air, and sea transport;
- to create sustainable conditions for other areas of the economy; and
- to promote employment opportunities in the areas of land, air and sea transport and to develop technical and scientific specialization and knowledge in the sector.

6.4 Guiding Principles

(i) Land Transport

- To guarantee the users the freedom of choice of transport, within an appropriate system of user charges;
- To assure users parity of conditions, equality of treatment in the access to, and enjoyment of, transport services;
- To formulate policies for order of the territory, regional development, quality of life, and protection of the environment;
- To set up requirements for the safe circulation of transport; and
- To satisfy national defense imperatives and the needs of strategic order.

(ii) Civil Aviation

- Quality—guarantee a continuing high standard of passenger services, aircraft, cargo, and mail;
- Participatory Management—establish an appropriate financial system that allows the civil aviation administration to recover its full costs of operation. The basic principle is the recovery of costs;
- Confidence—promote a favorable environment for development of credibility as a basic element of all operations; and
- Safety and security of operations.

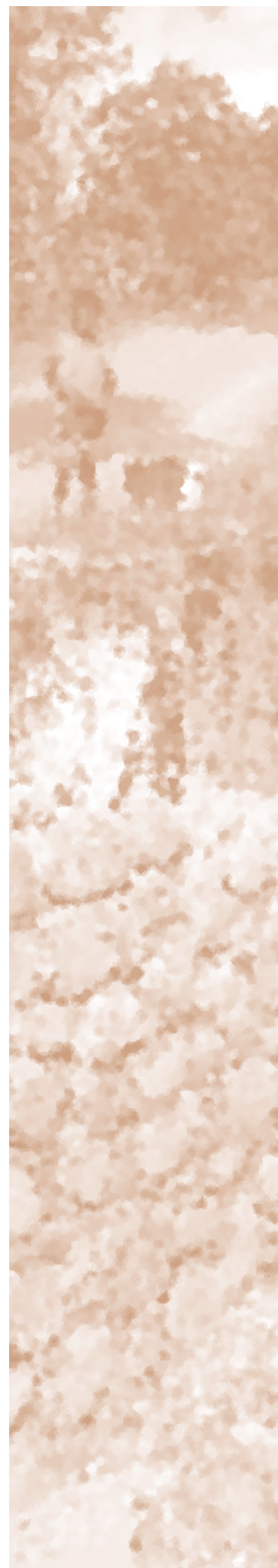
6.4.1 Key Performance Indicators

The following key development indicators are proposed for monitoring the performance of the transport sector:

(i) Land Transport

- Number and estimated percentage of road vehicles that are legally registered and have passed a mechanical safety inspection;
- Number of motorcycles, 4-wheel private motor vehicles, and total motor vehicles per 1,000 population;
- Number and estimated percentage of drivers who hold a legal license after having passed a driving competence and eyesight test;
- Number of road accident fatalities per 10,000 population—from Police reports and hospital records;
- Number and percentage of primary schools receiving a standard road safety education module;
- Number of heavy vehicles checked for overloading and percentage exceeding legal weight limits (once enforcement capability in place);
- Number of legally licensed public passenger transport vehicles (buses and taxis) per 10,000 population;

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- Percentage completion of an urban traffic management system for Dili—intersection controls restored, traffic signs and road markings, and channelization, one-way systems, etc.

(ii) **Sea Transport**

- Average hours per ship call for container and general cargo vessels;
- Rate of container handling—20-foot equivalent containers per hour;
- Average residence time of inward and outward containers on wharf container stacks;
- Ship-days per year spent queuing for a berth;
- Number of international liner shipping operators calling at Dili and number of ship-calls per year;
- Number of passenger ferry trips run, and passengers per year to Oecussi and Atauro; and
- Percentage of the other domestic port facilities restored to operational condition (Suai, Caravella, Com, Tibar beach landings).

(iii) **Civil Aviation**

- Annual available passenger seat capacity and passenger load factor on scheduled international services from Dili—Australia, Indonesia; and
- Number of civil aircraft movements at Comoro and other domestic aerodromes—scheduled, charter, and general aviation.

6.4.2 Strategies and Actions for the Transport Sector

(i) **Land Transport**

In the areas of road safety and road vehicles, the following short-and-medium term actions will be taken:

- Develop legal provisions for: vehicle weights and dimensions; vehicle construction, inspection and use; a Road Code;
- Introduce a fiscal system for roads and vehicles, in conjunction with the Ministry of Finance;
- Introduce a legal framework for the commercial carriage of goods;
- Formulate policies and set up a legal framework for entry to the road transport industry, passenger and heavy goods service vehicle licensing, and taxi services;
- Formulate policies and set up a legal framework for public passenger transport—urban, suburban, and inter-urban, defining the licensing regime for operators and imposing minimum regulations for safety and quality;

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- Analyze the need to create an urban public passenger transport company for the city of Dili, in the form of a public company or of a concession;
- Organize and improve the public passenger transport terminals in the city of Dili; and
- Develop an integrated road safety policy and its legal and institutional framework.

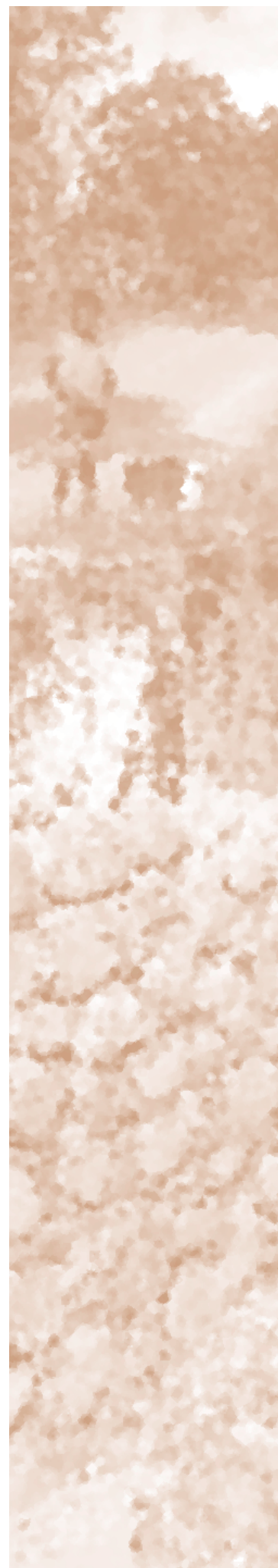
(ii) **Sea Transport**

- Develop the principal maritime legislation including: establishment of the port administration as a semi-autonomous self-financing authority; definition of port limits and regulatory controls therein; a code of maritime law;
- Review and revise the port tariff structure;
- Tender, on a competitive basis, an operational concession for providing, as a public service, a tug for the port of Dili to assist in the maneuvering of ships entering and leaving the port, for fire fighting and marine rescue services;
- Develop, as a first phase, basic port services at the ports of Suai and Oecussi; as a second phase, extend basic port services to the ports of Caravel and Com. The development of regional ports will be linked to the development of the maritime coastal transport between national ports;
- Complete, with current Japanese bilateral and multilateral assistance, the current projects with the aim of complete rehabilitation of the port installations at the port of Dili;
- Organize training programs and grant qualifications for Timorese in specialist maritime studies;
- Sign and ratify on behalf of East Timor the international conventions on maritime safety and transport and the Law of the Sea;
- Create a Timorese Register of Shipping;
- Support the creation of public passenger transport service linking Dili and Atauro and Dili and Oecussi;
- Develop a policy of support for national coastal trade, as part of a multi-modal policy for the movement of passengers and goods; and
- Create a national capacity, in basic terms, for condition survey and certification of ships. Prepare an agreement with a recognized classification society.

(iii) **Civil Aviation**

- The recruitment and training of Timorese for all levels of posts in the Administration area and Airport is a high current priority;
- Preparation of consolidated legislation and codes for the various

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areas: aerodrome categories and their respective parameters of operating safety, for all aeronautical infrastructure in East Timor; air medicine; issue and license fees for air operators; issue and license fees for the position of Controller of Air Traffic; regulation for the creation of the FIR/RIF (Flight Information Region for East Timor) and systems for their management and development; definition of parameters of operational and respective fiscalization; other matters necessary for the orderly development of aeronautical services, and to best guarantee operational safety and quality;

- Ratification and implementation of the principle treaties and conventions in the Civil Aviation area and accession to membership in ICAO. This is an area where it could be necessary to seek bilateral cooperative assistance;
- Consider the establishment of a Timorese FIR, to guarantee the sovereignty of the airspace of East Timor, with the commitment to expand air information services;
- Maintenance of the international airport of Dili and of the other national aerodromes at adequate and appropriate levels of operation and safety. In this area there will be a need for investment in navigation aids and ground safety services, such as fire-fighting and airport security;
- Provision of an appropriate level of air navigation and air traffic control services;
- Create a system of taxation for international air transport that provides for the financing of domestic services;
- Guarantee the operability of all the existing airports and prevention of their degradation;
- Join ICAO with the purpose of obtaining important sector support; and
- Establish bilateral agreements in the area of air transport with countries in the subregion with the objective of establishing reciprocal legal arrangements for future national operators.



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